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# Long-term effects of childhood work on human capital formation, migration decisions, and earnings in rural Ethiopia

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**Essa Chanie Mussa**

aus

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Referent: Prof. Dr. Joachim von Braun
Korreferent: Prof. Dr. Thomas Heckelei
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**Long-term effects of childhood work on human capital formation, migration decisions, and earnings in rural Ethiopia**


## Abstract

In Ethiopia, a quarter of children are child laborers, of which one in every three works full-time. Currently, more children than ever before also combine schooling with work. In addition, although net primary school enrollment increased three-fold—to almost 90 percent over the last decade, more than half of these children drop out of school to join the labor market before completing their primary education. As a result, lower educational attainment, high illiteracy rates, and low technical skills continue to characterize the Ethiopian labor force. Lower human capital has also hampered the development in the rural and agricultural sector, which employs about three-quarters of the labor force. Therefore, this study examines the consequences of childhood work participation on children's long-term human capital formation (schooling progression), their migration decisions, and adulthood earnings in rural Ethiopia. In so doing, it contributes to a very limited literature on the long-term penalties of childhood work on outcomes later in life from a developing country perspective.

This study uses a long-term panel dataset from five rural districts, collected in two survey waves: A baseline survey in 1999/2000 and a follow-up survey, 16 years later in 2015/2016. The random-effects Poisson model is used to analyze the effects of childhood work on children's long-term schooling progression, measured by the completed years of education. The findings show that full-time childhood work impedes long-term human capital formation, while in contrast, multitasking children (those who combined childhood work and school attendance) have attained more than twice as many years of schooling as their peers who worked full-time. The results also suggest that childhood work—excepting excessive, exclusive, and the worst forms of child labor—could be combined complementarily with child schooling to foster the long-term progression in human capital formation. However, these effects are heterogeneous according to child gender and childhood work type. Furthermore, using a doubly robust estimation method, the study also finds that full-time childhood work may limit the likelihoods of children's long-term village out-migration prospect compared to childhood educated peers. The results indicate that while those who worked exclusively during childhood are likely to be subsistence farmers when adults, schoolchildren tend to out-migrate in order to seek employment in non-farm jobs. In this regard, it was found that about 42, 34, and 24 percent of multitasking, school-only, and full-time childhood working children, respectively, currently work in non-farm jobs. Finally, using three-stage least squares approach, the estimates show that an extra one hour of childhood work per week could boost adulthood earnings by as much as 13.8 percent. The effects, however, exhibit diminishing returns when childhood work is more than five hours per day. Moreover, compared to schoolchildren, full-time childhood laborers earn, on average, 54.4 percent lower income in the adult labor markets. In indentifying the causal mechanisms, the study shows that childhood work may affect earnings through its effects on the probabilities of completing primary education and mobility to non-farming jobs later in life.

The findings suggest that eliminating full-time childhood work should be at the core of the country's human capital development policy. In order to cut dropouts before completing primary education, compulsory school enrollment for all school-aged children should be combined with continued support to children and parents. Conditional incentives such as education subsidies and school feeding programs could be tied with child's school enrollment and continued attendance.

**Langzeiteffekte von Kinderarbeit auf die Humankapitalentwicklung, Migrationsentscheidungen und Zukünftige Einkommen im Ländlichen Äthiopien**

**Zusammenfassung**

Eines von vier äthiopischen Kindern ist ein Kinderarbeiter, wobei ein Drittel in einem familiären Landwirtschaft und Hausarbeiten Vollzeit arbeitet. Derzeit kombinieren mehr Kinder denn je Schule mit ihrer Erwerbstätigkeit. Die Rate der Kinder die eine Grundschulausbildung beginnt liegt bei 90 Prozent, diese Zahl wurde in der letzten Dekade durch eine Verdreifachung der Anzahl der Kinder, die eine solche Ausbildung beginnt, erreicht. Etwas mehr als die Hälfte der Schüler bricht die Grundschulausbildung jedoch wieder ab, um eine Beschäftigung aufzunehmen und vorzeitig Teil der Erwerbsbevölkerung zu werden. Ein niedriger Bildungsgrad, eine hohe Analphabetenquote, sowie geringe technische Kompetenzen sind daher nach wie vor charakteristisch für die äthiopische Erwerbsbevölkerung. Drei Viertel dieser Erwerbsbevölkerung ist im landwirtschaftlichen Sektor, der niedrige Grad der Humankapitalentwicklung behindert die Entwicklung dieses Sektors, sowie die Entwicklung des ländlichen Raums im allgemeinen. Diese Studie untersucht die Auswirkungen von Kinderarbeit auf die langfristige Humankapitalentwicklung (Fortschreiten der Schulbildung) der Kinder, sowie den Einfluss der Erwerbstätigkeit auf Migrationsentscheidungen und die zu erwartende Einkommensentwicklung. Diese Studie ergänzt die im geringen Umfange vorhandne Fachliteratur in diesem Bereich mit einem Fokus auf den Preis der Kinderarbeit für das zu erwartende Leben von Kindern in Entwicklungsländern.

Diese Studie arbeitet mit verwendet einen Langzeit-Panel-Datensatz aus fünf ländlichen Bezirken, der in zwei Erhebungswellen erfasst wurde: Eine Basiserhebung 1999/2000 und eine Folgebefragung 16 Jahre später 2015/2016. Das *Random-Effects Poisson-Modell* wird eingesetzt um die Auswirkungen von Kinderarbeit auf die Langzeit Fortschreiten der Schulbildung zu untersuchen. Die Anzahl der abgeschlossenen Schuljahre diente hier als Messgröße. Die Ergebnisse zeigen dass Vollzeitkinderarbeit die langfristige Humankapitalentwicklung generell behindert, während eine Kombination von Kinderarbeit und Schulausbildung führt im Gegensatz dazu zu einer Verdopplung der abgeschlossenen Jahre in der Schulbiographie der Kinder. Die Ergebnisse lassen darauf schließen, dass Kinderarbeit mit Ausnahme von exzessiver, exklusiver und schlimmsten Kinderarbeit mit einer Schulausbildung kombiniert werden kann, um eine langfristig Verbesserung der Humankapitalentwicklung zu bewirken. Diese Ergebnisse variieren jedoch stark mit Bezug auf das Geschlecht der Kinderarbeiter und die Art der ausgeführten Tätigkeit. Unter Verwendung einer robusten Schätzmethode kommt diese Studie weiter zu dem Ergebnis, dass Vollzeitkinderarbeit eine Migrationsbewegung der Kinder, und jungen Erwachsenen, aus den Dörfern heraus behindert. Die Ergebnisse dieser Studie zeigen des Weiteren, dass Kinder, die Vollzeit arbeiten, im Vergleich zu ihren Altersgenossen, mit höherer Wahrscheinlichkeit im Erwachsenenalter als Subsitenzlandwirte arbeiten werden. Kinder welche die Schule besucht haben haben im Gegensatz dazu häufiger die Möglichkeit aus den Dörfern wegzuziehen um zukünftig Tätigkeiten außerhalb der Landwirtschaft nachzugehen. Diesbezüglich hat diese Studie ergeben dass 42 Prozent der Kinderarbeiter welche die Arbeit mit Schulbesuch kombinieren zukünftig eine Tätigkeit außerhalb der Landwirtschaft aufnehmen werden. Der Wert beträgt 34 Prozent bei Kindern die nur zur Schule gehen und 24 Prozent bei Kindern die ausschließlich arbeiten. Die Studie hat letztlich unter Verwendung eines *Three-stage least squares approach* ergeben, dass eine Stunde Kinderarbeit pro Woche die Einkommenserwartung im Erwachsenenalter um 13,8 Prozent erhöhen kann. Diese Effekt kommen jedoch nicht zum tragen

wenn die Kinder mehr als fünf Stunden pro Tag arbeiten müssen. Negative Effekte stellen sich ein, wenn die Kinder sehr viel arbeiten müssen, gerade ausschließlich arbeitende Kinder werden im Erwachsenenalter im Durchschnitt 54,4 Prozent weniger Einkommen am Arbeitsmarkt generieren können. Diese Studie zeigt in diesem Zusammenhang weiter, dass Kinderarbeit zukünftige Einkommenserwartungen negativ beeinträchtigt, da diese die Wahrscheinlichkeit des erfolgreichen Grundschulabschlusses verringert, und sich negative auf den Erwerbsverlauf ausübt, da sie die Mobilität aus den Dörfern hinaus behindert, was es erschwert, Tätigkeiten jenseits der Landwirtschaft aufzunehmen.

Die Ergebnisse legen nahe, dass die Beseitigung der Ganztagsarbeit in der Kindheit im Mittelpunkt der Humankapitalentwicklungspolitik des Landes stehen sollte. Der frühzeitige Abbruch von Grundschulkarrieren sollte durch ein Schulpflicht für Kinder und gezielte finanzielle Förderung von Familien und Kindern verhindert werden. Bildungszuschüsse und Teilnahme and Schulspeisungsprogrammen sollten an eine konsequente Einhaltung der Schulpflicht geknüpft werden.

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**List of Acronyms**

| | |
|---|---|
| 2SLS | Two-Stage Least Squares |
| 3SLS | Three-Stage Least Squares |
| AIPTW | Augmented Inverse Probability Treatment Weighting |
| AME | Average Marginal Effects |
| ATE | Average Treatment Effects |
| ATET | Average Treatment Effects on the Treated |
| CES | Constant Elasticity of Substitution |
| CIA | Conditional Independence Assumption |
| CRC | United Nations Convention on the Rights of the Child |
| CSA | Central Statistical Agency |
| CWI | Childhood Work Index |
| DHS | Demographic and Health Survey |
| EFA | Education For All |
| ELFS | Ethiopian Labor Force Survey |
| ERHS | Ethiopian Rural Household Survey |
| ESDP IV | Education Sector Development Program IV |
| ESDP V | Education Sector Development Program V |
| FAO | Food and Agriculture Organization of the United Nations |
| FDRE | The Federal Democratic Republic of Ethiopia |
| GLS | Generalized Least Squares |
| GPS | Generalized Propensity Score |
| GTP-I | Growth and Transformation Plan I |
| ILO | International Labor Organization |
| IPTWRA | Inverse Probability Treatment Weighting With Regression Adjustment |
| IRR | Incidence Rate Ratios |
| LHS | Left Hand Side |
| MoLSA | Ministry of Labor and Social Affairs |
| NELM | New Economics of Labor Migration |
| NER | Net Enrollment Rate |
| NREGA | Indian National Rural Employment Guarantee Act |
| OR | Odds Ratios |
| PCA | Principal Component Analysis |

| | |
|---|---|
| PSNP | Ethiopian Productive Safety Net Program |
| REOL | Random Effects Ordered Logit |
| RESET | Regression Error Specification Test |
| ROC | Receiver Operating Characteristic |
| RTs | Re-surveying Targets |
| SDGs | Sustainable Development Goals |
| SNNPR | Southern Nations, Nationalities, and Peoples' Region |
| SUR | Seemingly Unrelated Regression |
| TGE | Transitional Government of Ethiopia |
| TLU | Tropical Livestock Unit |
| WDI | World Development Indicators |

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## 1. Introduction

### 1.1 Study background

Ethiopia has experienced notable labor force growth in the last few decades. The country's active population, namely "[a]ll persons aged ten years and above who were productively engaged or available to be engaged during the reference period" (CSA, 2014a, p. 48), has tripled in the last three decades, from 14.7 million in 1984 to 33 million in 2005 (MoLSA, 2009), and it reached 43 million in 2013 (CSA, 2014a). This labor force growth has been driven primarily by high population growth, at about 2.6 percent per annum, which exceeds the World Bank's two percent threshold above which the provision of basic public services could be difficult, given a country's institutions and technologies (Ringheim et al., 2009). Over the past decade, the economy has grown by about 11 percent, while poverty declined from 45 percent in 1994/1995 to 30 percent in 2010/2011 (Geda & Yimer, 2014). Nonetheless, limited labor absorptive capacity of the economy amidst a surplus rural labor supply has led to pervasive rural underemployment, high incidence of poverty, and a high number of working poor in the agricultural and other informal sectors (MoLSA, 2009). Despite seeing sustained and impressive economic progress during the first growth and transformation plan (GTP-I) (2010/11-2014/15) and registered about 10 percent average real economic growth, poverty and unemployment continued to be the country's main development challenges (National Planning Commission, 2016).

Access to farmland is another main challenge in the context of unprecedented rural labor force growth. Past studies show that the average farmland size declined from about 1.4 hectares in 1977 to 1 hectare in 2012 (Headey & Jayne, 2014); specifically, about 55 percent of rural households depend on 1 hectare or less of farmland (Chanyalew et. al, 2010). Nationally representative household surveys also show that landlessness is a rising phenomenon in Ethiopia. In 2010/2011, one in every ten rural households was almost landless, working on less than 0.1 hectares (CSA, 2011). The problem affects mainly the rural youth, resulting in lower aspirations to stay in agriculture and consequently higher rural out-migration (Bezu & Holden, 2014). Often, under conditions of limited farmland availability, non-farm economic activities are used as alternative exits for the rural poor, the landless, and near-landless households (von Braun, 2007; World Bank, 2008). In line with this notion, the Ethiopian government is working to reduce rural unemployment by increasing the number of rural laborers employed in rural non-farm enterprises (Chanyalew et al., 2010). However, several studies (e.g. Bhatta & Årethun, 2013; Joshi & Verspoor, 2012; MoLSA, 2009; Seid et

al., 2016; World Bank, 2016a) have found that the majority of the Ethiopian workforce, mainly those working in the informal sector, is either illiterate or low-skilled—two serious obstacles for the shift of labor to high-paying non-farm economic activities. To put this in perspective, the current educational attainment profile of the Ethiopian labor force is comparable to the situation in Vietnam in the 1960s (Joshi & Verspoor, 2012). Looking deeper into the structure, Joshi and Verspoor (2012) report that about three-quarters of the Ethiopian labor force in 2001 was without any formal schooling, though this declined to about 56 percent in 2010. They also argue that since the illiterate young (13-14-year-old) active labor force would be obliged to continue working in informal economic sectors (agriculture and other activities) later in life, the impacts of the schooling deficit would persist for 30 years into the future (Joshi & Verspoor, 2012). In this regard, given that the long-term skilled labor demands of the Ethiopian economy—envisaging lower-middle income status by 2025—can be best addressed through the production of a better educated younger generation, it is critical for policymakers to have a better grasp of what impedes and enhances children's long-term human capital formation, migration decisions, and ability to earn better income when adults.

On the other hand, some studies have found sizeable impacts of investment in basic education on both individuals and the economy as a whole. For example, the 2004 World Bank poverty assessment report anticipates that the proportion of households living in poverty could have dropped by about 18 percent if Ethiopia had managed to achieve a universal four-year primary education program (basic numeracy and literacy skills) among its adult population (World Bank, 2005). With regard to private returns, compared to unskilled labor, those who attained 1-4 and 5-8 years of formal education earn about 67 percent and 1.5 times higher monthly wage, respectively. Even among informally employed labor, 1-4 and 5-8-year school attained workers command about 38 and 66 percent higher wages, respectively, compared to the illiterate workforce (Denu et al., 2005). This means that while skills generally result in higher returns, even in informal labor markets, lower human capital could hinder the effective mobility of the labor force, albeit mainly youth, from farm to non-farm economic activities and hamper their chances of earning a decent income.

### 1.2 Problem statement

Nationally representative child labor-related surveys in Ethiopia show that rural children participate widely in various low-intensity activities such as domestic chores and, to some extent, in physically demanding jobs such as farming. The surveys report that poverty is the

main driver of child labor. For instance, the 2001 national child labor survey has found that for about 90 percent of working-children, supplementing household income was the main reason for their work (CSA, 2002). Several empirical studies in the early 2000s also reported that child labor is widely prevalent in Ethiopia. Admassie (2002), using the Ethiopian Rural Household Survey (ERHS) dataset, has found that for rural Ethiopian children, work was the main responsibility for more than a third of them and schooling for 14 percent, while slightly more than a quarter of them had to combine work and study. In a related study, Admassie and Bedi (2003) have also noted extensive practices of child labor in rural Ethiopia, where as much as 21 percent of four- to five-year-old children engaged in certain labor-based activities and almost all children at ten years of age were involved in some form of work. They have also found that children toiled for 29-30 hours per week (Admassie & Bedi, 2003).

Over the last decade, the intensity of child employment in Ethiopia has declined, though it has still remained at a relatively high level. The share of children aged 7-14 years working in economic activities (farming and non-farm activities, excluding domestic chores), based on the number of hours worked in the previous seven days, declined from 56 percent in 2005 to about 26 percent in 2011. Moreover, among children working in economic activities, in the same period, while the share of work-only children declined from about 69.4 to 35.12 percent, on the contrary, the proportion of those who combined work and study more than doubled, increased from 30.6 to 64.9 percent (World Development Indicators, The World Bank, 2017). This shows that over the last decade, the nature of child labor in Ethiopia has been also changed, which suggests for relevant evidence regarding the consequences to the children's development and the society as whole, and appropriate policies to address the detrimental effects. In this regard, the changes in the structure of the child labor problem in the country may have been induced by static societal views about children's involvement in various work activities which often see it as an acceptable practice, on the one hand, and the notable expansion in access to education in rural Ethiopia, on the other.

In rural Ethiopia, the widespread practice of child labor has been accompanied by lower educational attainment (CSA, 2014b). As shown in Figure 1, although Ethiopia has made extraordinary progress in improving school enrollment, key educational outcome indicators have failed to match these enrollment figures. Results generated from World Development Indicators (2017) show that the net enrollment rate (NER) in primary schools surged from about 35 percent in 1999 to nearly 90 percent in 2015, a three-fold growth. However, the primary education completion rate stagnated at about 50 percent. This

discrepancy advances the need to understand the reasons behind the high prevalence of early dropout, and in this case, the widely practiced child labor deserves a thorough investigation.

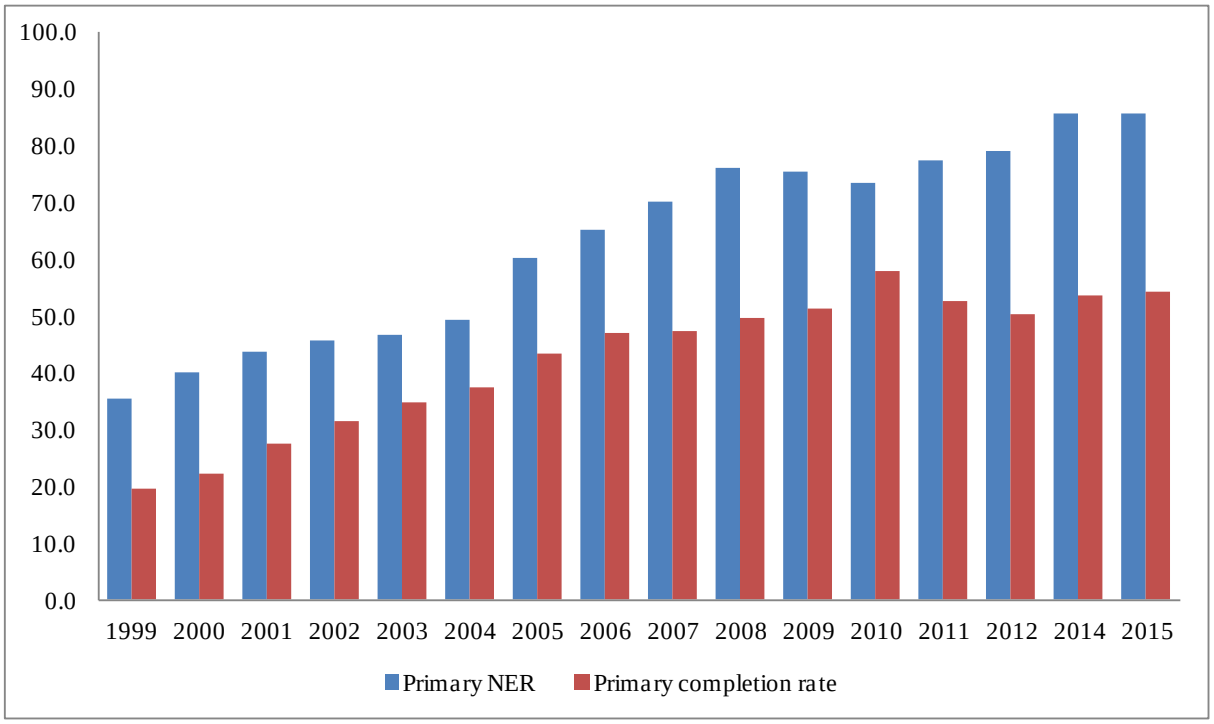


Figure 1. National primary education net enrollment and completion rate, 1999 -2015
Source: The World Bank, World Development Indicators (WDI) (2017)

Besides short-term working and studying time trade-off, and potential detrimental effects on early human capital formation (education), child labor can also impede long-term education progression. The penalty for long-term human capital formation may also lead to a cycle of adulthood poverty and precarious employment (FAO, 2015), which in turn may sustain intergenerational poverty and eventually impede social mobility. However, we also expect that the long-term effects of child labor on education progression might be affected by factors such as socioeconomic background and location. Admassie (2002) has found that while children in drought-prone Ethiopian rural villages tend to allocate their time between study and work, those who live in surplus-producing and relatively rich villages are more likely to spend their time on schooling. Regardless of this notion and other related facts, most previous empirical child labor studies in Ethiopia (e.g. Admassie, 2002; Admassie & Bedi, 2003; Cockburn, 2002; Cockburn & Dostie, 2007; Haile & Haile, 2012) have focused mainly on its short-term effects on educational outcomes such as enrollment and grade attainment. No currently published study has tried to uncover the long-term causal effects of child labor on

human capital formation, migration decisions, and earnings in rural Ethiopia, and so this led to a lack of effective policy continuity between early human capital (e.g. child education) and youth-targeted (e.g. adult education and vocational skill training) human capital and labor market policies.

Partly, perhaps due to extensive child labor that prevents school enrollment and early dropout from school, the problems of lower educational attainment, high illiteracy rates, and low-skilled labor also continue to define Ethiopian labor markets. For instance, although between 1999 and 2017 about 80 percent of 15-24-year-old adolescents participated in the labor market, i.e. slightly below the total labor force participation of about 83 percent (World Development Indicators, The World Bank, 2017), the majority of them were either illiterate or had inferior skills than what was required for decent jobs and better earnings.

First, during the last 16 years, the share of out-of-school adolescents (the percentage of lower secondary school-aged individuals often refers to those 10-19-year-old individuals who are not enrolled) declined only by 20 percentage points, from about 68 percent in 1999 to 47 percent in 2015 (Figure 2). Although this change is commendable, the illiteracy problem still needs more investigation, since illiterate adolescents entering the labor force will be a great challenge in the long term to realizing national development objectives.

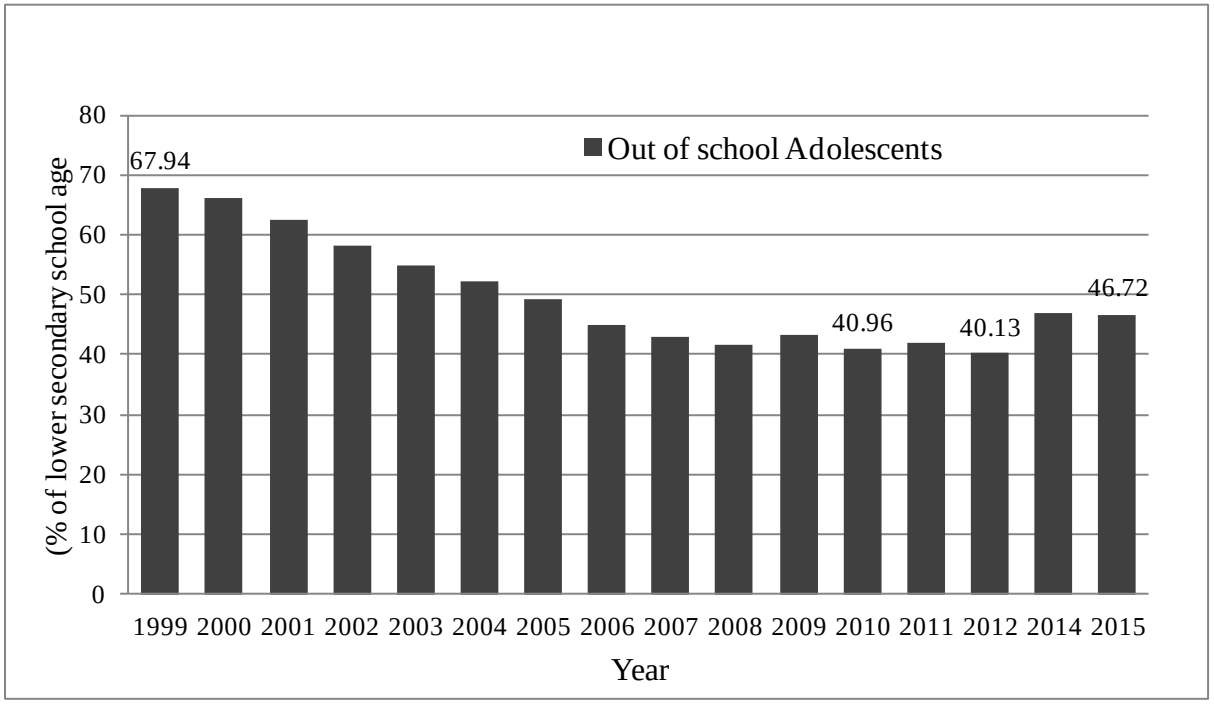


Figure 2. The share of lower secondary school age adolescents who are not enrolled in school
Source: The World Bank, World Development Indicators (2017)

In this regard, understanding long-term school progression differentials among children, vis-à-vis their childhood conditions, could help to identify better the drivers of post-primary education exclusion and attainment variances among adolescents and youths. In so doing, the evidence will help in addressing the barriers to school enrollment and progression.

Second, in addition to the high proportion of adolescents without formal schooling, low education attainment has been another serious problem in the Ethiopian labor markets. For instance, World Development Indicators data from 2009 to 2012 show that above two-thirds of the country's labor force had only a basic level of education, comprising either primary or lower secondary schooling (World Development Indicators, The World Bank, 2017). This signals that only a small section of enrolled children progressed to higher level. Connecting the dots, a lower rate of primary school completion, adolescents identified with lower human capital in the labor market, and a substantial amount of uneducated or low-skilled people collectively indicate the need for more evidence to understand the underlying factors. Thus, this thesis tries to identify how childhood work could affect children's long-term human capital accumulation, migration decisions, and, eventually, their earnings in the adult labor markets. The thesis uses a rich and novel panel dataset collected through tracking a sample of 4-14-year-old children from five rural Ethiopian districts in two survey waves: The baseline survey in 1999/2000 and a follow-up, administered after 16 years, in 2015/2016.

### 1.3 Motivation

Given the discussion above, and recognizing the decisive role of human capital (Becker, 1964; Mincer, 1958, 1974; Schultz, 1960) for sustainable human and economic developments, breaking the cycle of poverty and intergenerational inequality, and achieving structural transformation, the thesis examines the causal relationships between childhood work and adulthood outcomes. The World Economic Forum (2013) has strongly emphasized that addressing the challenges related to human capital is a critical step towards ensuring short-term economic stability and also growth, prosperity, and competitiveness in the long term. Fortunate enough to realize this, the childhood period forms the critical time for overall lifelong development and earnings to the extent that one can trace adults' health, physical, behavioral, and education conditions to the investments made in health and education in earlier years (World Economic Forum, 2013).

The critical importance of human capital for economic growth and development has been well demonstrated by the experiences of overwhelming growth witnessed in East Asian

economies, namely Japan, Taiwan, Hong Kong, and South Korea (Becker, 1995). Human capital also explains much of the differences in wages and income across the world (Becker, 1964, 1995; Heckman & Yi, 2012; Jorgenson & Fraumeni, 1989; Mincer, 1974; Schultz, 1960, 1961). Becker (1995), for instance, has noted that human capital that comprises education, on-the-job training, and health, constitutes about 80 percent of the wealth in developed countries. This means that issues of human capital in the process of economic development can only be neglected at a country's peril (Becker, 1995). In this regard, mounting empirical evidence from various disciplines show that early childhood provides the best window of opportunity for effective and cost-efficient human capital intervention in the run-up to building an economy that relies on a high-skilled labor force. These evidences particularly suggest that investment in early human capital formation is the bedrock of long-term child development and outcomes (Aizer & Cunha, 2012; Becker, 1964; Behrman et al., 2017; Cunha & Heckman, 2007, 2009; Currie & Almond, 2011; Currie & Thomas, 1995; Heckman & Masterov, 2007; Jorgenson & Fraumeni, 1989; McLeod & Kaiser, 2004; Mincer, 1958; Schultz, 1980). Behrman et al., for instance, based on their study in Ethiopia, India, Peru, and Vietnam cemented the idea that a policy environment providing greater support for human capital investment in underprivileged children (children from poor families) has a greater potential to increase children's adulthood earnings, thereby reducing the intergenerational transmission of poverty and inequality (Behrman et al., 2017). On top of the human capital argument for a child's lifetime earnings, von Braun (2017) has also stressed that investment in education should also take into account children's potential role as agents of change in realizing sustainable development societies.

However, one of the potential challenges in realizing the promises of education, both at the individual and societal level, in many developing countries is the extensive prevalence of child labor in its many forms. From our earlier discussion, it was quite apparent that while investment in child education is a forward-looking strategy, empiricists show consistently that educated children will likely earn a better income than their uneducated counterparts. Although working children can support family income in the short term, underinvestment in their human capital due to lower schooling attainment and poor health may result in lower earnings when adults with a high risk of intergenerational persistence (Roggero et al., 2007). For instance, Currie and Almond (2011) found that a significant proportion of variations in outcomes in later life could be explained by child-related factors and family background observed at the child's school entrance age. Specifically, in support of this notion, human

capital and other factors measured during the 6-8-year-old period can predict about 12 and 11 percent of the likelihoods of completing high school and college level education, respectively (McLeod & Kaiser, 2004). In a related study, Currie and Thomas (1999) have also concluded that about a fifth of wage variations at the age of 33 can be explained by test scores observed at the age of seven. This means that educational attainment and employment (labor market outcomes) later in life can be explained to a large extent by early human capital conditions.

Therefore, it is well understood that policies intended to enhance access to quality education thereby improving the skills, knowledge, and capabilities of the labor force, require precise and reliable empirical evidence surrounding the processes of early and long-term human capital formation. Given that human capital can be also one of the mechanisms through which child labor could affect other outcomes such as adulthood earnings, similar evidence may also provide useful insights into the prospects of attaining inclusive development and accelerating structural transformation in rural areas and beyond. This thesis, consequently, has been impelled by an increasing recognition that childhood work and education conditions can have persistent and profound impacts on a multitude of outcomes observed later in life. In realizing this motivation, a sample of 4-14-year-old rural children from the fifth round of the Ethiopian rural household survey were tracked after 16 years so that their key adulthood outcomes could be linked up to their childhood conditions.

### 1.4 Research objectives

Based on its importance in light of sustainable development and poverty reduction, the thesis addresses an overarching research question, namely "What are the long-term effects of childhood conditions on adulthood human capital and labor market outcomes in rural Ethiopia?" To address this question, the thesis tackles the following specific research objectives, and sets out:

(i) To describe the short-term associations between childhood work participation and child schooling outcomes in rural Ethiopia.

(ii) To investigate the long-term effects of childhood work on human capital accumulation.

(iii) To estimate the long-term effects of childhood work on migration decisions and patterns.

(iv) To identify the consequences of childhood work participation on adulthood earnings and the mechanisms through which these effects are transmitted.

### 1.5 General conceptual framework

The core elements of the thesis are conceptualized by connecting early human capital formation (child schooling outcomes) and childhood work—both in period 1—to long-term (period 2) outcomes such as adult human capital, migration, and earnings (Figure 3). In period 1, child-, household-, and village-related factors are assumed to affect childhood work (the hours worked in various activities, the age at which the child starts taking on certain responsibilities, and the combinations of work and study) and schooling outcomes (enrollment and grade attainment). Although the focus of the thesis is less on the drivers of child labor and more on its consequences, poverty and credit constraints have been central to several theoretical and empirical studies, though their findings are full of loopholes. While Basu and Van (1998) have explicated the reasons why children work and argued that poverty is the prime example in this regard, Bhalotra and Heady (2003), among others, have challenged this axiom, finding, like many other studies, a positive association between child labor and household farmland size in Pakistan. Other empirical studies (e.g. Boozer & Suri, 2001; Canagarajah & Coulombe, 1997) have also noted that poverty was not the main cause of child labor. On the other hand, previous studies have shown that when households face credit constraints, children may also work, albeit the returns on their work are lower compared to alternative uses of their time (Baland & Robinson, 2000).

Turning to the implications for human capital formation, following the seminal works by Schultz (1960) and Becker (1964), several empirical studies have examined the effects of child labor on human capital formation. The literature presents strong empirical evidence on the detrimental effects of child labor on children's educational outcomes (Akabayashi & Psacharopoulos, 1999; Bezerra et al., 2009; Boozer & Suri, 2001; Gunnarsson et al., 2006; Heady, 2003; Holgado et al., 2014; Kassouf et al., 2016; Putnick & Bornstein, 2015), though some studies have also found positive associations between child labor and human capital formation (Dumas, 2012; Fan, 2004; Luong, 2011; Phoumin, 2008; Putnick & Bornstein, 2015). Trying to unravel the reasons behind this train of thought, Putnick & Bornstein (2015) have asserted that the positive associations between some types of child labor and school enrollment in some countries could be the fact that children use income from work to pay for school fees, transportation costs, and educational materials such as textbooks and uniforms.

Furthermore, after the Coleman Report (Coleman *et al.*, 1966) the roles of family background and school quality on education attainment have been thoroughly and extensively examined. Several of these studies have found strong associations between household wealth

status and children's school enrolment (e.g. Filmer & Pritchett, 1999, 2001; Glewwe & Jacoby, 2004; Huisman & Smits, 2009) and attainment (e.g. Filmer & Pritchett, 1999).

Theoretically, however, if one considers child labor and the soft skills gained as a result, such skills and those acquired through studying may in fact complement each other (Heckman, 2007). For instance, the social-emotional skills that a working child may develop through interacting with adults and peers could shape the child's cognitive skill development. Various skills may also interact with each other and play key roles in labor markets in adulthood (Heckman, 2007). In this regard, there could be possible synergies between childhood work and school participation which may affect children's outcomes in later years.

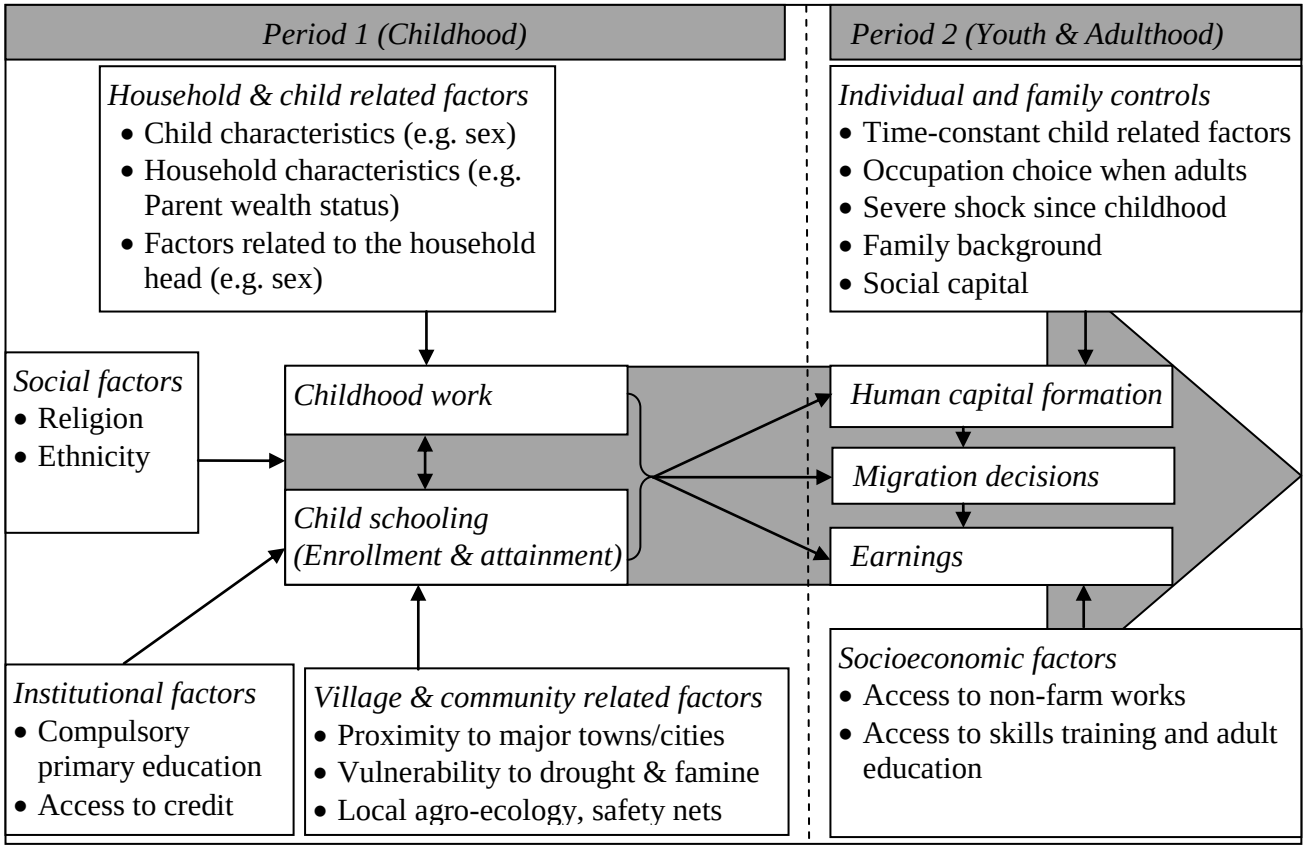


Figure 3. Childhood work, child schooling, and adulthood outcomes, own conceptualization

The second part of the framework, in period 2, links long-term outcomes such as human capital formation, migration decisions, and earnings with childhood work and schooling conditions. However, unlike the short-term aspects, evidence on the long-term penalties of childhood work is limited and the literature is scant. Among the available related empirical studies, Alderman et al. (1997) noted that productivity, income levels, and health status in later years depend on schooling during childhood. Some empirical studies (Beegle et al.,

2009; Beegle et al., 2008; Dumas, 2012; Emerson & Souza, 2011; Ilahi et al., 2005) have also provided insights into the long-term consequences of child labor on wages, earnings, occupational trajectories, health, educational attainment, or cognitive development. For instance, Emerson and Souza (2011) have noted a non-linear effect of early entry into the labor market on adulthood earnings, whereby the effect of child labor on earnings is negative for children younger than 12 years old and positive for 12-14-year-old children. A study by Ilahi et al. (2005) has showed, in a study among Brazilian children, that early entry into the labor market tends to reduce lifetime earnings and increase the likelihood of being poor when adults. On the other hand, Beegle et al. (2009) have found a negative association between hours worked during childhood and schooling level five years later among schoolchildren, but increased probabilities of being a wage earner in Vietnam. Knight and Yueh (2008) have also argued that like human capital, social capital also affects earnings in the adult labor markets.

However, no published empirical study has so far examined the causal relationships between childhood work and schooling and migration decisions and patterns later in life. This study attempts to examine the effects of childhood work and schooling (early human capital investments) on long-term village out-migration decisions of children; assuming that parents make childhood work and schooling decisions taking the long-term migration prospect of the child into account. In this regard, there is a long-held attitude among rural Ethiopian parents that educated child is expected to be employed in "Brain work", referring to public service jobs which are highly regarded occupations by the society and often involves migration to urban areas. This belief, in many instances and societies, on the contrary, also results in lower child education and high rates of school dropouts for the fear of children will be migrating, leaving parents behind when grown up. The discussions above, in general, show the complex associations between childhood conditions and outcomes later in life, empirical ambiguities in producing conclusive evidence, and knowledge gaps in making effective, cost-efficient, coherent, and forward-looking human capital policies.

Given the inherent relationships between the issues under consideration, and based on the conceptual framework herein, this thesis addresses the objectives in three stages. First, it identifies the associations between childhood work and schooling outcomes, using baseline data. Then, in the consecutive three chapters, the long-term outcomes, that are human capital accumulation, migration decisions, and earnings are discussed, using various childhood work measurement parameters. In the third long-term analytical chapter, the thesis then identifies the potential mechanisms through which childhood work could affect adulthood earnings.

### 1.6 Differentiating basic concepts

There is no universally agreed definition of child labor. Therefore, related studies that aim to guide policy actions should delineate clearly what it is meant by the term and distinguish it from child work. Child labor is generally understood as "child time in activities that are somehow harmful to the child" (Edmonds, 2009). However, International Labor Organization (ILO) suggests that the definition of child labor, and actions to address associated problems, should emanate from the three fundamental international conventions, namely 1973's ILO Minimum Age Convention (No. 138), the 1999 ILO Convention on the Worst Forms of Child Labor (No. 182), and 1989's United Nations Convention on the Rights of the Child (CRC) (ILO, 2013). The United Nations Convention on the Rights of the Child (CRC), for example, stresses that children should be protected from "work that is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral or social development" (UN, 1989, p. 9). The International Labor Organization (2004, p. 16) defines it as "work that deprives children of their childhood, their potential and their dignity, and that is harmful to physical and mental development." For the Food and Agriculture Organization (FAO) (2015, p. 11), child labor is "work that impairs children's well-being or hinders their education, development and future livelihoods."

These definitions point to the potential short- and long-term consequences of child labor and implied major risks associated with it which could be carried over time. Moreover, the above definitions also imply important distinctions between work that is harmful to children's well-being and development, and that which is not. In this regard, Woldehanna (2010) suggests that "Child labor [unlike child work] is used for work which is likely to damage children's health, physical and psychological development as well as their chances of fulfilling other rights, mainly the right to education" (Woldehanna, 2010, p. 161). However, there is no universally agreed intensity of work or cut-off point to indicate when and how child work becomes child labor and starts to negatively affect children's well-being in the short-term, and their labor market performances later in life. In this thesis, 'child labor' is defined as 'childhood work', in order to include all types of child-related works (e.g. paid and unpaid or domestic and farm-related activities) performed by children for at least one hour per week. Therefore, the thesis uses the terms 'child labor', 'child work', and 'childhood work' interchangeably.

The thesis relies on alternative measurements of childhood work in different activities, including farming, herding, domestic chores (fetching drinking water, collecting firewood,

taking care of siblings and elders, cleaning, and cooking food for the household), and other non-farm activities such as selling local drinks and helping parents in retail jobs. Moreover, the study does not make distinctions between paid (very rare) and unpaid jobs. Child labor is thus measured in three different ways: Childhood work and school combinations (work-only or full-time work, school-only, combining work and school or multitasking, and neither), the number of hours worked in the previous seven days, and the age at which the child started to work within and outside the household. The thesis also introduces a new index-based measure of childhood work, generated using principal component analysis.

### 1.7 Sampling design and data description

The thesis uses a unique and novel panel dataset from rural Ethiopia, generated through a follow-up tracking survey of children from the fifth round of the Ethiopian Rural Household Survey (ERHS), conducted in 1999/2000. The ERHS is a unique panel survey with seven rounds collected between 1994 and 2009, following well-spread households in rural Ethiopia. It is conducted jointly by Addis Ababa University, University of Oxford, and the International Food Policy Research Institute (IFPRI). The fifth round survey covered 18 rural villages located in four major Ethiopian regions (Tigray, Amhara, Oromia, and Southern Nations, Nationalities, and Peoples' Region (SNNPR)). A total of 1,681 households were surveyed, constituting 8,924 individuals of which 3,183 were 4-14-year-old children. After 16 years, in 2015/2016, we administered a follow-up tracking survey to 789 of these children from 326 re-sampled households (Table 1). Unlike the ERHS that follows the households, this study followed the children. For the sake of brevity and consistency, we refer to these children as 're-surveying targets' (RTs) throughout the thesis.

The study followed stratified multistage sampling technique to re-sample households. In 1999/2000, the villages were grouped into five strata based on their terrains, agroecology, vulnerability to famine, and farming technologies and practices (Admassie, 2002). Therefore, in the first step, one village was randomly selected from each stratum, giving a total of five communities. These villages constituted 628 farm households, 411 of which had children with the required baseline information (child name and age) necessary to link and conduct the follow-up survey. Thus, in step two, the study used a simple random sampling proportion to size—the number of total baseline households in each village—to select 326 households. For the sample selection, the baseline household rosters were used as sampling frames. Finally, a total of 789 children were included as the ultimate focus for the follow-up tracking survey.

Table 1. Stratification and re-sampling processes of survey villages and households

| Strata | (Step 1) (baseline survey) | | (Step 2) (Follow-up[1]) | Local climate[2] and geographic location |
|---|---|---|---|---|
| | Major Characteristics | Baseline survey sites | | |
| 1 | -vulnerable to famine<br>-hilly and mountainous<br>-ox plow technology | Geblen, Dinki<br>(No. of households:152) | Dinki<br>(Ankober)<br>(N=87) | *Kola* & *Woina Dega;*<br>200 kms northeast of Addis Ababa |
| 2 | - vulnerable to famine<br>- flat terrain<br>- ox plow technology | Haressaw, Shumsheha, Korodegaga, Gara-Godo, Domaa (No. of households: 504) | Shumsheha<br>(Bugna)<br>(N= 149) | *Woina Dega* and *Kola;* 630 kms north of Addis Ababa |
| 3 | - relatively rich<br>- flat terrain<br>- ox plow technology | Yetmen, Sirbana-Goditti, Adele - Keke, Turufe-Kecheme, Eteya, Bako-Tibe, Jimma- Somodo (No. of households: 577) | Adele Keke<br>(Kersa)<br>(N=97) | *Woina Dega;* 497 kms southeast of Addis Ababa |
| 4 | - relatively rich<br>- mountainous terrain<br>- hoe culture | Adado<br>(No. of households: 134) | Adado<br>(Bule)<br>(N=134) | *Woina Dega;* 386 kms south of Addis Ababa |
| 5 | - migrant-dependent<br>- self-supporting | Indibir, Aze-Debo, Debre Birhan villages<br>(No. of households: 314) | Debre Berhan villages<br>(N=184) | *Dega* & *Woina Dega;*<br>132 kms northeast of Addis Ababa |
| Number of households | | 1681 | 651 | |

***Source**: ERHS, 1999/2000 (in Admassie, 2002), [1]District names in parentheses [2]The Ethiopian local climate is commonly divided into three zones: Kola, Woina Dega and Dega. In terms of altitude, Kola refers to areas below 1500m above Sea level, Woina Dega (similar to a tropical climate) between 1500-3000m above Sea level, and Dega (similar to temperate climate) is areas above 3000m above Sea level.*

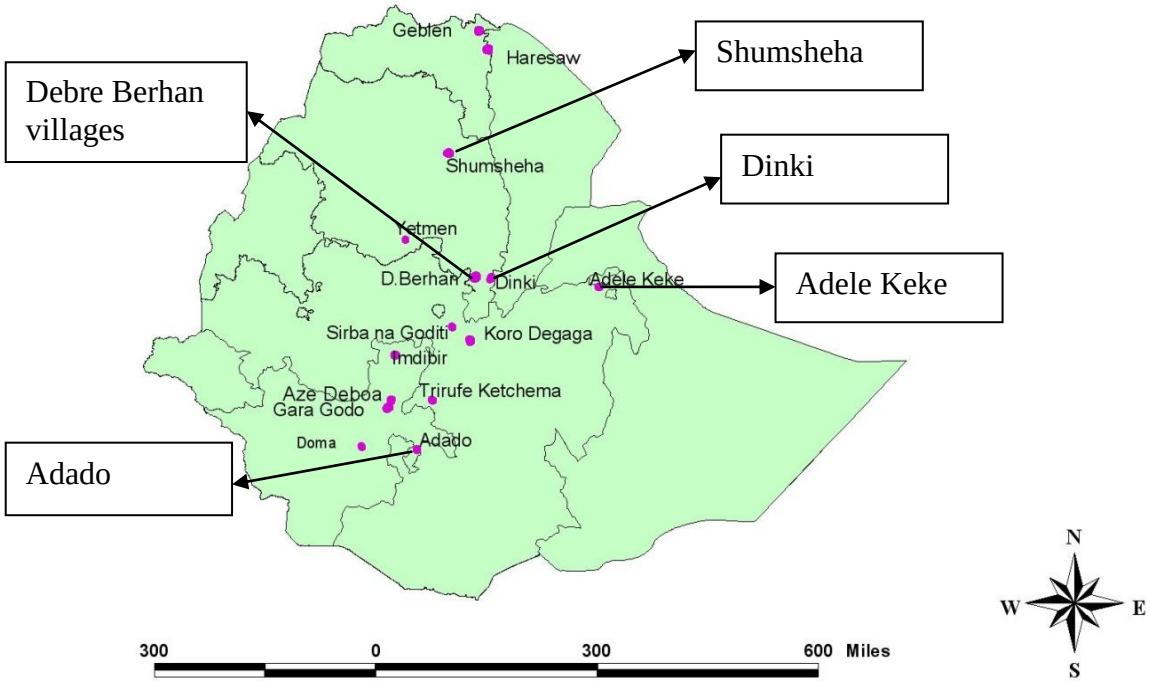


Figure 4. Ethiopian rural household survey villages

**Source**: Adapted from Dercon and Hoddinott (2011)

The follow-up survey was conducted in 2015/2016 and tracked children and collected both household and individual level data. It collected data on the baseline households if the RTs were continuing members and on split-off households if the RTs had formed their own families. Moreover, children who had left the baseline households and joined other (host) households (e.g. as housemaids, guards in private houses) or were living with other relatives are also re-surveyed, using separate and tailored questionnaires. The study also collected community-level data from each village, related to agriculture, migration, access to farmland, child labor, education, access to health services, sources of energy and drinking water, and infrastructure through key informant interviews and focus group discussions (FGD) with farmer representatives. The village-level data also include the incidences of shocks such as famine and droughts in the previous two years, seasonal food and livestock prices in the previous 12 months, and seasonal average farm labor wages disaggregated by gender in the previous cropping season.

***Reconnaissance and pilot surveys:*** Before administering the main tracking survey, reconnaissance surveys were conducted in two of the sample villages, namely Adele Keke in Oromia and Adado in the SNNP regions, in July and August 2015, respectively. The villages were selected on the basis that they would provide a fair view of the children's traceability. Additionally, Adele Keke had relatively good geographical access and less migration, while Adado was presumed to be less accessible, due to its terrain, and had a higher rate of migration and mobility. In addition, a pilot survey was also conducted in October 2015 in Sirbana Goditti, one of the ERHS survey villages but not part of the follow-up survey, following which the main follow-up tracking survey was conducted from November 2015 through mid-February 2016, which collected both household- and individual-level data.

***Selection biases due to attrition****:* In the follow-up survey, some households and RTs were attired due to the migration of the targets alone or collectively with entire households, death, or withdrawal from the follow-up survey. A household was considered attired if it were not re-surveyed either itself with at least one of the RTs as a continuing member, or through other children as split-off households or members of other households. In this regard, 14 households could not be traced with all member RTs, leading to a 4.3 percent household level attrition. Since a baseline household can be re-surveyed multiple times if its RTs have different household formation statuses, the 312 baseline households totaled 517 households in the follow-up—188 baseline and 329 split-offs. Furthermore, data were collected on 652 RTs; 137 RTs were not tracked due to death (25 RTs), far-flung migration (102 RTs), and

lack of consent to be re-surveyed (10 RTs). This means that the individual level attrition rate was about 17.37 percent while about 82.63 percent of the RTs were successfully re-surveyed. It was analyzed and found that there was no significant difference between the re-surveyed and attired children in terms of their childhood work and schooling conditions. It is thus less likely that selection biases due to the attrition of the RTs would be a concern. Ultimately, the study collected data on a total of 2,268 individuals, constituting 1,192 new members, 705 continuing members, 329 split-off households, and 42 RTs as members of other households.

### 1.8 Organization of the thesis

The thesis is organized as follows. Chapter Two deals with the links between childhood work and schooling outcomes, using various child labor measures, and hence sets the foundation for the subsequent long-term analytical chapters. The analyses in this chapter are based entirely on the baseline cross-section data. Regarding the variables of interest, childhood work is treated in three different ways: Hours worked in the previous seven days, the age at which the child started working, and combinations of work and study in the previous 12 months as main or additional occupations. Child schooling, on the other hand, is controlled through enrollment and attendance and completed years of schooling.

Chapter Three takes details from the previous chapter and produces a longer-term perspective, by investigating whether and, if so, how childhood work impedes children's long-term schooling progression, measured after 16 years. In so doing, childhood work is controlled as the age at which the child started participating in various work activities, the number of hours the child worked in the previous seven days, and how the child used to combine work and study. The long-term attainments of key education milestones include enrollment into formal education, attaining four years of schooling, and the completion of primary education. Schooling progression between the two waves is also measured as the number of completed years of schooling as a level value and in categorical measures.

Using the human capital investment lens to examine migration decisions, the fourth chapter discerns the effects of childhood work and school participation on individuals' village out-migration decisions and patterns later in life. Having provided a detailed account of village-level changes related to migration, the chapter provides causal evidence, controlling for observables, using a doubly robust estimation method. To address partly the limitations associated with most of the childhood work measures, in a first ever attempt, the thesis introduces a childhood work index, constructed using principal component analysis (PCA).

The last analytical chapter addresses the key objective of the thesis, namely the long-term causal effects of childhood work on earnings. Childhood work here too is controlled by the number of hours worked in the previous seven days, mutually exclusive combinations of childhood work and schooling, and the childhood work index. Methodologically, it uses the three-stage least squares method as its main analytical strategy, and ordinary least squares to discuss the associations between mutually exclusive combinations of childhood work and schooling and adulthood earnings. The chapter also examines differentials in long-term human capital formation and occupational mobility, mainly in relation to joining non-farm jobs, as potential pathways through which childhood work could affect long-term earnings.

Finally, Chapter Six concludes on the major findings from the previous analytical chapters, synthesizes and links their key messages, and puts forward potential policy implications. The chapter also highlights promising future research directions and caveats of the analyses in the thesis.

## 2. Childhood work participation and child schooling outcomes in rural Ethiopia

### 2.1 Introduction

Child labor is a long-standing global development issue and is replete with multifaceted dimensions and undertakings. Historical records show that children have worked for many centuries, with the issue of child labor becoming part of the public debate during the Industrial Revolution in England (Hobbs et al., 1999). Recent estimates show that in 2012, about 168 million children—a decline by a third from its level in 2000—worldwide were child laborers and that Sub-Saharan Africa continued to have the highest incidence in this regard (ILO, 2006, 2013a), with about one-fifth of children found in some form of working situation (ILO, 2013). The estimates also indicate that almost 60 percent of the global child labor is found in the agriculture sector, affecting the lives of about 100 million children worldwide, due to long working hours and associated occupational hazards (FAO, 2015; ILO, 2013). Some country-level studies also show that about 30 percent of African children, three times more than the rate in Asia, work for more than 15 hours per week in their homes or family businesses (Webbink et al., 2012).

Nationally representative child labor-related surveys in Ethiopia have also reported that rural children participate widely in different low-intensity working activities such as herding and domestic chores and, to some extent, in physically demanding jobs such as farming. The Ethiopian Demographic and Health Survey (DHS), for instance, finds that about 27 percent of 5-14-year-old children engaged in child labor[1] including farming and non-farming-related work such as in unpaid family enterprises and domestic chores. It has also indicated that male and female children seemed to work in these family enterprises and housekeeping activities to varying extents (CSA & ICF International, 2011). Moreover, using the Ethiopian rural household survey dataset, Admassie (2002) has indicated that for rural children work was the main responsibility for more than a third of them and schooling for 14 percent, while slightly more than a quarter had to work alongside their schooling. The study has also noted that childhood work and schooling circumstances considerably vary according to age, gender, and geographic locations. In a related study, Admassie and Bedi (2003) have reported extensive practices of child labor in rural Ethiopia, where as much as of fifth of four-

[1] The survey defines child labor as "(a) children age 5-11 who in the seven days preceding the survey worked for someone who is not a member of the household, with or without pay, or engaged in any other family work or did household chores for 28 hours or more, and (b) children age 12-14 who in the seven days preceding the survey worked for someone who is not a member of the household, with or without pay, or engaged in any other family work for 14 hours or more or did household chores for 28 hours or more." (CSA & ICF International, 2011, p. 31)

to five-year-old children engaged in certain labor-based activities, and almost all children at their tenth year of age were involved in some form of work. They also noted that children contributed about 29-30 hours of work per week to the household economy (Admassie & Bedi, 2003).

The widespread practice of child labor in rural Ethiopia has also been accompanied by lower educational attainment (CSA, 2014b). As pointed out in the introductory chapter, beyond the short-term trade-offs between work and study time, child labor could also endanger the physical development, school progression, and long-term health of child laborers, and as a result, child labor may also lead to a cycle of long-term poverty and precarious employment (FAO, 2015), which in turn could perpetuate intergenerational poverty and hamper social mobility. However, the nature and short-term consequences of child labor on child educational outcomes might be heterogeneous according to child specific factors such as gender, household socioeconomic characteristics, or geographic locations. Local agro-ecologies, which also guide economic activities and livelihoods, are vital aspects in child development through affecting access to schooling and child labor participation. In this regard, a study conducted by Admassie (2002) has shown that while children in drought-prone Ethiopian villages tend to allocate their time between schooling and work, those who live in relatively prosperous and resource-rich villages are more likely to spend more time on schooling. With the objectives of understanding the drivers and short-term effects of child labor, most previous child labor studies in Ethiopia (e.g. Admassie, 2002; Admassie & Bedi, 2003; Cockburn, 2002; Cockburn & Dostie, 2007; Haile & Haile, 2012) have used the hours worked by children, or combinations of work and study, as measures of child labor and focused on enrollment or attainment as educational outcomes. Thus, this chapter provides more nuanced evidence on the associations between various measures of childhood work, including the age at which the child started working in relation to key child-specific and household-related factors, and it sets the foundation for the long-term analytical chapters.

The rest of the chapter is organized as follows. The next section presents a review of the empirical literature on child labor and schooling, mainly from short-term viewpoints. Then, the sources of data and the analytical methods are described briefly. The subsequent sections present results on the extent, patterns, and associations of childhood work in relation to key variables, and the chapter ends with main insights and final remarks.

## 2.2 Review of the empirical literature

Child labor has been one of the main areas of empirical investigations in the field of economics. Several studies have shed light on its drivers and estimated short- and long-term consequences, mainly on the children themselves. A number of studies have analyzed child labor in relation to adult labor (Basu, 1999; Doran, 2013; Fan, 2004; Manacorda & Rosati, 2007) and its association with schooling and effects on early human capital formation (Edmonds, 2006; Emerson & Souza, 2008; Phoumin, 2008; Ravallion & Wodon, 2000; Sim et al., 2017). Child labor has also been studied in relation to agricultural, income, or health shocks (Beegle et al., 2006; Duryea et al., 2007; Soares et al., 2012), poverty (Bhalotra, 2007; Cockburn & Dostie, 2007; Manacorda & Rosati, 2007; Ray, 2000; Udry, 2004), and economic growth (Edmonds, 2005, 2016; Kambhampati & Rajan, 2006; Kruger, 2007; Swaminathan, 1998). Moreover, empirical works have also explored child labor and social programs (Dubois et al., 2012; Hoddinott et al., 2009; Islam & Sivasankaran, 2015) and household credit constraints (Baland & Robinson, 2000; Beegle et al., 2003; Ranjan, 1999, 2001), collectively reporting mixed evidence according to child groups and country settings.

The empirical findings on whether child labor stems from poverty or the opportunistic behavior of agents (parents and children) for incentives and employment opportunities are disputable. On the one hand, notable works (Basu, 1999; Basu & Van, 1998; Bhalotra, 2007; Edmonds & Turk, 2002; Manacorda & Rosati, 2007; Udry, 2004) have strongly argued that child labor is driven mainly by poverty and there are a number of unintended consequences involved in banning the practice. In line with the luxury axiom of child labor, recent studies in Brazil (Soares et al., 2012) and India (Rammohan, 2014) have found inverse relationships between family wealth and child labor. On the contrary, other studies (Bhalotra & Heady, 2003; Kis-Katos, 2007; Parikh & Sadoulet, 2005; Phoumin, 2008; Rosenzweig & Evenson, 1977) have challenged the luxury axiom view. The positive relationship between wealth and child labor is often referred to as the "wealth paradox" (Bhalotra & Heady, 2003), in as much that anti-poverty policies alone may not help governments reduce or eliminate child labor. In Ethiopia, Cockburn and Dostie (2007) have found that children's time uses in rural areas vary according to family asset ownership and household composition. The authors in this case, thus, suggest that policymakers should take into account the potential effects of asset-based poverty alleviation programs on child labor and schooling, as households may respond to changes in returns.

Several empirical studies have also examined the effects of production shocks on child labor and schooling outcomes (Beegle et al., 2006; Kruger, 2007). More specifically, these studies have analyzed children's role in consumption smoothing, and how production shocks could affect school enrollment (Kruger, 2007) and the time they spend in school (Beegle et al., 2006). Conversely, a study conducted in Mali by Dillon (2013) shows that child labor is used by households to adjust for production and health shocks, concluding that while production shocks will likely increase children's withdrawal from school and raise their participation in farm work, health shocks to men and women tend to increase children's work hours in family enterprises and childcare. This study also reveals that the different use of child labor to cope with shocks could also be specific to child gender and affect boys and girls differently. Soares et al. (2012) has also examined how local coffee production shocks in Brazil affect families' wealth and the opportunity costs of children's time and labor. The study finds an inverse relationship between household wealth and child labor and a positive association of household wealth with children's schooling.

Child labor has also been examined in relation to social programs, and mixed evidence has been reported. A study conducted in rural Ethiopia by Hoddinott et al. (2009), for instance, shows that working hours for younger boys decline in productive safety net programs (PSNP) for households and significantly increase for girls when public work programs are combined with other food security programs. This, perhaps, could happen due to the transfer of workloads to girls while parents engage in outdoor work. In a related setting in Mexico, *Progresa* positively affected children's performance in primary school, impeded performance in secondary school, but enhanced schooling continuation at all levels (Dubois et al., 2012). In one of the largest social security programs in the world, namely the Indian National Rural Employment Guarantee Act (NREGA), Islam and Sivasankaran (2015) have noted that after the launch of the act, younger children's time allocated for education has increased and for older ones, outside working time has increased. These results above, in a nutshell, imply that social programs, through their effects on how children's time is allocated, may have unintended consequences on early human capital formation, which may also affect adult labor market outcomes and the intergenerational persistence of poverty.

Past studies also looked into the trade-off between child labor and early human capital formation. In Tanzania, rural children's hours of study are affected by hours of work, and strong and negative associations between reading and mathematical skills and the number of hours worked by children have been observed (Akabayashi & Psacharopoulos, 1999).

Similarly, Heady (2003) has also noted lower achievement in reading and mathematics skills among children who worked outside home activities. Moreover, an inverse association was observed between educational attainment and the number of hours worked among rural children in Ethiopia (Haile & Haile, 2012). However, some studies also reported potential synergies between work and studying, showing that work may not always be detrimental to child schooling. In relation to this notion, Dumas (2012) has found that child labor—measured by years of work as a child in economic activities—does not deter learning in Senegal, instead finding a positive effect of child labor on test scores eight years later. The author argues that the positive effect of child labor on oral tests could be due to its financial effects and informal learning from parents while working in marketing activities.

## 2.3 Methods and data

With the aim of understanding the baseline conditions, the chapter uses graphs and tables to present and discuss childhood work and schooling conditions vis-à-vis selected child and household-specific factors. It uses the data described in the introductory chapter, specifically, it uses the baseline data and additional information from previous ERHS surveys as a complement. Moreover, although the follow-up study was initially planned to re-survey 789 children, here we focus only on the re-surveyed children, i.e. 652 in total. Thus, the chapter provides prior insights for subsequent chapters that analyses long-term human capital formation (Chapter Three), migration decisions and patterns (Chapter Four), and adulthood earnings (Chapter Five), all of which are devoted to unraveling the effects of childhood work on the respective outcomes during adulthood.

## 2.4 Results and discussion

### 2.4.1 Characterizing the sample children and households

Table 2 presents child-, household-, and village-related variables associated with the baseline context and also expected to be correlated with childhood work and schooling statuses. The variables may also affect the extent and direction of long-term relationships between childhood work and adulthood outcomes considered in the subsequent chapters. The table shows that children aged an average of 8.93 years and started participating in childhood work, on average, at the age of 6.3 years. This shows that children in the survey villages were more likely to start working earlier than the country's official primary school entrance age,

i.e. 7 years. The gender composition of the sample children showed that about 52 percent of children were males.

Looking at the children's participation and the extent of their work, they contributed to the household economy through various activities, including farming, collecting firewood, fetching drinking water, taking care of younger siblings and elders, cleaning, cooking food, and herding cattle. These activities varied in terms of the skills, effort, and time required, thereby suggesting potential differences in both short- and long-term implications for the children. In the 12-month period prior to the baseline survey, while about two-thirds of children took part in some form of work activity as their main or additional occupation, an average child worked about 20 hours per week, translated into about three hours per day.

The results also indicate that boys and girls were generally equally likely to participate in various childhood work, but results revealed clear variations in the areas of concentration when disaggregated by the types of work into domestic chores and farming-related activities. Accordingly, while close to two in every three girls participated in domestic chores (about 45 percent for boys), almost half of boys and a third of girls worked in farming, herding, and related activities. This shows that the gender differentials could be shadowed when work is aggregated and may lead to misleading conclusions. In addition, while about a third of all children were attending school during childhood, their grade attainments adjusted for age showed that children have achieved, on average, only about 21.7 percent of the highest expected grade for their age, which is a very low level of attainment by any standards. Perhaps, factors such as non-enrollment into school, enrolled in school later than the official school entrance age, or early dropout may have contributed to the lower grade attainment.

Table 2. Summary statistics for child, households, and village-specific variables, 1999/2000

| Child and household related characteristics | Pooled | Female | Male |
|---|---|---|---|
| Age (year) completed in 1999/2000 | 8.93(3.09) | 9.04(3.13) | 8.83(3.06) |
| Age (year) when started working | 6.28(1.57) | 6.37(1.50) | 6.21(1.62) |
| Child is male(*) | 0.520(0.50) | - | - |
| Birth order among 4-14-year-old siblings (ratio) | | | |
| Oldest child/ 1st born | 0.431 | 0.451 | 0.413 |
| 2nd oldest/ 2nd born | 0.299 | 0.272 | 0.325 |
| 3rd oldest/ later born | 0.270 | 0.278 | 0.263 |
| Hours worked (last 7 days) | 20.19(22.76) | 19.64(21.73) | 20.69(23.70) |

*Table 2. continued.*

| Child and household related characteristics | Pooled | Female | Male |
|---|---|---|---|
| Participated in domestic chores | 0.534(0.50) | 0.620(0.49) | 0.454(0.50) |
| Participated in farming and herding activities | 0.393(0.49) | 0.300(0.46) | 0.478(0.50) |
| Child participated in any kinds of work(*) | 0.65(0.48) | 0.64(0.48) | 0.66(0.48) |
| School participation at baseline(*) | 0.342(0.46) | 0.325(0.47) | 0.357(0.48) |
| Highest grade attained (years) | 0.68(1.17) | 0.60(1.11) | 0.73(1.22) |
| Age-adjusted highest grade attained (ratios) | 0.217(0.46) | 0.192(0.42) | 0.241(0.50) |
| Baseline head is male(*) | 0.836(0.37) | 0.830(0.38) | 0.841(0.37) |
| Baseline head is literate(*) | 0.462(0.50) | 0.454(0.50) | 0.469(0.50) |
| Age of the baseline head(years) | 47.04(12.53) | 47.20(12.08) | 46.89(12.95) |
| Head had physical health problem(*) | 0.15(0.36) | 0.176(0.38) | 0.127(0.33) |
| Head satisfied with education quality(*) | 0.736(0.44) | 0.712(0.45) | 0.758(0.43) |
| Head expects declines in farmland size(*) | 0.249(0.43) | 0.251(0.43) | 0.248(0.53) |
| Household participated in off-farm works(*) | 0.310(0.46) | 0.307(0.46) | 0.304(0.46) |
| Household size in 1999/2000 | 7.360(2.40) | 7.35(2.30) | 7.37(0.2.50) |
| Proportion of children in the household | 0.630(0.14) | 0.643(0.14) | 0.636(0.14) |
| Adult member left or died (1997-1999)(*) | 0.218(0.41) | 0.204(0.40) | 0.230(0.42) |
| HH is a member of any farmer groups(*) | 0.923(0.27) | 0.917(0.28) | 0.929(0.26) |
| Child belongs to Amhara ethnic group | 0.525(0.50) | 0.514(0.50) | 0.534(0.26) |
| Child belongs to Argoba ethnic group | 0.054(0.23) | 0.051(0.23) | 0.056(0.23) |
| Child belongs to Gedeo ethnic group | 0.260(0.44) | 0.246(0.43) | 0.268(0.44) |
| Child belongs to Oromo ethnic group | 0.164(0.37) | 0.188(0.39) | 0.142(0.35) |
| Plots' soil fertility reduced(*) | 0.540(0.50) | 0.544(0.50) | 0.537(0.50) |
| Livestock owned (Tropical Livestock Unit - TLU) | 3.42(2.38) | 3.17(2.89) | 3.66(3.77) |
| Size of farmland owned (hectare) | 1.39(0.95) | 1.41(0.94) | 1.36(0.97) |
| HH worked on the same plot size since 1994(*) | 0.581(0.49) | 0.605(0.49) | 0.560(0.50) |
| Distance to the nearest major town (km) | 10.10(2.76) | 9.91(2.84) | 10.26(2.68) |

***Note**: S*tandard deviations are in parentheses. For binary variables (*), *No*=0 and *Yes*=1

With regard to the birth order of children among 4-14-year-old siblings, about 43.0 percent of RTs were the only child or the oldest RT among 4-14-year-old siblings, while 29.9 percent and 27.0 percent were the second oldest and later-born siblings, respectively.

The thesis has also factored in a number of family background variables associated with the head and baseline households in the analyses. Table 2 also shows that about 83.6 percent of the households were male-headed, with an average age of 47 years and a 46.2 percent literacy rate. Furthermore, the average household size was about seven persons, an increase of about one person since 1994, and that in the two years prior to the baseline survey (1997–1999), at least one adult household member had left or died in about 19.6 percent of households. This could be one of the household level shocks which could affect the work and schooling lives of children, but also their long-term developments. To proximate village school quality, and as the main factor affecting child schooling decisions, the study included heads' satisfaction with the quality of education in the village schools. The results show that about three-quarters of the heads were satisfied with the quality of education, which may have positive effects on a child's schooling in terms of both enrollment and grade attainment.

Other household-related factors which may also explain the incidence and intensity of childhood work included household's participation in off-farm jobs, the proportion of children in the households, and changes in soil fertility. While these factors also tend to affect the earnings capability of baseline households, this, in turn, may also affect the decision to put children to work or send them to school. In this regard, just fewer than a third of the households engaged in off-farm work. Moreover, while about 54 percent of the households believed that the soil fertility of their plots reduced, a further inquiry has revealed that about 39 percent of households practiced soil conservation for least to one of their farm plots.

As part of the household wealth index[1], the baseline households owned about 3.42 tropical livestock unit (TLU) of livestock, and the average farm size was about 1.39 hectares. Livestock and land ownership may affect parents' decisions on child schooling and work participation. The asset and child labor associations have been the center of attention for a number of empirical studies whereby some studies have argued for the existence of positive association between the two, also termed as the "wealth paradox" (Bhalotra & Heady, 2003). Ethnicity may also play a significant role in child school enrollment, the age of the child to school enrollment, child preference (gender and age) to send to school or work, and child's school continuation. In this regard, about 52.5, 5.4, 26.0 and 16.4 percent of children belonged to the Amhara, Argoba, Gedeo, and Oromo ethnic groups, respectively. Finally, the villages were located, on average, about 10 kilometers away from their nearest major towns.

[1] The wealth index was constructed using livestock, farmland, and other assets; see Appendix 1 for details.

### 2.4.2 Understanding children's work and school lives

This section presents the schooling and disaggregated working conditions of the re-surveyed children in relation to key factors associated with them and baseline households. In general, the results suggest that childhood work and school combinations, and the intensity of work, vary substantially across children's age cohort, gender, and birth order. As has been shown using Table 3, school participation in the study villages has been comparable to the national level reported by the 2001 Ethiopian Child Labor Survey—a nationally representative and stand-alone child labor survey. The findings reveal that while about 34.2 percent of sample children were attending school as of 1999/2000, the national rate in 2001 was about 36.44 percent. It has also been noted that while the national average school participation for boys was relatively higher than the baseline figure by about eight percentage points, the results for girls were comparable.

The table also shows how boys and girls combined work and study. The study has found that about 65 percent of children took part in some form of work activity, either exclusively or alongside schooling, during childhood. The national-level evidence shows about 85 percent work participation, indicating the extensive participation of Ethiopian children in the rural economy. Moreover, while a larger share of children in both surveys were full-time childhood workers, the proportion of multitasking children was relatively higher in the national level survey compared to the sample villages.

Table 3. Children's participation in schooling and working activities by gender

| Child work and school characteristics | Ethiopia (2001)* | | | Sample (1999/2000) | | |
|---|---|---|---|---|---|---|
| | Total | Male | Female | Total | Male | Female |
| School attendance (*Yes*=1, *No*=0) (%) | 36.44 | 42.80 | 33.20 | 34.20 | 35.70 | 32.50 |
| Participated in any work activities (%) | 85.7 | 85.2 | 86.2 | 65.0 | 65.8 | 64.2 |
| Work-school combinations (%) | | | | | | |
| Work-only | 51.4 | 47.3 | 55.7 | 43.6 | 43.1 | 44.1 |
| School-only | 3.8 | 4.9 | 2.7 | 11.2 | 12.1 | 10.2 |
| Combining school and work | 34.3 | 37.9 | 30.5 | 23.2 | 24.5 | 21.7 |
| Inactive | 10.6 | 10.2 | 11.0 | 22.1 | 20.4 | 24.0 |

**Sources:* Ethiopian Child Labor Survey report (CSA, 2002a)
***Note**: Ethiopian Child Labor Survey includes 5-14-year-old rural children whereas our sample children from the ERHS comprise all those aged between 4 and 14, inclusive.*

Furthermore, from a gender perspective, while boys to some extent were more likely to multitask compared to girls, about 44 percent of girls were full-time workers, marginally above the boys' participation rate. Moreover, a fifth of the sample children in the survey villages were inactive—neither working nor studying—mainly due to age (too young) of the children and disability, to actively participate in work and schooling.

A further description of children's work (number of hours worked in the previous seven days, summarized by activity type and child gender) is found in Table 4, and Figures 5-7 depict the distribution patterns of hours spent on farming and domestic chores by gender for the rural average and those in the survey villages. Overall, the sample children in this study worked about 20 hours per week, while the rural average, based on the 2005 Ethiopian Labor Force Survey (ELFS), was 27 hours per week. However, this difference could be due partly to the fact that while the ERHS survey includes 4-14-year-old children in the sample, the ELFS dataset has covered aged 5-year-olds and above children.

Table 4. Children's intensity of work (hours worked per week[1]) by work type and gender

| Sample survey | *Total hours worked* | | | *Productive activities* | | | *Domestic chores* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Male | Female | Total | Male | Female | Total | Male | Female |
| Rural Ethiopia | 27.32 | 26.99 | 27.68 | 32.84 | 35.79 | 28.40 | 12.28 | 9.88 | 13.93 |
| Sample Survey | 20.18 | 20.69 | 19.64 | 29.88 | 31.91 | 26.48 | 16.83 | 13.32 | 19.70 |

*Source*: Compiled from the 2005 ELFS (CSA, 2005) and 1999/2000 ERHS datasets

While the gender disaggregated figures in Table 4 for the total hours worked seem to suggest that girls and boys engage equally in work, further disaggregated analyses into productive (including farming, herding, and non-farm activities) and domestic chores convey different messages. Among those who worked at least one hour per week, they seemed to have spent much of their working time in productive activities than in domestic chores such as fetching drinking water and collecting firewood. In this regard, children who worked in productive activities at the national level spent about as much as 2.5 times more hours than domestic workers. With regard to those who engaged in productive activities, they worked about 32.84 hours per week, ranged from about 28.40 hours for girls to about 35.79 hours for boys. Similarly, our data has also suggested that farming children worked about 29.88 hours per

[1] *The values for Rural Ethiopia were calculated from the 2005 LFS dataset (N= 28,492), and the sample survey refers to our baseline data (N=652) from the Ethiopian Rural Household Survey. All values under productive activities and domestic chores do not include children with zero hours of work.*

week (about twice the number of hours worked by domestic workers) and that boys were slightly more likely to work more hours in productive activities (about 31.91 hours per week) compared to girls (26.48 hours per week). Conversely, the study has found that girls were more likely to work more hours in non-productive or housekeeping activities, such as cleaning, cooking, fetching water, and collecting firewood, than boys. On average, while girls in the current study worked about 19.70 hours per week on domestic chores, boys contributed about 13.32 hours per week. The results signal the presence of gender differentials in the type of work, which is also a useful indicator of potential differences in acquiring childhood soft skills, and, possibly, it could also lead to heterogeneous long-term effects.

The study has examined further the distribution pattern of hours worked by gender and finds that while children, regardless of gender within both surveys, showed identical work patterns, our data seemed to highlight relatively more non-working children (Figure 5). As pointed out earlier, since some children were working at the age of four, the current study includes them in the analyses, which might have pushed the proportion of non-working children in the ERHS higher (to about a third) than the rate observed in the LFS for national rural children. Generally, the results have demonstrated that while about 5-10 percent of children, regardless of their gender and survey, worked between 30 and 50 hours per week in various jobs, many of them seemed to work fewer than 30 hours per week. There are also some outliers, perhaps due to the proportion of full-time childhood workers, who contributed more than seven hours per day to the household economy in the previous seven days.

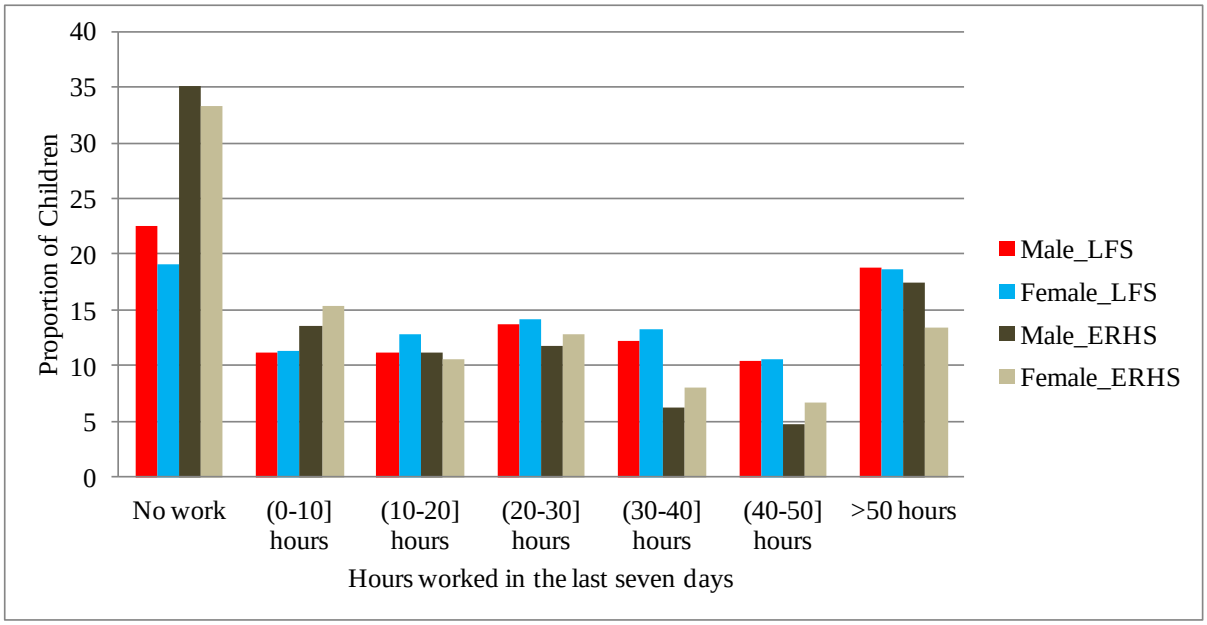


Figure 5. Hours worked in various childhood activities in the previous seven days by gender

The results, in general, suggest that while children are observed working at various work intensities, gender seems to have an insignificant role in this regard. To see if the same is true for what follows, the study disaggregated childhood work into productive and domestic chores, grouped by child gender, and plotted using Figures 6 and 7. As presented using Figure 6, unlike the distribution using aggregated hours worked, it is noted that the amount of productive work, measured in hours worked, varied by gender. In this regard, in both surveys, a relatively smaller proportion of girls than boys worked above 30 hours per week. On the contrary, while fewer than 10 percent of boys in the LFS were working fewer than ten hours per week, there was no gender variation in the ERHS data for this level of work. However, girls in the ERHS survey worked largely in the range of 10 to 30 hours per week. In general, the study finds that while boys have engaged greatly in productive activities, girls also contributed to productive work, albeit to a lesser extent.

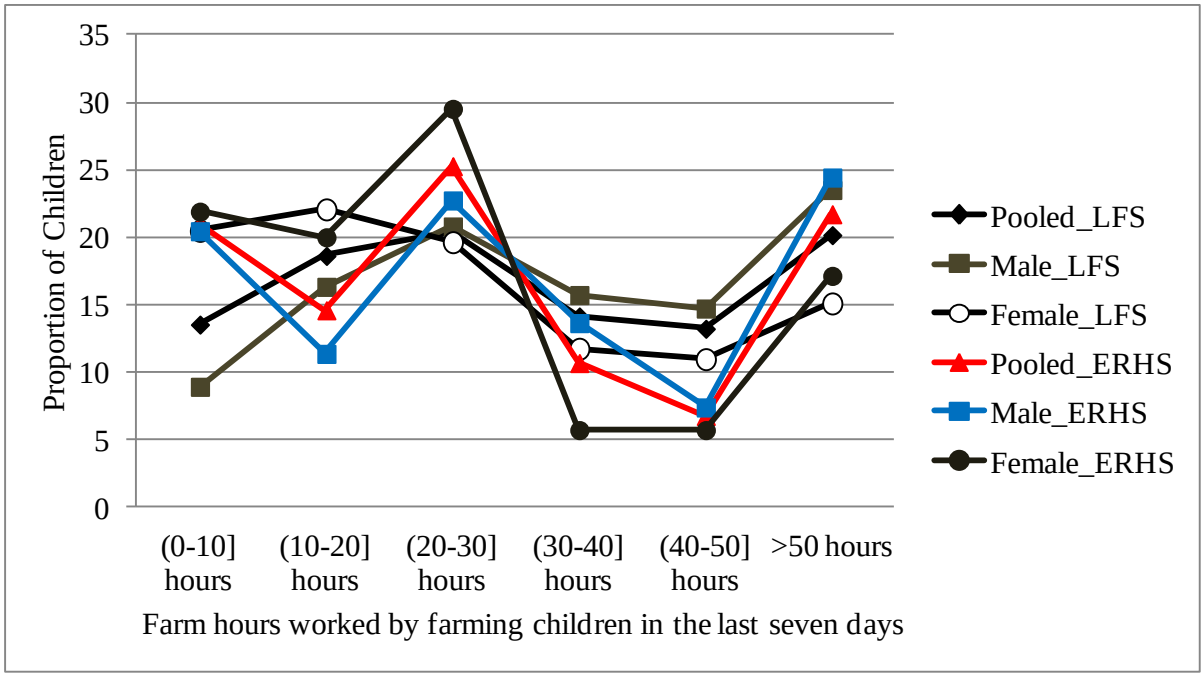


Figure 6. Hours worked in farming and related activities in the previous seven days by gender

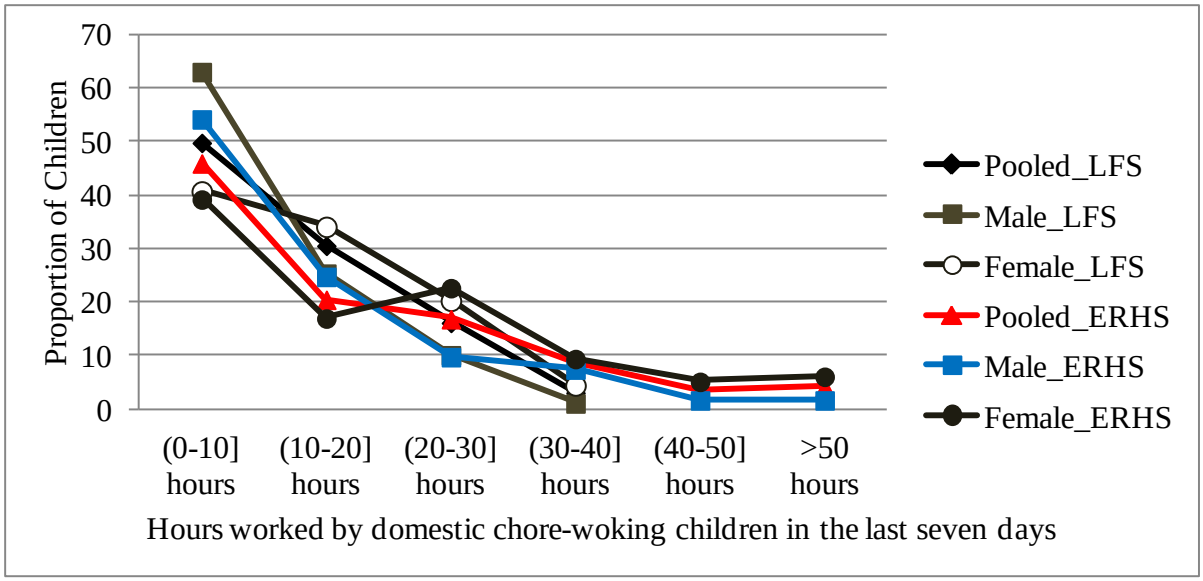


Figure 7. Hours worked in domestic chores in the previous seven days by gender

On the contrary, Figure 7 shows that while the proportion of children working in domestic chores consistently declines as we move to a higher number of hours worked, the pattern seems to be equally applicable to both girls and boys. Moreover, although LFS showed no children working in domestic chores for more than 40 hours per week, about 5 percent of those in the ERHS survey worked above 30 hours per week. Perhaps, the LFS survey periods (season) may have meant the nonobservation of children working more than 40 hours on domestic chores. However, Figures 6 and 7 show that regardless of gender, children work longer hours in productive activities than in domestic chores.

### 2.4.3 Childhood work and school combinations

Table 5 illustrates childhood work and schooling combinations grouped by child age cohort, birth order among 4-14-year-old siblings, and gender. The study finds that a high proportion of children were exclusive (full-time) workers, in fact twice as many as those who combined work and study. However, from a gender perspective, while boys were slightly more likely to either to attend schooling full-time (albeit fewer children were found in this group) or multitask compared to girls, the latter tended to be full-time workers. It is also noted that children are more likely to take up work responsibilities, with or without studying, as they grow up. For instance, while 12-14-year-old children were more unlikely to be inactive (2.31 percent), about 47.98 percent of them were full-time workers and a third of the same cohort children were multitasking.

As one may also expect, inactivity and work-only conditions are more likely to dominate early childhood (4-8-year-old) period, due mainly to the inability to handle many of the tasks at this age and exemption from working, but also those younger than seven years of age were not expected to be in school. The study also finds that most of the children who combined work and study were mainly either from the 9-11-years-old or older cohort.

Table 5. Childhood work and schooling circumstances by gender, age cohort, and birth order

| Work and school combinations | *Gender group* | | | *Age cohort (years)* | | | *Birth order* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Pooled | Boys | Girls | 4-8 | 9-11 | 12-14 | First | Second | Later |
| Work-only | 43.47 | 42.03 | 44.92 | 41.16 | 43.45 | 47.98 | 47.33 | 42.05 | 39.2 |
| School-only | 10.90 | 12.41 | 9.39 | 8.04 | 14.29 | 13.87 | 11.74 | 14.36 | 6.82 |
| Combining both | 22.81 | 23.80 | 21.83 | 7.72 | 38.69 | 35.84 | 31.32 | 24.1 | 9.09 |
| Inactive | 22.81 | 21.77 | 23.86 | 43.09 | 3.57 | 2.31 | 9.61 | 19.49 | 44.89 |

Note: *Values are the proportion of children in each child group.*

Generally speaking, it was apparent that while full-time working was the main activity for children in all age groups, albeit rising slightly as we move to older children, combining work and study seems to be the daily task for most middle and older age children. Childhood work also exhibits similar patterns by birth order to the age cohort.

Looking at the main activities of children at specific ages, excluding inactive children, Figure 8 shows that after the age of nine, they tend to combine work and study, while the odds of being a full-time worker decline, though they remain higher. After the age of 13, the proportion of full-time working children shows a surprise increase, perhaps, due to school dropouts after finishing lower primary (first-cycle) education, which is often accessible in the village schools through satellite schools. On the contrary, the proportions of multitasking and school-only children decline. Moreover, it also shows that inactive younger children are more likely to join one of the other groups after turning seven, pushing up the graphs for all other groups. It has been observed that rural children were less likely to be inactive after the age of eight. Similar age and work associations have been reported by Tafere and Pankhurst (2015) in Ethiopia, Singh and Khan (2016) in India, Bhalotra and Heady (2003) in Ghana, Khanam (2008) in Bangladesh, and Grootaert (1999) in Cote-d'Ivoire.

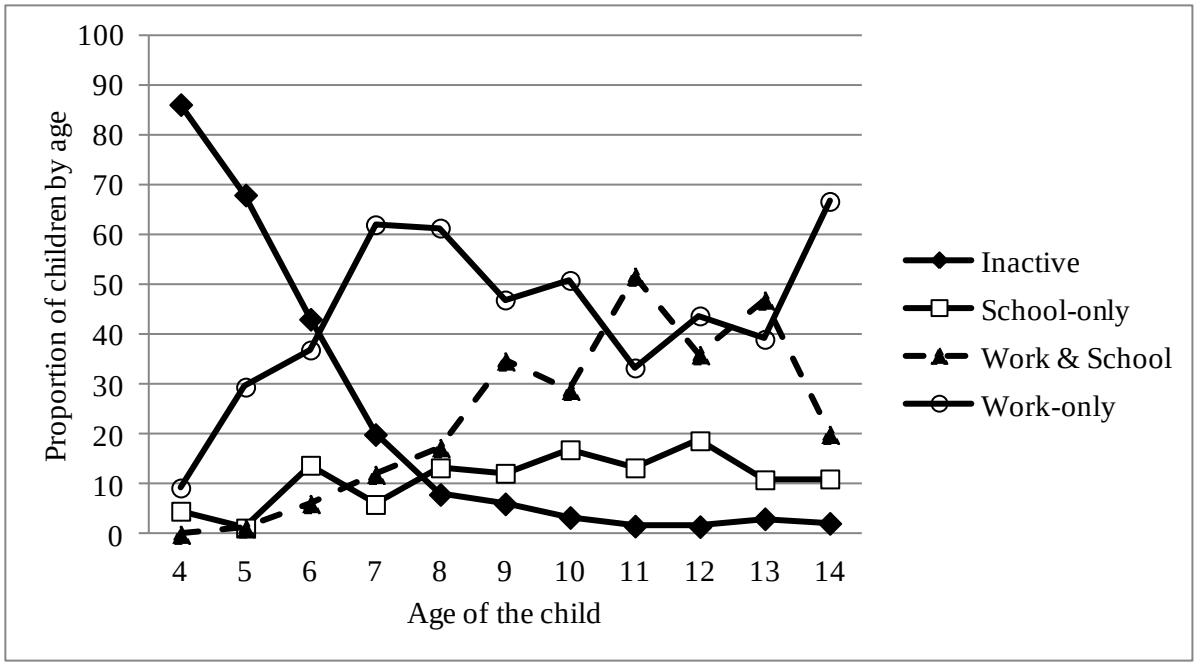


Figure 8. The distribution of children by age based on work and school combinations

The study also uses another aspect of childhood work to proximate early childhood exposure to work, namely the age at which the child started working; Figure 9 demonstrates its associations with child grade attainment. Various theoretical and empirical studies have argued that children who engage in child labor at an early age (often before the age of 14, based on international standards) could be greatly exposed to health shocks and physical damage, which may also obstruct their childhood schooling attainments and impede long-term human capital formation and labor market outcomes. The results of this study show that while grade attainment based on the work-starting age had non-linear patterns, the share of illiterate children was relatively lower for those who started working at the age of seven. Moreover, the share of children grouped by grade attained increased, as children postpone when to enter child labor activities up to the age of seven. However, any further delays after the age of seven have been associated with slight declines in grade attainment and a rise in the probability of being out of school. However, it has to be noted and understood that the age at which a child started working may or may not be similar to the child's age during baseline survey. This means that the graph could behave differently if we consider the child's age as a running variable. The result, however, runs against the widely and long-held view that child labor before the age of 14 could impair schooling.

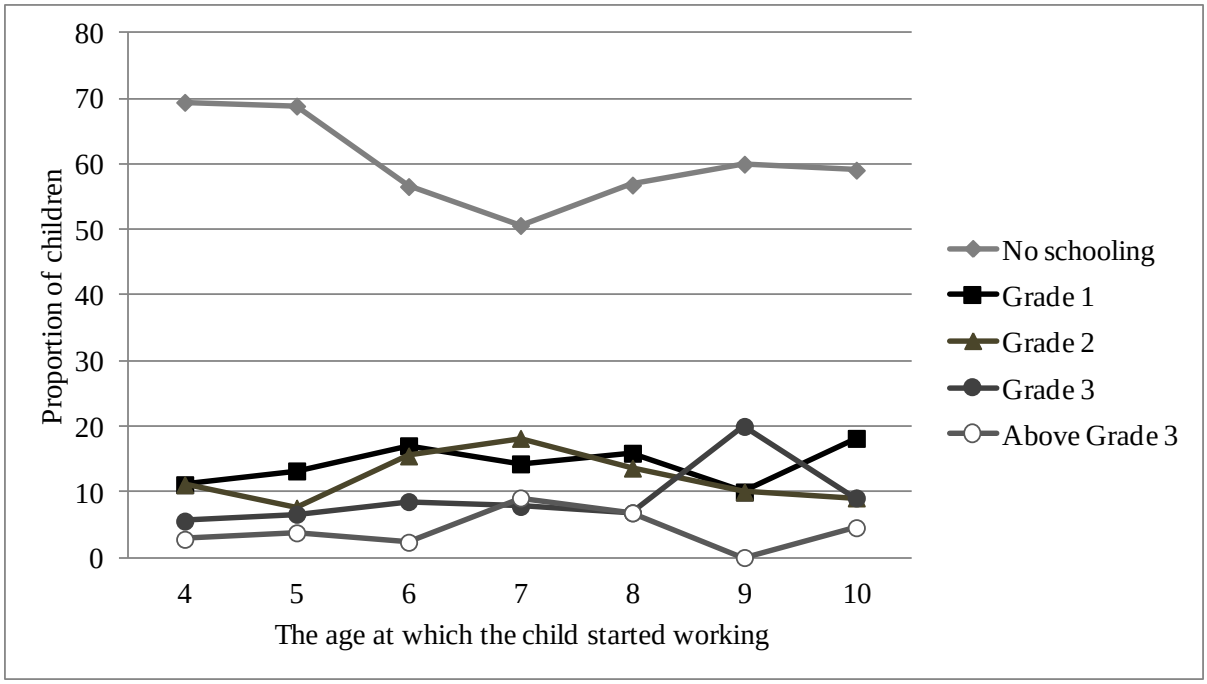

Figure 9. The age at which children started working and grade attained

In general, the preceding discussions have pointed to useful variations in childhood work conditions based on child gender, age, and birth order, all of which need to be controlled for in the further causal analyses. Previous empirical studies, such as Akabayashi and Psacharopoulos (1999) and Heady (2003), have found negative associations between children's reading and mathematical skills and the number of hours children worked. Moreover, Boozer and Suri (2001), Beegle et al. (2008), and Emerson and Souza (2011) have also reported substantial trade-offs between child labor and early human capital formation in various countries. Furthermore, in Ethiopia, Haile and Haile (2012) have shown that among 7-15-year-old rural children, later-born siblings had a lower chance of attending school. Seid and Gurmu (2015) have gone even further and found that while birth order does not affect siblings' school participation, later-born schoolchildren tend to have longer study and school hours. In this regard, perhaps the age of the children in the sample under investigation may have led to differences in the effects of birth order on schooling.

### 2.4.4 Childhood work and household socioeconomic status

The thesis has also examined children's school and work lives with respect to land and livestock holdings of the baseline households (Table 6). The results presented using Table 6 show that the tendencies to be a full-time childhood worker and somehow combining work with study rise in line with the size of a farm holding. This means that children from land-rich

households are more likely to be full-time workers, and also combine work and study, meaning that the two are positively related. In related literature, the positive association between childhood work and household asset ownership is often discussed as wealth paradox (Bhalotra & Heady, 2003). The idea is that if poverty were the culprit of child labor, then we should expect a decline in children's labor participation as households become wealthier. But, at times this is not the case, instead as households get wealthier, children tend to work longer hours or alongside schooling. In this regard, about half of the children from land-rich parents were full-time laborers. It is also intriguing that children from middle-sized-livestock-owning families were more likely to either multitask or be a full-time worker. The results associated with land and livestock ownership indicate that economic conditions such as asset ownership could be the main drivers and predictors of childhood work conditions. However, being a full-time worker or multitask may not be explained entirely by household poverty status. As discussed above, the likelihoods of participating in childhood work and schooling have non-linear associations with farmland and livestock ownership. To get a better view of this tendency, a wealth index (Figure 10) was constructed for baseline households, using several asset indicator variables,[1] discussed in relation to childhood work and school outcomes.

Table 6. The share of children based on combinations of work and school grouped by household asset

| Household characteristics | School-only | Multitasking | Work-only | Inactive |
|---|---|---|---|---|
| *Land size in 1999* | | | | |
| ≤0.5ha | 17.19 | 21.09 | 35.94 | 25.78 |
| 0.51-1.0 ha | 8.23 | 22.78 | 44.94 | 24.05 |
| 1.01-1.5 ha | 10 | 29.17 | 41.67 | 19.17 |
| 1.51 -2.0 ha | 3.03 | 30.3 | 43.94 | 22.73 |
| > 2.0 ha | 12.75 | 18.79 | 50.34 | 18.12 |
| *Livestock size in 1999* | | | | |
| No livestock | 9.8 | 17.65 | 41.18 | 31.37 |
| 0.1-1.5 TLU | 17.69 | 17.01 | 39.46 | 25.85 |
| 1.51-3.0 TLU | 4.39 | 31.58 | 47.37 | 16.67 |
| 3.1-4.5 TLU | 11.9 | 20.24 | 44.05 | 23.81 |
| ≥4.5 TLU | 10.73 | 26.83 | 45.37 | 17.07 |

***Note**: The ratios (row values) indicate the proportion of children from the corresponding groups of households with a specific combination of childhood work and schooling.*

[1] The wealth index construction procedure is included in Appendix 1.

Figure 10 results children's work patterns according to household wealth status. Characterizing child work and schooling by the wealth quintile reveals that while children from the poorest households were unlikely to study exclusively and were relatively more likely to be inactive compared to others within each quintile, the reverse was true for children from the richest households. This means that as we go from the poorest to the richest households, the likelihood of children attending school on a full-time basis increases. In this regard, children from the richest households were about four times more likely to study exclusively than their peers from the poorest households. Moreover, in consonance with the previous results, about half of children from middle-income households tended to be full-time workers. As such, full-time childhood work exhibits an inverted U-shaped relationship with parent wealth status. Furthermore, perhaps due to varying economic and social reasons, many children from the poorest and richest households tended to combine work and study. It is expected that based on household wealth status, children might have to combine different sets of work with their studies, which also implies differential long-term consequences on labor market outcomes and human capital formation. This means that multitasking and full-time childhood work conditions inversely related over the wealth status. The results, in general, show how childhood work and schooling conditions could interplay with parent poverty and likely jointly to shape children's future lives.

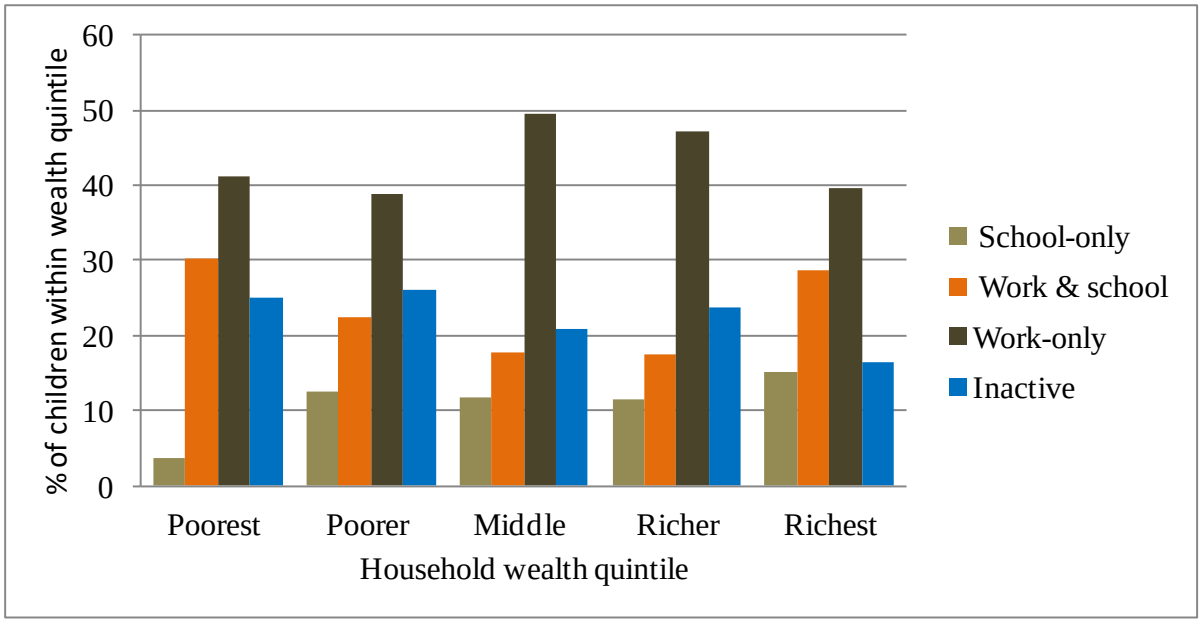


Figure 10. Childhood work and school participation by parental wealth status

The results suggest that poverty may play a role in the decision leading up to childhood work and schooling, mainly on the nature of work and study combinations. Based on the luxury axioms of child labor argument by Basu and Van (1998), and credit constraints by Baland and Robinson (2000), we could anticipate less work involvement (full-time and combining it with study) among children from affluent households. Although the effects of wealth on child labor cannot be overvalued, somehow, and contrary to the luxury axiom of child labor, the results generally show the widespread practice of child labor regardless of household wealth status. We can reiterate the results from Table 6 that when we consider land and livestock assets alone, we note somehow a positive association between childhood work and the size of these assets in the households.

Combining work and schooling for children may be an opportunity to learn important life skills, socialize, build trust and networks in communities, and be prepared to take higher social and economic responsibilities. Unlike a formal apprenticeship, which provides students with a chance to combine classroom with workplace learning, also referred to as "learning while earning" (World Bank, 2017, p. 158), most of the work activities undertaken by school children in rural Ethiopia could be described as learning while helping parents or working as sole laborers in mostly unpaid activities. While combining work and school is a common practice in many developing countries (Akabayashi & Psacharopoulos, 1999; Bhalotra & Heady, 2003; Haile & Haile, 2012; Mansur et al., 2016; O'Donnell et al., 2002; Pankhurst et al., 2016; Patrinos & Psacharopoulos, 1995; Singh & Khan, 2016; Tafere & Pankhurst, 2015), important omissions remain regarding its long-term effects on labor market outcomes (International Labour Organization, 2015).

The most necessary evidence to complement the preceding discussion is children's schooling outcome according to household wealth. Figure 11 plots children's grade attainment, grouped by household wealth quintiles. Interestingly, regardless of wealth status, children were similarly distributed across grade levels and slightly concentrated between the first and third grades. However, relatively speaking, children from the most affluent households were less likely to be observed achieving no grades at all. Again, taking a closer look at the distribution among children with some level of attainment, it can be noticed that those from the top wealth quintile constituted the majority among first- and second-graders. Conversely, relatively fewer children from the middle quintile were observed in these grade levels. In relation to this point, we can recall that about half of the children from middle

wealth quintile households were full-time childhood workers, reducing the average grade attainment in this quintile.

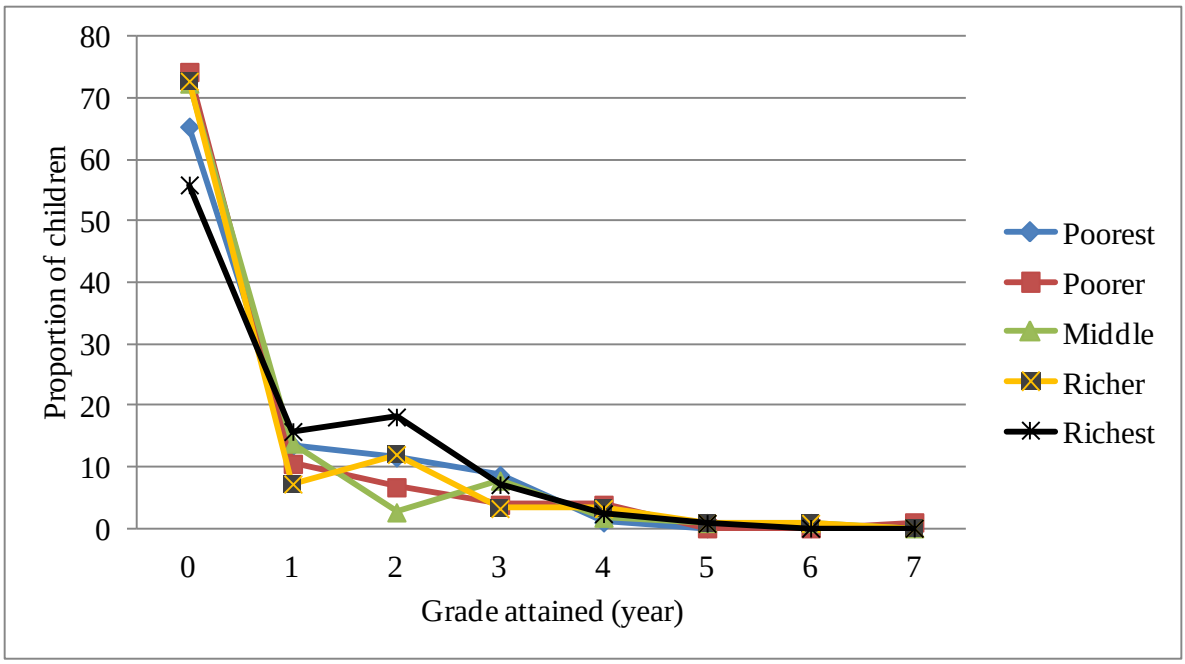


Figure 11. Children‘s grade attainment grouped by household wealth quintiles

After the second grade, however, the distributions are identical, regardless of household wealth, albeit for fewer children. Previous empirical studies from various countries have reported strong associations between household wealth status and school enrollment (Filmer & Pritchett, 1999, 2001; Glewwe & Jacoby, 2004; Huisman & Smits, 2009) and attainment (Filmer & Pritchett, 1999).

### 2.5 Conclusions

In this chapter, the associations between childhood work and schooling outcomes have been examined. More specifically, it has characterized childhood work, measured using the hours worked in the previous seven days, the age at which the child started working, and mutually exclusive combinations of work and study with respect to a multitude of factors. The descriptive results suggest that childhood work varies according to child-specific factors such as gender, age cohort, and birth order, and household socioeconomic status, linked mainly to household wealth. Among several insights, the study finds that the hours worked increase in line with age of the child, boys and girls seem to allocate their time differently in productive activities and domestic chores, and that full-time childhood work has an inverted U-shaped relationship with household wealth. In addition, child work-entry age and grade attainment

are associated non-linearly, while postponing work-entry age up until the school entrance age may increase the odds of school attendance, and expected level of grade attainment; each additional non-working year after this age is associated with lower levels of grade attainment. Furthermore, our results also suggest that poverty may play a role in the decision leading up to working and schooling, mainly on the nature of work and study combinations.

Theoretically, attending schools exclusively, without being distracted by work, could give children the opportunity to enjoy effective attendance, reducing potential health shocks (which could otherwise hinder progression), and help them spend more time studying. Thus, if the quality of child education is high, and provided that the adult labor markets function well—better demand for and high rewards to skills acquired through formal schooling, then full-time schooling could be a worthwhile decision for a later life. It is also hypothesized that multitasking children may have the opportunity to learn and omplement skills, which could give them an upper hand when entering adulthood, mainly to the non-farming sectors. Through the combination of work and study, children might develop an entrepreneurial spirit, acquire occupation-specific skills, and enhance their ability to shift easily to productive jobs later in life. These and related issues are discussed thoroughly in the following analytical chapters.

## 3. Does childhood work impede long-term human capital accumulation? Empirical evidence from rural Ethiopia

### 3.1 Introduction

Human capital—skills, knowledge, and capabilities (Becker, 1964)—contributes to higher labor productivity, which in turn drives economic growth and development, and results in wider societal prosperity. Human capital is one of the most critical factors in explaining wage differentials in labor markets, economic growth disparities, and income differences across the world (Becker, 1964; Mincer, 1974; Schultz, 1960). Thus, public investment in human capital, in order to expand access to quality education and health services, helps increase the productive capacity of the labor force and could accelerate structural transformation. Studies show that about 80 percent of the wealth in developed countries is constituted by human capital and that the astonishing economic growth records in Japan, Taiwan, Hong Kong, and South Korea have been driven mainly by sustained and adequate investment in this regard (Becker, 1995). Related to this notion, we find strong evidence in the literature that early human capital investment, such as child education, is the bedrock of long-term child well-being and development. Together with health capital, childhood education sets the foundation for adult human capital and hence affects adulthood labor market outcomes. Empirical evidence shows that early human capital, measured during the 6-8-year-old period, can explain about 12 percent of variations in adult educational attainment and about 20 percent of adult wage differentials (Currie & Thomas, 1995; McLeod & Kaiser, 2004). This is because, according to the multi-period human capital formation framework (Cunha & Heckman, 2007), human capital investments made at different points of childhood complement the production of future human capital.

A number of factors, however, characterize the state of child education in developing countries, including lower enrollment, higher early dropout rates, poor learning outcomes, and gender disparity in access to education and attainment, collectively contributing to a limited stock of human capital. Consequently, ensuring all schoolchildren complete primary schooling and advance to higher levels of learning is the most critical policy challenge facing many developing countries. In this regard, primary school completion has been often used to track progress and success in the education sector, which also has access and continuation components (World Bank, 2005).

Since the early 2000s, Ethiopia has made significant progress on improving access to education, manifested by a surge in enrollment. However, the primary education completion

(eight-year schooling) rate stagnated at the lowest level. For instance, in 2000, only 13 percent of the population aged 15 and above had completed primary education (ORC Macro, 2004). Since then, despite remarkable success in expanding access to education, the equivalent attainment of higher grades has not been apparent, since too many children leave school early—as indicated by the low 47 percent primary education completion rate (MoE, 2015), even though it doubled from its level in 2000 at 22.6 percent (World Development Indicators, The World Bank, 2017). Even more worrying is that this completion rate has a noticeable gender bias, in that only a third of girls had completed primary school (World Bank, 2010). This finding is corroborated by the current study as well, with the follow-up survey results showing that fewer than a third of children completed primary education, and for girls specifically it was one in every four. The lower rate of primary education completion among the youths is more likely to pose a critical policy challenge to the country's long-term development goals, i.e. transforming the structure of the economy, attaining lower middle-income status, and meeting the skilled labor demands of the economy in the long term.

Various factors may have contributed to lower level of primary education completion. Besides poverty and other socioeconomic hurdles, child labor could be one of the most critical factors preventing a child's progress in schooling. In relation to this point, the 2001 Ethiopian child labor survey, the first stand-alone nationally representative survey example of its type, indicates that about 42.3 percent of 5-14-year-old children participate both in productive and housekeeping activities and contribute about 34 hours of labor to the household productive activities per week. The share of working children, based on number of hours worked in the previous seven days, raised to 79.4 percent if we consider those who work in either domestic chores or productive activities (CSA, 2002). Moreover, as discussed in the introductory chapter, Haile and Haile (2012) and Admassie (2002) also found that widespread child labor practices have detrimental effects on child educational outcomes. The baseline data of this study also shows that while about two-thirds of children participated in some form of childhood work, only a third attended school. Furthermore, almost every second child was a full-time worker and left out of school completely in 1999/2000.

A very critical policy issue in this regard, therefore, is to identify if childhood work participation impedes children's long-term school progression and, if so, which children are more likely to be affected detrimentally—and to what extent. In this chapter, the thesis advances Admassie's (2002) study to a longer-term perspective, and examines the long-term effects of childhood work on human capital accumulation. In order to realize the objective, in

2015/2016, a follow-up individual-level tracking survey was carried out to a sample of 4-14-year-old children studied in Admassie (2002), and constructed a unique and novel panel dataset that spanned 16 years. The study was conducted in five baseline rural districts.

The rest of the chapter is organized as follows. In the next section, the study discusses related literature and identifies the evidence gap, which we endeavor to fill through our contribution. Then, the chapter presents the study's theoretical underpinnings and its position in the wider human capital literature. This is followed by a data description and a model specification section. Then, the results are presented and discussed. The robustness of the results is also highlighted and the chapter concludes with a number of key findings.

### 3.2 Review of related literature

Earlier empirical studies provide mixed evidence on the effects of working on educational outcomes among adolescents in secondary schools and colleges from developed countries, mainly in the US. Some studies have found that part-time jobs while studying may reduce learning outcomes and hinder educational attainment (Carr et al., 1996; Marsh & Kleitman, 2005; Singh et al., 2007; Singh & Ozturk, 2000). Moreover, due to, for instance, limited available time for schooling and extracurricular work (Marsh & Kleitman, 2005; Steinberg & Dornbusch, 1991), working students may lag behind in their schooling compared to their non-working peers (Carr et al., 1996). In contrast, while some findings have also showed that some level of work may enhance learning outcomes (Lillydahl, 1990; Staff & Mortimer, 2007), others argue that the effect is inconsequential once the pre-existing differences are controlled for (Schoenhals et al., 1998) or become ambivalent (McNeal, 1997). These latter studies suggest that working while studying among adolescents is not always harmful as long as their working hours are not too many. However, it would be misleading to use these findings to infer the effects of childhood work on school progression in a developing country setting like Ethiopia.

In contexts related to the current study, several authors have explored empirically the effects of child labor on human capital formation. The short- and medium-term effects of child labor on human capital formation have been examined in relation to school enrollment or participation (Assaad et al., 2010; Beegle et al., 2009; Boozer & Suri, 2001; Sánchez et al., 2009), test scores for language, mathematics, and other subjects (Dumas, 2012; Emerson et al., 2016; Gunnarsson et al., 2006; Heady, 2003; Sánchez et al., 2009), academic performance (Glick & Sahn, 2010; Holgado et al., 2014), and grade attainment (Beegle et al., 2009, 2008; Haile & Haile, 2012; Zabaleta, 2011).

Generally, two strands of thought have dominated the discussion on the associations between child labor and human capital formation. The first and most prevalent view argues that child labor negatively affects educational outcomes and deters human capital formation (Beegle et al., 2009; Emerson et al., 2016; Gunnarsson et al., 2006; Haile & Haile, 2012; Heady, 2003; Le & Homel, 2015; Sánchez et al., 2009; Sedlacek et al., 2009; Zabaleta, 2011). These authors contend that child labor may reduce the time available for attending school, studying, doing homework, resting, and participating in extracurricular activities. This, in turn, leads to exhaustion, thereby preventing proper class attendance, lowering schooling performance, and eventually resulting in limited cognitive development. In contrast, the second view argues that child labor does not impede human capital formation (Dumas, 2012; Fan, 2004; Luong, 2011; Phoumin, 2008; Putnick & Bornstein, 2015), because perhaps it may bring financial and material resources into the household, increase children's socialization, and help them learn skills and develop an entrepreneurial attitude. Thus, children may have better access to food, invest more in their health, and attend school, thus leading to progress in their education and accumulating higher human capital. From this perspective, child labor could be acceptable as long as it does not hold back children's human capital accumulation.

The main limitations of most of the above studies are related to the types of datasets they used, the outcomes of interest, and hence the perspectives under which the inferences have been made. They focus mainly on the effects of some measures of child labor on specific outcomes such as enrollment, grade attainment, or test scores, but they seldom go beyond the short-or medium-term effects to examine the longer-term consequences of child labor, mainly after children have entered the adult world, i.e. school progression and the stability of short-term effects over time. For instance, evidence concentrating solely on child school enrollment at a given point in time may be misleading in relation to long-term school progression and attainment in rural areas. Children enrolled at one point could dropout even in the same year in response to families' seasonal labor demands, take up additional responsibilities, or get married and leave school too early. To cite cases, using a sample of Latin America countries, Sedlacek et al. (2009) have found that while the enrollment gap for 8-11-year-old children, based on household income group, is negligible, children from the poorest households are more likely to dropout from school after the age of 11 than their peers from more affluent households. They also indicate that child labor reduces both enrollment and educational attainment in Latin America, thereby suggesting that policy efforts to

increase access to education and increase enrollment are not enough to ensure educational progression. Therefore, considering that school progression and grade attainment are more vital than just enrollment, policymaking for improving human capital needs evidence on the long-term effects of child labor on these educational outcomes.

In this regard, even those studies that rely on short-span panel datasets are less reliable in making long-term extrapolations. The causal relationship between childhood work and school progression may also be complicated by the pre-existing child-level differences in innate abilities, the desire and ability to combine work and study, aspirations to out-migrate and work in non-farm jobs, and other unobserved factors. Biases due to these variables, on the one hand, and omitted variables, on the other, may affect the econometric identification of causality. From a developing country context, Beegle et al. (2008) have conducted the closest study to this study, using a ten-year-span panel dataset to address these identification problems, albeit in a different methodological manner. These authors analyzed the effects of child labor on long-term educational outcomes and occupational choice in Tanzania, using a panel dataset spanning from 1991-94 to 2004. Analytically, while the instrumental variables method has been used often (Beegle et al., 2008; Dumas, 2012) to address the endogeneity problem in the estimation, in our case, we employed the longitudinal nature of the data, using observed childhood grade attainment in the first wave (1999/2000) and grade attainment when adults in the second wave (2015/2016). The objective of the chapter, therefore, is to identify how childhood work, with or without concurrent studying, affects children's progression in long-term human capital accumulation.

### 3.3 Theoretical framework

The theoretical frameworks on human capital investment, aligned with the dynamics of skill formation, guide the analysis of this chapter. Past empirical results are inconclusive on whether or not childhood work deters long-term human capital formation, primarily when childhood work is not only in response to poverty, but also when it is a widespread and acceptable societal practice. Theoretically, however, childhood work may influence long-term human capital formation through a number of channels. First, its effects may be manifested on early (child) human capital formation, which could be detrimental or beneficial in light of long-term human capital accumulation. Assuming that child labor is a household-level decision, altruistic parents make human capital investment decisions for their children—sending them to school and/or work, or inactivity, which determines their early human capital

stock. Regarding the long-term human capital implications, childhood work may exert its effects through affecting not only schooling, but also the acquisition of work experiences and occupation-specific skills.

While most theories set out to understand the factors behind child labor and schooling decisions, we find limited theoretical analyses of their dynamics and long-term consequences on human capital formation (Basu, 1999; Basu & Tzannatos, 2003; Emerson & Souza, 2003; Hazan & Berdugo, 2002). The idea behind the dynamic process of human capital formation, due to the interactions between child labor and schooling, is that children who receive more schooling tend to have higher human capital when adults. Basu and Tzannatos (2003) have noted that childhood work can help them learn some skills or another form of human capital which, in turn, could be facilitated by gaining an education. This means that there could be an indirect positive link between the level of childhood work and adulthood human capital. However, using the leisure, schooling, and work classification of children's activities, Basu and Tzannatos (2003) have argued for potential inverse relationships between child labor and schooling if a child allocated her available time between the two elements. Therefore, according to these theoretical arguments we can assume that child labor may affect long-term human capital, not only through reduced childhood education and increased health hazards, but also positively by improving access to schooling through income effects and gaining work experiences that may be useful for later life.

Empirical studies have also uncovered evidence that child labor and schooling are not necessarily mutually exclusive (Admassie, 2002; Emerson & Souza, 2008b; Patrinos & Psacharopoulos, 1997; Putnick & Bornstein, 2015; Soares et al., 2012), i.e. school children may also work, which could be the most likely scenario in rural areas where access to education is improved and yet social norms and culture often guide child upbringing practices. In such societies, early human capital investment through schooling may interplay with work participation to shape jointly the long-term progress and the process of human capital accumulation. The study here assumes that childhood work could be detrimental to long-term human capital formation if it interferes significantly with studying, by competing for limited time, leading to poor school attendance and study due to exhaustion caused by laborious jobs, school absenteeism, and early dropout. Thus, the cross-effects of childhood work and study on long-term human capital accumulation is ambivalent.

Somehow related to this notion, in dynamic human capital and skill formation frameworks, Cunha and Heckman (2007, 2009, 2010) and Heckman (2007; 2006) provide

extensive explanations which might be applicable to this study. The main idea behind their framework is that human capital investments in early life are likely to have effects on adulthood outcomes. By self-productivity, Cunha and Heckman (2007) and Heckman (2007) mean "[t]he skills produced at one stage augment the capabilities attained at later stages," (Cunha & Heckman, 2007, p. 35), and "[…]capabilities are self-reinforcing and cross-fertilizing and […] the effects of investment persist" (Heckman, 2007, p. 13252). This means that the skills and the human capital attained during childhood may augment these aspects during adulthood. On the other hand, through dynamic complementarity (Cunha & Heckman, 2006, 2007, 2009; Heckman, 2007), they suggest that "[c]apabilities produced at one stage of the life cycle raise the productivity of investment at subsequent stages" (Heckman, 2007, p. 13253). This dynamic process can account for the emergence of socioeconomic differentials later in life (Heckman, 2007). To place this idea within the perspective of this study, full-time childhood work, or combined with study, may lead to differences in long-term human capital by affecting the productivity of human capital investments and regulating the self-productivity of previous skills. However, Heckman (2006) has also indicated that early learning makes subsequent learning efficient and produces a self-enforcing motivation to learn more in the future. This implies that while schoolchildren tend to continue schooling in subsequent years and end up with higher human capital level when adults, full-time childhood workers may lag behind and are likely to acquire lower human capital later in life. As a result, it is impossible to tell ex-ante whether or not childhood work impedes the progression of long-term human capital formation.

## 3.4 Analytical framework

### 3.4.1 Sources of data

The chapter uses the data described in the introductory chapter, the baseline survey combined with the follow-up tracking survey. The chapter makes its analyses using 652 RTs, i.e. only re-surveyed children. Childhood work is controlled as mutually exclusive work and school combinations (work-only, school-only, and combining work and study), hours worked in the previous seven days, and the age at which the child started participating in childhood work. The latter variable is also a good proxy to measure work exposure and the number of years the child could have worked in various activities. Moreover, the outcome variables include enrollment into formal education, completed years of education, and completion of first-cycle

(grade four) and second-cycle (grade eight) primary education. These education outcome variables are used to measure human capital formation between 1999/2000 and 2015/2016.

### 3.4.2 Econometric model specification

The long-term school progression (binary and count) is the outcome variable. In modeling the causal effects of childhood work at baseline on grade attainment measured at baseline and follow-up, we specify the econometric model using the framework discussed in Andreß et al. (2013). The expression showing the child's probability of making the conditional transition from $g_1$ grade level (schooling at baseline) to $g_2$ (grade attained at adulthood) is:

$$h_{gi}(t) = \Pr(y_{i2} = g_2 | y_{i1} = g_1) \tag{3.1}$$

where $h_{g1}(t)$ denotes the conditional transition function of child $i$ with grade $g_i$ at time $t$, Pr(.) represents the conditional probabilities of observing the corresponding category $g_2$ of the outcome variable $y_{i2}$ at time $t=2$, $g_1$ denotes baseline (1999/2000) grade attainment, and $g_2$ denotes the number of completed years of education at follow-up (as of 2015/2016). For a continuous outcome variable, the conditional schooling transition function is specified as:

$$h_{gi}(t) = G(\beta_0(t) + \beta_1 x_{1it} + ... + \beta_k x_{kit} + \gamma_1 Z_{1i} + ... + \gamma_j Z_{ji} + \beta_w w_i + \varepsilon_{it}) \tag{3.2}$$

where $x_{it}$ denotes time-varying variables, $Z_i$ stands for time-invariant variables, $w_i$ stands for childhood work, $\beta$ and $\gamma$ are estimable coefficients, and $\beta_w$ is the parameter of interest.

The stochastic part of the model is a composite error term, $\varepsilon_{it}=v_i+u_{it}$, where $v_i$ is an unobserved predictor of the outcome ($y_{it}$) that is specific to the child, and therefore time-constant, and $u_{it}$ is a normally distributed error term with a mean of zero and variance of $\sigma_{it}^2$. The latter includes measurement errors and is time-varying. Thus, the main difference between alternative model specifications is how we handle the individual-specific component of the error term ($v_i$).

While the model choice should have been informed primarily by formal tests between alternative specifications, due to the time-invariant nature of childhood work (constant work participant/ exposure), the standard fixed effects model cannot be used. In other words, the study assumes that the effects and distribution of unobservable factors such as children's innate abilities are random and uncorrelated with the regressors. Since the outcome variables are measured in binary and count forms, following Andreß et al. (2013), the main panel

model for the categorical (discrete response) variables model, with a unit-specific error term only, *vi*, is:

$$\Pr(y_{it} = g_i) = G(\beta_0(t) + \beta_1 x_{1it} + ... + \beta_k x_{kit} + \gamma_1 Z_{1i} + ... + \gamma_j Z_{ji} + \beta_w w_i + \nu_i) \quad (3.3)$$

where $\Pr(y_{it} = g_i)$ is the probability function of observing $g_i$, i.e. completed years of schooling ($y_{it}$) for child *i* at time *t*, and $G(\cdot)$ denotes the proper distribution function. Accordingly, we first estimate the probit regression model, which provides the probabilities (within the proper limits i.e. $0 \leq \Pr(y_{it} = g_2) \leq 1$) of attaining key education milestones (long-term school enrollment and the completion of four and eight years of formal education) as:

$$\Pr(y_{it} = g_2 | x_{it}, Z_i, w_i) = \Phi(\beta_0(t) + \beta_1 x_{1it} + ... + \beta_k x_{kit} + \gamma_1 Z_{1i} + ... + \gamma_j Z_{ji} + \beta_w w_i) \quad (3.4)$$

where $\Phi(\cdot)$ represents the standard normal distribution function. The probit estimation for long-term enrollment (not attainment) does not include the baseline education attainment, but childhood work indicators and other covariates are included.

Second, for the count part of the outcome variable (the number of completed years of education attained—measuring the extents of progression from baseline values), using the random effects Poisson model, and assuming gamma distribution for $\nu_i$ term (Greene, 2005, 2007), the unconditional joint density for child *i* is specified as:

$$\Pr(y_{i1}, y_{i2}, ..., y_{iT} | \mathbf{X_i}) = \frac{\left[\prod_{t=1}^{T} \lambda_{it}^{y_{it}}\right] \Gamma\left[\theta + \sum_{t=1}^{T} y_{it}\right]}{\Gamma(\theta)\left[\prod_{t=1}^{T} \Gamma(y_{it} + 1)\right]\left[\left(\sum_{t=1}^{T} \lambda_{it}\right)^{\sum_{t=1}^{T} y_{it}}\right]} Q_i^{\theta} (1 - Q_i)^{\sum_{t=1}^{T} y_{it}} \quad (3.5)$$

where $\lambda_{it} = \exp(\alpha + x_{it}^{'}\beta + \nu_i)$ - $\nu_i$ is independent of $x_{it}$ and distributed in a log-gamma density with $\exp(\nu_i) \sim G(\theta,\theta)$ and $Q_i = \theta / (\theta + \sum_{t=1}^{T} \lambda_{it})$. It is a negative binomial distribution for $Y_i = \sum_{t=1}^{T} y_{it}$ and with mean $\Lambda_i = \sum_{t=1}^{T} \lambda_{it}$ .

### 3.5 Results and discussion

#### 3.5.1 Changes in access to education in the survey sites

Expanding access to universal quality primary education has been one of Ethiopia's major national development policies, mainly after the current government took power in 1991 (MoE, 2015; World Bank, 2010). In 1994/95, the country abolished school fees (World Bank, 2009) and a nationwide effort was made—and considerable progress has been achieved—on

school development through the construction and expansion of schools, leading to shorter commuting distances, teachers' professional development, textbook distribution, and the introduction of information and technology to assist the teaching process. Consequently, public spending on education as a share of GDP increased from about 4.0 percent in 2000 to 4.5 percent 2013 (UNESCO, 2016) and has enjoyed a share of the national budget of between 20 and 25 percent over the last decade (MoE, 2015; World Bank, 2016b). In addition, net enrollment in primary education improved from 44 percent in 1999/2000 to 94.3[1] percent in 2014/15 (MoE, 2000a, 2016), and more than two-thirds of secondary schools accessed educational satellite television broadcast programs despite all the challenges involved in ensuring seamless service provision (MoE, 2015). However, the Ethiopian education system also suffers from technical and structural bottlenecks. Only about 28 percent of secondary schools have access to an internet service (MoE, 2015), and a significant gap also exists in ensuring girls have access to quality primary education. A recent report showed that Ethiopia needs more than 50 years to achieve universal primary completion among rural girls, after having achieved the goal among boys in urban areas (UNESCO, 2014). An important challenge in this regard is to ensure that all enrolled children attain at least full primary education level and in so doing drastically reduce the risk of early school dropout, mainly among rural girls. In 1999/2000, all the study villages had primary schools, either within the local vicinity or a nearby village located at an accessible distance away from home. The discussions below highlight education-related changes during the period of analysis.

**Dinki**: The main primary school (grades one through six) was located in the village center, called Chibte or Gendawuha, where the village market takes place, and a "satellite" school has been available at Addis Alem sub-village (grades one through four). While it was common to send children, mainly among Muslim and Argoba families, to a religious school, children's participation/enrollment in formal education was very low. The baseline community-level study by a group of social scientists and experts found that while there was lack of classrooms, tables, and blackboards, other factors, including distance, the demand for children's labor in farming activities, and job prospects, inhibited enrollment in Dinki (Kenaw & Tegegne, 1996). Key informants during the village study in 1996 also indicated that the demand for child labor, mainly during harvest time, in addition to the religious and cultural values of a secular education program, was the main reason for lower enrollment in formal education (Kenaw & Tegegne, 1996).

[1] Net primary enrollment is 85.59 percent in the World Bank's World Development Indicators (World Bank, 2017a).

School progression, however, seemed to have been impeded by other factors, including lack of nearest and accessible junior and high schools in the villages and cultural attitudes to and associated risks involved in girls' education. For instance, with regard to access, during the baseline study, children who managed to finish their elementary education in the village, and up to grade eight in Aliyu Amba (a walking distance from Dinki) had to travel to Debre Berhan town (about 60 km from Aliyu Amba), to attend high school. Moreover, school enrollment data by class showed that most students did not progress beyond first-cycle primary school level, and the attrition rate was higher when it comes to girls, driven by high dropout rates as a result of fear of rape and kidnapping.

Subsequent village-level, in-depth studies have also found very few children progressed in their schooling over the last decade despite improvements in schools and allied infrastructure development. For instance, in 2010, the village already had a full primary school and reached out to remote sub-villages through satellite schools, usually in a self-contained teaching system, which led to a rise in enrollment, as many as 50 percent of girls, in this regard (Tiumelissan & Yimer, 2010). It has also been highlighted that child labor continues to be the main reason for student absenteeism and dropouts, mainly in the second semester—overlapping with crop threshing and harvesting season and peak labor demand (Tiumelissan & Yimer, 2010). As part of the current study, the most recent revisit to the village was done in 2015/2016, and finds that unlike the 1996 situation, school progression up to high school level was a relative success, due to the opening of a high school in the nearby town, Aliyu Amba. There is a surge in the number of children attending high school at Aliyu Amba, with some actively commuting from the village and others staying in the town. Partly due to legal pressure, villagers reported that it was less likely that parents would pull children out of school and refuse to send them to formal education, which we believe was a major factor in this improvement.

**Debre Berhan villages**: this site comprises four neighboring villages—Kormargefia, Milki, Bokafia, and Karafino. An elementary school located in Bokafia also used to serve households living in Kormargefia and Milki. The baseline survey in 1996 (Getu et al., 1996) has reported that school dropout was common, mainly at the end of the year when households face a labor shortage, marriage, and also due to distance of the school away from homes. The study has also showed that although very few compared to the number of children enrolled in primary schools, relatively many children went to high schools in the nearby Debre Berhan town. Moreover, unlike the case in Dinki, girls' enrollment in these villages was relatively

higher than that attributed to boys. Child labor was one of the factors leading to lower school progression. In Debre Berhan villages, schools also provided "labor education", introducing students to the basic concepts of farming, such as how to plow, weed, harvest, and other farm-related activities (Getu et al., 1996).

Starting in 2012 at grade five, as of 2014, the school that serves Kormargefia and Milki villagers, located in Kormargefia, was upgraded to full primary school level, enrolling about 270 second-cycle children in 2015/2016. Bokafia and Karafino villages had also access to full primary schools both within the villages and in Tebase and Debre Berhan towns. Moreover, it has been also observed that compared to other survey villages, mainly due to their proximity to Debre Berhan town, many children in these villages joined high school, technical and vocational education, as well as universities.

**Shumsheha**: The village is located near Lalibela town. It had one elementary school (grades one through six) in 1996, which served about nine sub-villages. School dropout was high due to children migrating with parents, participation in childhood work such as selling fuelwood, cattle herding, and also early marriage among girls. School enrollment was also low, due to the belief that children would leave their parents if they attended modern education. School progression to high school level, as a result, was very low (Ali & Tafesse, 1996). Students who decided to attend junior and high schools had to travel to the nearest town, Lalibela, about nine kilometers away. In 2005/06, Shumsheha's elementary school was upgraded to junior level, to grade eight (Yirgu & Yihdego, 2013).

A mid-term community-level study by Carter and Yihdego (2012) has reported improvements in the school infrastructure to full-cycle primary school level, and new satellite and first-cycle primary schools were also constructed in other sub-villages. The community-level in-depth studies have also found that above 50 percent of children were enrolled in 2010/11 and 2011/2012, but there were also many dropouts at the end of the academic year, due to participation in child work and marriage (Carter & Yihdego, 2012; Yirgu & Yihdego, 2013). Lower school progression, mainly as a result of high dropout rates among second and fifth graders, was due mainly to abrupt changes in the instruction system for those from alternative schools (after attending first-cycle education in "satellite" schools), school distance (Shumsheha primary school) from the sub-villages, and as a result of higher demand for child labor by parents for farming, mainly boys, and other activities. In addition, lack of school facilities such as toilets, playgrounds, staff offices, and textbooks, mainly in the satellite schools, hindered children's school progression (Yirgu & Yihdego, 2013).

**Adado** is located in southern Ethiopia, Bule district. An earlier village-level report shows that it had one primary school in 1996. School enrollment was very low (estimated to be about 20 percent) and very few transferred to junior and high schools, located in Bule (10 km) and Dilla (25 km) towns, respectively (Gebre et al., 1996). Unlike what have been noted in Dinki and Shumsheha—school enrollment and progression were also impeded by the fear of children's migration leaving parents behind—the villagers' perception that schooling helps very little in earning a higher income in non-farm jobs led many children in Adado to dropout in the early grade stages (Gebre et al., 1996). However, it seemed that school fees collected for books did not make a significant contribution to lower enrollment and poor progression among children. Moreover, unemployment after graduation, unlike in most other survey villages, has never been mentioned as a major problem in Adado. For instance, many of college graduates were employed in different administrative positions in the *woreda* and *zone* offices. As a result, it has been argued that school progression in Adado seemed to have been limited due to attitude to education, the desire to migrate to other areas such as Shakiso to work in gold mining jobs, high demand for child labor during the coffee harvest, an inability to afford schooling expenses mainly among poor households, and also low education quality, meaning that many children would fail grade eight (Berhanu et al., 2014).

In 2015/2016, this study has also found that only about 20 percent of surveyed adults with up to four years of schooling could functionally read and write or do simple arithmetic calculations. It continued to be a common practice for children to dropout early from school before completing primary education, and migrate to other areas such as Shakiso, Adola, and nearby towns including Bule and Dilla, in order to work in non-farm jobs. However, although it was not possible to get precise statistics from village school about the number of school-aged children in the village and those who enrolled, regularly attended, and progressed to successive grade levels, improvements were reported compared to the situation in 1999/2000.

**Adele Keke**: In 1996, Gashaw et al. (1996) conducted a village-level study, as part of the ongoing longitudinal study of twenty rural communities, which began in 1994, and reported that the village had one elementary school which enrolled students until grade five. They have also noted very low school enrollment even compared to religious schools. Moreover, although the village is located near an agricultural college, now called Haramaya University, and near cities and towns including Haramaya, Dire Dawa, and Harar, children's school progressions to high schools and university education levels have been reported as being very low. Gashaw et al. (1996) have noted further a tendency that parents discriminate

when choosing to send children to school, as children with better abilities would often be enrolled while less intelligent ones were likely to work. Most children dropped out from school, once they reached grade eight, and often work in family farming.

In 2012, and also in 2015/16, Adele Keke had four primary schools, serving more than twenty sub-villages, also known as 'zones'. Community level awareness of the value of education had improved, but overall, parents still preferred their children to work on the farms or at home (Carter & Yihdego, 2012). However, the newly constructed schools had no electricity, no drinking water for children, and no toilets. Moreover, all across the schools, there was a shortage of teaching materials such as books, desks and chairs, and blackboards. Unlike other villages, this study has noted that the availability of alternative junior schools in the nearby villages of Dengego and Adele *01 Kebele* contributed to relatively higher primary education completion in the village. The nearest secondary school for the village children is located in Haramaya town (about 5 km), accessible by public transport from the village.

### 3.5.2 Long-term education attainment

Below, the section presents some key education outcome indicators relevant to the discussion on education progression vis-à-vis child labor (Table 7). Through the follow-up survey, the study finds that about 86 percent of RTs have enrollment experience in formal education, but could have also dropped out before completing any grades, while the rest have never been to school. The study also notes gender differences in school attendance, in that 10 percentage points more girls than boys have not had access to formal education. Assuming that those who were enrolled at some point in time are also functionally literate, the value is very high compared to the national average youth literacy rate of 52 percent in 2011 (MoE, 2015). Despite significant take-up after 2000, the 2016 Demographic and Health Survey (DHS) has reported that 48 percent of women and 28 percent of men aged 15-59 years have no formal education (DHS, 2017), which is still above the illiteracy rate among adults in this study. The current education sector development plan, namely the Ethiopian Education Sector Development Program V (ESDP V), states that a high level of adult illiteracy, even compared to other sub-Sahara African countries, poses a major development challenge to achieving lower middle-income status by 2025 (MoE, 2015).

Interestingly, among those children who have never been to school during baseline survey, the study has found that about 78.71 percent of them have enrolled in schools since then, leaving about one-fifth behind. This illustrates how child education status at one point

in time in a rapidly changing economy, and subsequent generalizations about long-term trends, could be misleading unless backed by follow-up studies. Furthermore, average formal schooling (years) completed among RTs is about 5.83 years: 6.46 years for males and 5.14 years for females. This means that girls have lagged by about one year of schooling behind boys when adults. The differences also persist as we go further and look at progression to higher education levels. The tracking survey also shows that only 30 percent of boys and close to 26 percent of girls have completed primary education, i.e. eight years of schooling.

Table 7. Education outcomes of children during adulthood, as of 2015/2016

| Education outcomes | Pooled | Male | Female |
|---|---|---|---|
| Ever enrolled into formal education, *percent* | 86.20(0.35) | 92.33(0.27) | 79.55(0.40) |
| Enrolled into formal education after 1999, *percent* | 78.71(0.41) | 86.73(0.34) | 70.53(0.46) |
| Attended at least four years of schooling, *percent* | 62.30(0.49) | 69.91(0.46) | 53.99(0.50) |
| Completed primary schooling, *percent* | 28.01(0.45) | 30.01(0.46) | 25.88(0.44) |
| Average grade completed (years) | 5.83(4.17) | 6.46(3.97) | 5.14(4.28) |

Note: *Values in the parentheses are standard deviations in proportions and the last row in years. For all binary variables (except the last row), yes is denoted by one and no is by zero.*

The follow-up survey has also revealed further that about 70 percent of boys completed at least four years of schooling, with girls following with a 15 percentage point gap at about 54 percent. This means that although the gender differential in education progression persists at various school levels, it gets narrower as we go up to higher levels, though differences with reference to these key education outcomes have always been in favor of males. Below, the study explores whether such a lower level of primary school completion is in some way associated with child-specific factors, and particularly with participation in childhood work.

In Table 8, the study presents the distribution of categorized grade attainments in 2015/2016 by gender and birth order. It is evident that twice as many girls (23.0 percent) as boys (11.80 percent) are illiterate (having not completed any schooling). Moreover, in terms of birth order, the risk of illiteracy rises as we go from younger to elder siblings, thereby implying that the chances of attaining some level of education improve among younger siblings, perhaps partly because they have had the opportunity to benefit from the recent expansions in access to education in rural areas through the Education For All (EFA) and universal primary education programs. On the other hand, regardless of gender and birth order between about 28 and 40 percent of children completed five to eight years of schooling.

Table 8. The highest grade completed by re-surveying targets (2015/2016)

| Education level during the follow-up survey (2015/2016) | youth group by gender (%) | | | birth order (%) | | |
|---|---|---|---|---|---|---|
| | Pooled | Male | Female | Eldest | 2n born | Youngest |
| Never completed formal education | 17.18 | 11.80 | 23.00 | 20.64 | 14.87 | 14.20 |
| First cycle (Grades 1-4) | 20.55 | 18.29 | 23.00 | 21.35 | 16.92 | 23.30 |
| Second cycle (Grades 5-8) | 34.20 | 39.82 | 28.12 | 28.47 | 36.92 | 40.34 |
| High school (Grades 9-10) | 17.18 | 17.11 | 17.25 | 16.01 | 20.51 | 15.34 |
| Preparatory and above | 10.89 | 12.98 | 8.63 | 13.52 | 10.77 | 6.82 |
| Observations | 652 | 339 | 313 | 281 | 195 | 176 |

Note: *Values are percents in column-wise. The last row shows the number of observations by column.*

Recalling the results in Table 7 indicating that relatively more males than females completed lower- and to some extent upper-primary education, the findings in Table 8 show that the gender-based gaps diminish at higher schooling levels. Moreover, while the share of children who managed to progress to high schools and beyond remained below 20 percent, about 10 percent of children attended preparatory schools or joined a higher education institution.

### 3.5.3 Characterizing education transition between 1999/2000 and 2015/2016

The most relevant piece of information to complement long-term schooling attainment is children's respective educational condition during childhood. Table 9 tabulates education attainments at the baseline and follow-up surveys. It depicts the distribution of children in 1999/2000 in the first column, and the corresponding transitions to various school-cycles (phases) when adults in the subsequent columns. Partly also due to their ages, the results show that education distribution at baseline skews downward, i.e. most children were either out of school or attending first-cycle (grades one through four) schools. More specifically, 16 years ago, slightly above two-thirds of children were not enrolled in formal schooling, whereas about a third attended within the first-cycle primary education level.

Accordingly, after 16 years, *ceteris paribus*, one may expect that these children would have graduated from higher education, entered the labor markets with the necessary skills and knowledge, or at least currently be studying in higher education. However, the reality is rather different. It has been found that among illiterate children during childhood, while about a quarter continued to be out of school or enrolled and never passed any grades after 16 years, about 32.14 and 22.45 percent have completed grades at second- and first-cycle primary

education levels, respectively. The results reaffirm that since 2000, access to basic education has expanded significantly in rural areas and resulted in much higher enrollment for those who previously did not have the opportunity, due to various socioeconomic and institutional reasons, such as child labor and school distance.

Table 9. Schooling transition of children during the previous 16 years, 1999/2000-2015/2016

| | Baseline | Grades completed during adulthood (2015/2016) | | | | |
|---|---|---|---|---|---|---|
| | values, | Illiterate | Grades | Grades | Grades | Preparatory |
| Education category | 1999/2000 | / informal | 1-4 | 5-8 | 9-10 | and above |
| No formal education | 67.94 | 25.51 | 22.45 | 32.14 | 13.78 | 6.12 |
| (Grades 1-4) | 31.02 | 0.0 | 12.29 | 37.99 | 27.93 | 21.79 |
| (Grades 5-8) | 1.04 | 0.0 | 0.0 | 16.67 | 16.67 | 66.67 |
| Observation | 577 | 100 | 110 | 195 | 105 | 67 |

*Note: Values, except the last row, show percentages within each schooling category calculated column-wise.*

A closer look at the 2015/2016 distribution also shows interesting trends regarding children's upward educational mobility. It is noted that most children have advanced their education up to somewhere within the second-cycle (grades five through eight), leaving a relatively small segment of children in the first-cycle (grades one through four) or out of school. Moreover, some also progressed to even higher levels such as preparatory schools and university. The study has also found that among those who were attending grade one through four at the first observation, more than two-thirds progressed to second-cycle primary and above. One of the most critical questions in this respect is why relatively few children were able to progress to higher levels or complete primary schooling while the majority were left behind. The major contribution in this chapter, therefore, is that it explores whether childhood work conditions observed at baseline does indeed matter to children's long-term progression in human capital formation. The chapter provides exceptional evidence in related contexts on whether or not childhood work in smallholder rural farming communities deters long-term human capital formation (education attainment).

### 3.5.4 Family wealth status and long-term education outcomes

Since the release of the Coleman Report (Coleman et al., 1966) in the United States and the Plowden Report (Peaker, 1971) in Great Britain on the role of school and family

characteristics on educational outcomes, the debate and empirical research has continued to unravel the associations between these two elements. Both reports argued that children's educational outcomes are determined largely by family backgrounds rather than school characteristics. Heyneman and Loxley (1983), on the contrary, have argued that many of the variations in children's educational outcomes in developing countries are due to school-related factors. In line with the Coleman and Plowden reports, a number of studies provide evidence that in developing countries, where the credit market is imperfect, investment in human capital is determined by household resources. Past studies have found compelling evidence on the critical role of household resources on school enrollment (Filmer & Pritchett, 1999, 2001; Glewwe & Jacoby, 2004; Huisman & Smits, 2009) and long-term education outcomes such as the completion of key education milestones, including getting through high school (Filmer & Pritchett, 1999; Williams Shanks & Destin, 2009). These studies have argued that wealthier households have the capacity to maneuver around monetary issues (Huisman & Smits, 2009) and have the lower opportunity cost of sending children to schools instead of them working in paid or unpaid jobs (Basu, 1999). On the contrary, children from poorer households may be left out of school or dropout before completing basic education. The results reported in Table 10 and visualized using Figure 12, however, point mixed picture regarding long-term enrollment and achievements, according to parental wealth status.

Table 10. Parent wealth status and child education progression to adulthood

| Parent wealth status in 1999 | Grades completed during adulthood (2015/2016) | | | | |
|---|---|---|---|---|---|
| | No formal education | grade 1-4 | grade 5-8 | grade 9-10 | Preparatory & above |
| Poorest | 19.64 | 22.32 | 27.68 | 20.54 | 9.82 |
| Poorer | 18.02 | 23.42 | 33.33 | 13.51 | 11.71 |
| Middle | 17.04 | 21.48 | 34.07 | 14.07 | 13.33 |
| Richer | 19.59 | 25.00 | 33.11 | 12.84 | 9.46 |
| Richest | 12.33 | 11.64 | 41.1 | 24.66 | 10.27 |

*Note: values in the table are percentages of children from the corresponding wealth status*

The results show that while children from the richest (fifth quintile) households are relatively less likely to remain out of school in the long term, children belonging to other wealth strata showed equal likelihoods of being illiterate. Similar trends are also observed in the first-cycle grades, in that all children, except those from the richest stratum, are equally observed in this category. On the contrary, relatively more children from the wealthiest households are more

likely to be observed in grades five through eight, and nine through ten. However, further progression to higher education levels seems to be affected less by the parents' wealth status. The above distribution is also illustrated using Figure 12 (Baseline household wealth statuses are presented on the x-axis and y-axis is for the percentage of adults within each parental wealth status).

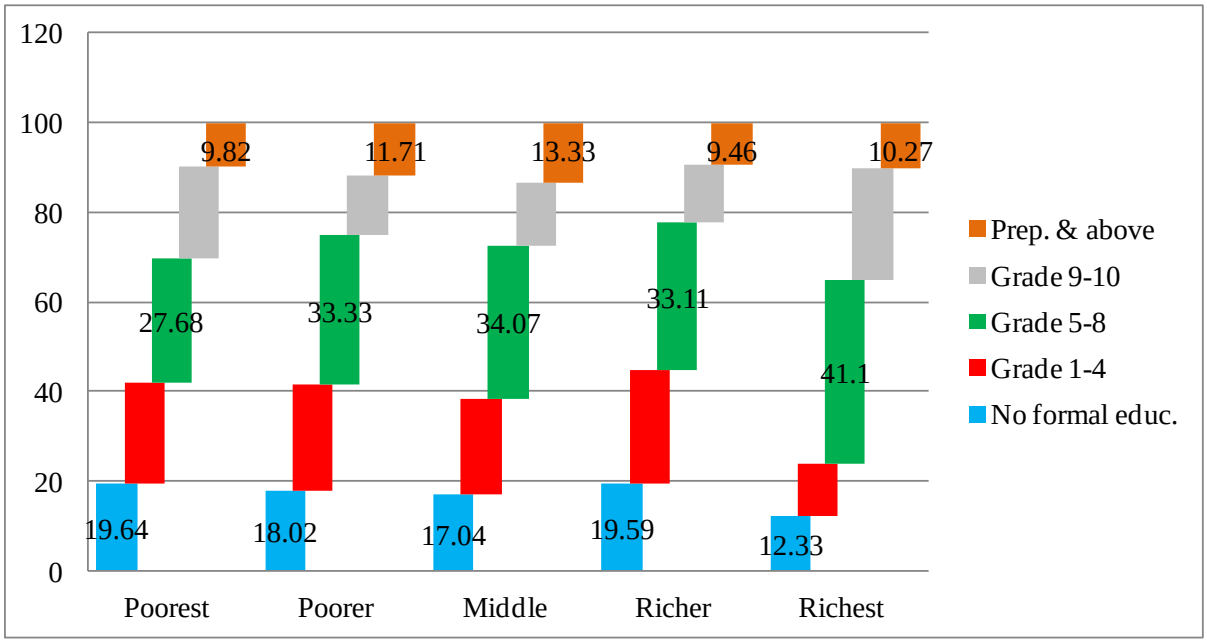


Figure 12. Children's long-term grade completion by parent wealth status

It can be recalled results from Table 6 that while children from the poorest households were less likely to study full-time and more likely to be inactive compared to others within each wealth quintile, their peers from most affluent parents were observed the reverse. Moreover, it also finds that multitasking and full-time childhood working inversely relate over parent wealth status. That is, while many children from the first and fifth wealth quintiles used to combine work and study, those from the middle tended to be full-time laborers. Going into the long-term, depicted by Figure 12, family background, proximate by wealth, might play a role in children's enrollment and progression into the upper primary and secondary schools.

Understanding the main factors impeding long-term enrollment and attainment, controlling socioeconomic differences, and devising a relevant strategy is critical to achieving and maintaining the goal of universal primary education, and supplying the economy with the required skilled workforce. Controlling for the variables discussed above and other factors, this chapter investigates if children's work participation impedes or enhances long-term

educational outcomes in rural Ethiopia. Below, the study also provides descriptive results between childhood work indicators and long-term school outcomes.

### 3.5.5 Childhood work and long-term education outcomes

Childhood work is measured in three different ways: Hours worked in the previous seven days, the combinations of work and study during childhood, and the age at which the child started working. In relation to the latter variable, although working below the age of 14 years, in general, is considered as child labor, work may have differential effects on long-term school progression, even among those who worked before this cut-off age. In this section, however, after highlighting on the other aspects of work, the study provides descriptive evidence on the educational progress of children based on work and schooling combinations.

#### 3.5.5.1 Childhood work and grade attainment

To recall from the previous chapter, excluding inactive children during childhood, more than half started participating in agricultural and domestic chores between the ages of six and eight years. It was also noted that a third had already participated in chores and farm activities by the age of five, and about 94 percent of children entered into labor activities before turning ten years of age. Moreover, the baseline data have also shown that slightly fewer than half of the children have never been to school but already started working. This means that most of children are likely to start working before they enroll in school. However, relatively speaking, while the majority of children start working as 6-8-year-olds, this group is also more likely to be in school compared to the rest. It seems that this cohort is the most active child age group.

Long-term educational attainment is tabulated in Table 11 in relation to the average age at which the child started working and the hours they worked in the previous seven days. On average, children started working at about the age of six. However, it is also noted that illiterate adults started childhood working relatively later than their literate counterparts when adults. Moreover, using the number of hours the child worked in the previous seven days, illiterate adults, on average, worked about three hours per week more than those who later attained one to four years of schooling, and an hour longer per day than those who completed five to eight years of schooling. On the other hand, those who completed nine to ten years of schooling worked the lowest number of hours than the rest. It also shows that the number of hours worked per week increases as we go from high school completers to illiterates, in one hand, and to those who have attained some preparatory and above grades, in the other.

Table 11. Adulthood (2015/2016) grade attainment by childhood work indicators

| Childhood work indicators | No formal education | grades 1-4 | grades 5-8 | grades 9-10 | Preparatory and above |
|---|---|---|---|---|---|
| Mean hours worked per week | 24.84 | 21.76 | 18.49 | 16.19 | 21.50 |
| Mean child age (year) when start working | 6.53 | 6.43 | 6.19 | 6.05 | 6.26 |

Figure 13 demonstrates the educational accomplishments of children after 16 years, based on their childhood work and school combinations, excluding inactive children. It shows that schoolchildren (school-only and combined it with work) have progressed in their education relatively ahead of working-children. While a third of full-time childhood workers remained illiterate even after 16 years, above 80 percent of all schoolchildren completed fifth grade or went beyond during the same period. It can also be recapped from the previous results that slightly fewer than a fifth of all children and a quarter of those who were out of school are illiterate even when adults. This shows that while those who were out of school were more likely to be full-time childhood workers, some of such children may also continue to be illiterate in the long term as well.

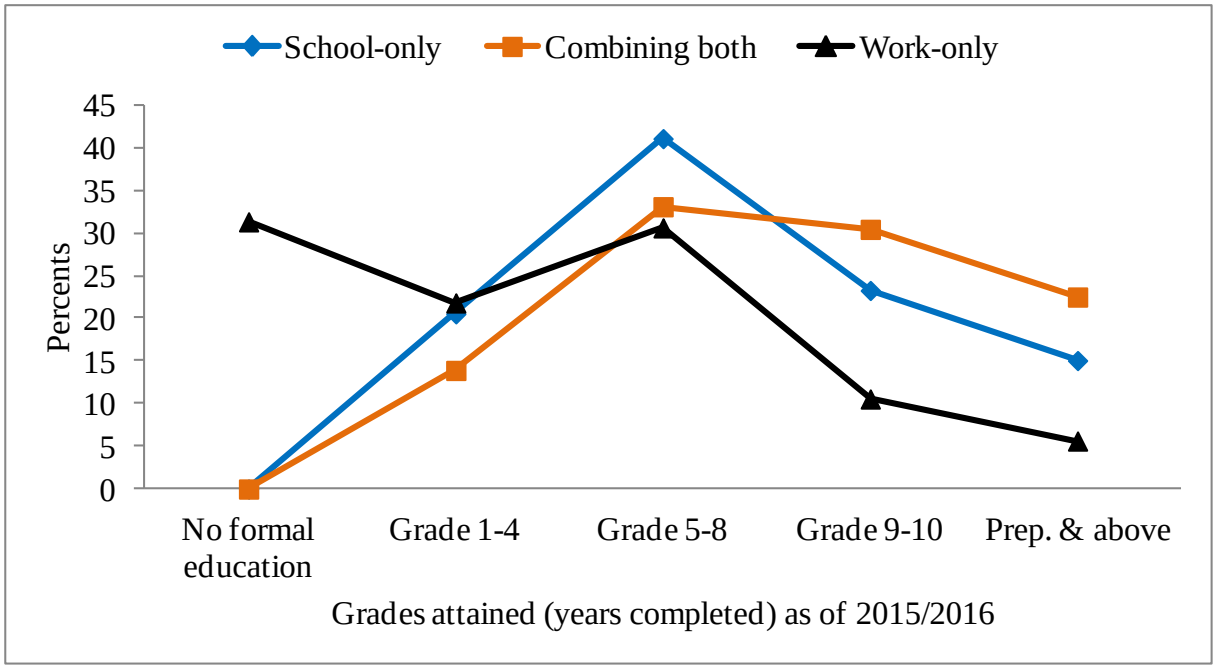


Figure 13. Education attainment of targets based on childhood work-school combinations

It has been also noted that while many of school-only children concentrate within second-cycle primary schools, relatively many of those who combined work and study are relatively more likely to progress to higher levels compared to others. More specifically, multitasking

children are two times more likely to reach higher levels of education than the average, four times more than full-time childhood workers, and five percentage points above the school-only children. However, it is also noted that only about 10 percent of children (about 20 percent among multitasking, 15 percent among school-only, and 5 percent among work-only children) are able to advance to higher education levels after 16 years.

#### 3.5.5.2 Childhood work and completion of key schooling milestones

Unlike the preceding discussion, here the focus is on children's long-term achievement of specific and key educational milestones such as enrollment into formal education and the attainment of four years of schooling (first-cycle) and eight years of schooling (full primary). Hence, the study reflects on some critical human capital policy questions: Could full-time childhood workers be enrolled and attain some level of schooling as they grow up? Would combining work and study impede long-term schooling progression? Would school-only children have a better leg-up in their long-term human capital formation? The answers to these questions would partly justify child education policies and child labor regulations. Table 12 presents the long-term key educational indicators based on childhood working conditions, accompanied by a mean test of progression from first-to second-cycle education.

Table 12. Completion of key education levels by childhood work when adults

| School and work combinations | Average grade (years), mean(sd) | Education completion (2015/16) | | Mean test |
|---|---|---|---|---|
| | | First-cycle | Primary school | |
| Inactive | 5.3(3.7) | 59.03 | 20.14 | 7.33*** |
| School-only | 7.4(3.7) | 79.45 | 38.36 | 5.52*** |
| Combined both | 8.4(3.7) | 86.09 | 52.98 | 6.68*** |
| Work-only | 4.3(3.9) | 46.83 | 16.20 | 8.01*** |

Note: *Significance levels: *P<0.10, **P<0.05, ***P<0.01; values in the parentheses are standard deviations*.

From the outset, we can see that regardless of childhood work conditions, progressions from the first-cycle to the second-cycle primary school levels are generally significantly lower, although slightly more than half of the multitasking children managed to do so. Looking at the data based on childhood work and school combinations, the results show that while those who combined work and study are more likely to complete both first and second-cycle primary education, work-only children continued to lag behind their peers. Multitasking children had twice as many years of schooling as work-only peers. On the other hand, the

latter, who were also out of school, managed to attain, on average, four years of schooling, although they are relatively fewer compared to others who have achieved these school levels.

To sum up, in addition to child-related factors such as child gender and birth order, childhood working conditions may have persistent and profound effects on long-term human capital accumulation. Moreover, although the evidence is mixed, it has been noted that while children from the richest parents tend to be enrolled and attain more years of schooling later in life, progression to higher education seems to be related weakly to parental wealth status. Long-term education progression, such as completing primary school, on the other hand, substantially varies by childhood work and school combinations.

### 3.5.6 Econometric results and discussion

#### 3.5.6.1 Childhood work and attainment of key education outcomes

Tables 13-15 present probit regression estimations for the associations between childhood work (the age at which the child started participating in various work activities, the number of hours the child worked in the previous seven days, and how the child used to combine work with study) and the attainment of key educational milestones as of 2015/2016. The study examines enrollment in formal education and the completion of four- and eight-year schooling. However, long-term enrollment is analyzed only with respect to the age at which the child started working and the number of hours worked in the previous seven days, as the school-only and multitasking children based on combinations of work and study are enrolled during childhood. In all models, robust standard errors are generated, and standard errors are clustered at baseline household level, which relaxes the independence assumption to account for common household-level effects on siblings' school progression. Moreover, a regression error specification test (RESET) is also conducted and the area under the receiver operating characteristic (ROC) curve is computed, using measure of sensitivity against specificity. The test results suggest that the functional form assumed here (normal error term distribution under a linearity assumption) is appropriate and that the models have excellent discrimination ability (i.e. the ability to identify those children who attained the respective key education outcomes as opposed to those who did not do so) (Mandrekar, 2010).

The results presented in Table 13 show that by controlling for child, household, head of the household, and village-specific variables, the number of hours worked and long-term enrollment have significant non-linear associations. The results, indicated by average

marginal effects (AMEs)[1], i.e. "partial effects for each observation using the actual value of their regressors and […] averaged across the sample values" (Jones et al., 2013, p. 255), indicate that by holding other variables at their observed values, an extra hour of work, up to some cut-off level, is associated with a reduction in the expected probability of enrollment in formal education by about 0.5 percent ($P<0.01$). However, we do not find a statistically significant association between the child's work-entry age and their long-term educational enrollment.

The association between hours worked and long-term enrollment implies that children who worked long hours during childhood were more likely to be left out of school. However, although it is contrary to a prior expectation, after a cut-off level, hours worked are associated with a higher probability of enrollment, albeit to a minimal extent. This, however, reaffirms partly the descriptive results presented using Table 11. Perhaps those children who worked above the cut-off level might have used the income to support their schooling in the long term. However, while there is almost no variation in the distribution of children among categories of hours worked based on household wealth (Figure 14), children who worked longer hours tended to be full-time workers, allocating about 10 hours per week or more to work than the average, with a third of them never attending formal education until adulthood. Moving forward to Tables 14 and 15, the association between hours worked and long-term educational attainment is strong until grade four, but it diminishes and becomes insignificant in relation to the completion of eight years of schooling. The results suggest that hours worked during childhood may explain only long-term enrollment and progression within lower level of grades, while it seems to have little to do with further school progression.

On the contrary, a significant association is found between the age at which the child started working and the chances of completing eight years of schooling later in life. Keeping other variables at observed values, a year's delay in the work-entry age, after some age cut-off, is associated with a reduction in the expected probability of primary school completion by 1.2 percent (Table 15). In other words, while postponing the childhood work work-entry age positively but insignificantly associated with the chances of primary school completion, that is, unable to predict the odds of attaining eight years of schooling, those who were too late to start working were less likely to complete primary schooling. This also suggests that non-working children may not necessarily be schoolchildren; they could also be inactive.

[1] There are various views regarding whether the marginal effect at the mean (MEM), the marginal effect at representative values (MER), or the average marginal effect (AME) should be used for analysis. Following their discussion, and as argued by Long & Freese (2014), we opted to use the AME results.

Table 13. Probit regression on the associations between childhood work and long-term enrollment, coefficients and corresponding AME

| | (1a) | | (1b) | | (2a) | | (2b) | |
|---|---|---|---|---|---|---|---|---|
| | Coefficients | Std. Err. | AME | Std. Err. | Coefficients | Std. Err. | AME | Std. Err. |
| Hours worked | -0.0280*** | (0.0103) | -0.005*** | (0.0018) | | | | |
| Hours squared | 0.0004** | (0.0002) | 0.0001** | (0.0000) | | | | |
| Work entry age | | | | | 0.2202 | (0.2719) | 0.0413 | (0.0508) |
| Age squared | | | | | -0.0188 | (0.0180) | -0.0035 | (0.0034) |
| Constant | 27.2280*** | (5.7525) | | | 31.3518*** | (6.5556) | | |
| Observations | 636 | | 636 | | 461 | | 461 | |
| Post-estimation tests | | | | | | | | |
| *RESET test* | 0.650 | | | | 0.950 | | | |
| *lroc test* | 0.805 | | | | 0.808 | | | |

Table 14. Probit regression on the associations between childhood work and completing four-year schooling, coefficients and corresponding AME

| | (1a) | | (1b) | | (2a) | | (2b) | | (3a) | | (3b) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficients | Std. Err. | AME | Std. Err. | Coefficients | Std. Err. | AME | Std. Err. | Coefficients | Std. Err. | AME | Std. Err. |
| Hours worked | -0.021** | (0.010) | -0.005** | (0.002) | | | | | | | | |
| Hours squared | 0.000 | (0.000) | 0.000 | (0.000) | | | | | | | | |
| Work-school combinations♣ | | | | | | | | | | | | |
| Combining both | | | | | 0.155 | (0.275) | 0.029 | (0.053) | | | | |
| Work-only | | | | | -1.220*** | (0.239) | -0.318*** | (0.051) | | | | |
| Work entry age | | | | | | | | | -0.172 | (0.289) | -0.043 | (0.071) |
| Age squared | | | | | | | | | 0.006 | (0.019) | 0.001 | (0.005) |
| Constant | 26.620*** | (5.195) | | | 30.898*** | (6.119) | | | 30.523*** | (6.562) | | |
| Observations | 636 | | 636 | | 495 | | 495 | | 461 | | 461 | |
| Post-estimation tests | | | | | | | | | | | | |
| *RESET test* | 0.180 | | | | 0.115 | | | | 0.491 | | | |
| *lroc test* | 0.870 | | | | 0.876 | | | | 0.880 | | | |

Table 15. Probit regression on the associations between childhood work and completing eight-year schooling, coefficients and corresponding AME

| | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficients | Std. Err. | AME | Std. Err. | Coefficients | Std. Err. | AME | Std. Err. | Coefficients | Std. Err. | AME | Std. Err. |
| Hours worked | -0.004 | (0.010) | -0.001 | (0.003) | | | | | | | | |
| Hours squared | -0.000 | (0.000) | -0.000 | (0.000) | | | | | | | | |
| Work-school combinations♣ | | | | | | | | | | | | |
| Combining both | | | | | 0.206 | (0.230) | 0.069 | (0.077) | | | | |
| Work-only | | | | | -0.785*** | (0.213) | -0.223*** | (0.066) | | | | |
| Work entry age | | | | | | | | | 0.537 | (0.314) | 0.145 | (0.085) |
| Age squared | | | | | | | | | -0.044* | (0.024) | -0.012* | (0.006) |
| Constant | 30.084*** | (6.617) | | | 34.972*** | (7.419) | | | 30.192*** | (6.863) | | |
| Observations | 636 | | 636 | | 495 | | 495 | | 461 | | 461 | |
| Post-estimation tests | | | | | | | | | | | | |
| *RESET test* | 0.645 | | | | 0.292 | | | | 0.154 | | | |
| *lroc test* | 0.794 | | | | 0.816 | | | | 0.805 | | | |

*Note:* In the Tables 13-15 above:

- *Significance levels: *P<0.10, **P<0.05, ***P<0.01*
- *Work-school combinations♣ - comparison group is school-only children*
- *Average Marginal Effects (AME)*
- *The estimations have also included other control variables including sex of the child, age-adjusted grade attainment (except in enrollment model), age of the child (except where we estimated the age at which the child entered into labor market and having faced major shock before the age of 15 years), birth order, head characteristics (age, sex, perceptions on education quality, future farmland size and soil fertility, literacy status and health status). Household related factors (wealth quintiles, household size, the proportion of children in the household, participation in non-farm activities, previous out-migration or death of an adult from the household, transfers to the household, and changes in plot size in the last 5 years). Village-specific variables (distance from the nearest junior school and prone to drought.*

One of the concerns in the above analyses is whether household wealth affects differently childhood work status, and hence children's key education attainments later in life. To address this concern, the study examines the distribution of children on hours worked and the age at which they started working, grouped by household wealth status (Figure 14). Children are identically distributed on categorized hours worked and the age at which they started working regardless of household wealth status. This means that the effects of these childhood work indicators are less likely to be affected by variations in parent wealth status.

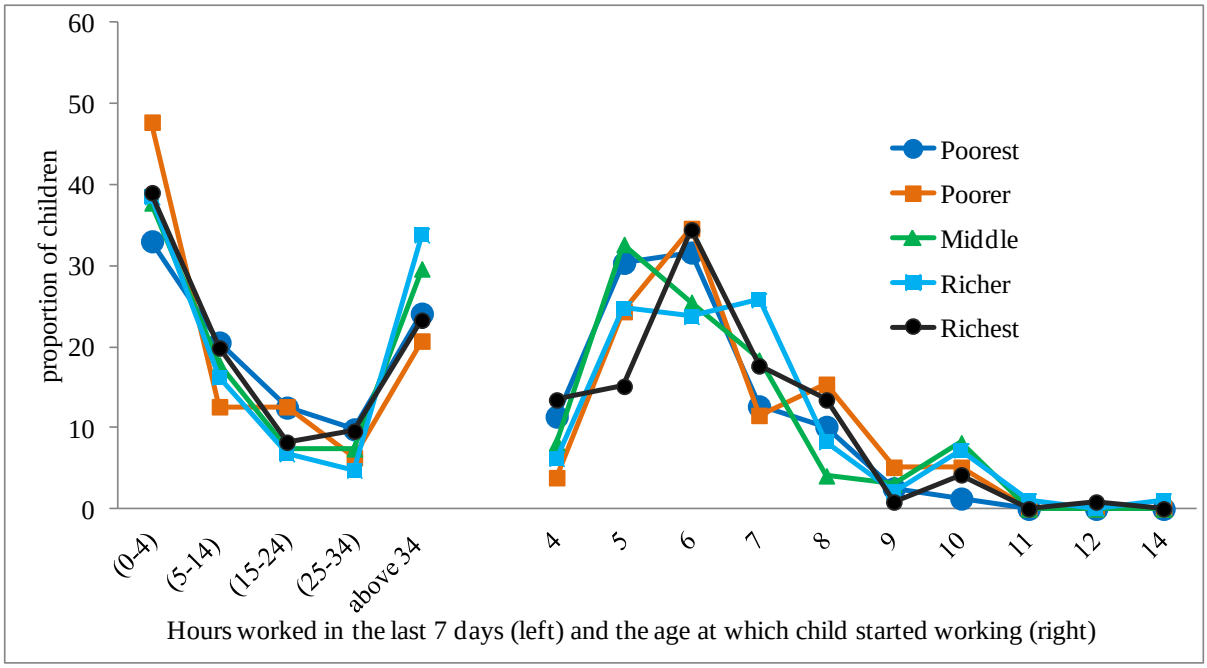


Figure 14. The distribution of children by hours worked (left) and based on the age at which the child started working (right) grouped by parental wealth status.

Consequently, household wealth seems to have a weak association with long-term school progression through observed variations in hours worked and work-entry age, which in other words also means that parent wealth associated weakly with school progression through these channels. While this finding signals that poverty is less likely to drive children excessively to work, in spite of potential differences in the types of childhood work by household wealth, this does not purge the potential role of wealth in the long-term educational outcomes through other channels.

In Tables 14 and 15, the study also presents results of the associations between childhood work and school combinations and the probability of completing four and eight years of formal education. Relative to school-only children, a comparison group, no

significant associations between combining work and study and completing both four and eight years of education later in life are observed, although multitasking children are slightly ahead of the comparison group in grade attainment. On the contrary, work-only children have about 32 and 22 percent lower prospects of completing four and eight years of formal education, respectively, compared to school-only children, keeping all other controls at their observed values. The study notes that the gap between working and schoolchildren fades away as children progress into higher education, which also corroborates the previous descriptive results. Generally, the preceding discussion indicates that various aspects of childhood work could be used to predict completion of key educational milestones by children in the long term. Moreover, childhood conditions exhibit different associations with long-term human capital formation.

#### 3.5.6.2 The effects of childhood work on long-term education progression

In the previous subsection, the study estimated long-term education (adulthood) as a binary outcome and used childhood conditions, as well as household and village-specific controls, as predictors. In this subsection, the study considers education progression between the baseline and the follow-up periods and estimates panel model regressions. The outcome variable includes the number of completed years of schooling at level value and grouped based on school-cycles (phases): No formal education (zero years), first-cycle primary (one through four years), second-cycle primary (five through eight years), secondary (9-10 years), and preparatory and above (11 years and above) education. Given time-invariant participation variables, the study estimates a random-effects Poisson model for the count part (number of completed years of education) as the main analytical strategy, and random-effects ordered logit (REOL) is used to analyze the school-cycle transitions and provide additional evidence. The study presents results for the pooled sample (Table 16), grouped by child gender (Table 17) and type of childhood work (Table 18 and 19). All the models were correctly specified and the discussions will be based on the incidence-rate ratios (IRR) and odds ratios (OR). Moreover, to deal with model misspecifications, and to account for potential error term correlation between siblings at the household level, the study presents robust standard errors clustered at the baseline household level. Additionally, the likelihood ratio tests for all models show that we have significant variability between children, which favors the random effects ordered logistic regression over a standard ordered logistic regression.

Table 16 presents random effects (Poisson and ordered logit) model results on the long-term effects of childhood work on grade attainment and transitions between school-cycles for the pooled sample. The estimates illustrate whether grade attainment differentials between children, observed after 16 years, are due to their childhood work conditions, controlling for other child-related, head and household socioeconomic contexts, and village-related covariates. Focusing on the first childhood work measure, it is showed that while the age at which the child started work has insignificant effects on the number of years child is likely to complete in the long term (Model 1), the REOL results show non-linear and significant effects on the odds of transiting to higher school-cycles (Model 2). In this regard, a year's increase (delay) in the age at which the child started work leads to 1.523 times more odds of being observed at higher school cycles, holding all other variables constant. Nevertheless, the effect decays and turns negative after 6.8 years of age. That is, any further delays in starting work after this age lead to lower odds of school-level transition, say from first-cycle or lower primary to second-cycle or upper primary school-levels (phases). The results suggest that keeping all other controls constant, early entry into childhood work does not necessarily work against long-term education progression; instead, work-inactivity at school entrance age could be a sign of long-term falling behind in human capital formation, and so, perhaps, working children could also be active in schooling. This finding seems to run against a common understanding that early participation (say below the age of 14) in work is harmful to children's health, education, and physical and psychological development. However, this kind of assumption, in addition to its short-term perspective, does not factor in schooling conditions alongside other covariates. In this study setting, however, children who are not active in work by school entrance age would likely lag behind in their long-term schooling progression, too. It also challenges the view that the two elements are mutually exclusive, and that we cannot attain universal primary education as long as child labor exists.

Likewise, while the study does not find significant effects of hours worked on the incidence rate, i.e. expected years of formal education (Model 3), an increase in hours worked is associated with lower odds of transiting to a higher school-cycle (Model 4) from the baseline (childhood) status. Keeping all other predictors at their mean, children who worked one more hour per week had a 1.4 percent lower probability of progressing to a higher school phases from what is observed at the baseline. The result partly reaffirms our earlier assertion that the number of hours worked is inversely related to long-term enrollment, though it has a negligible effects on completion of either four or eight years of formal education.

Table 16. Random-effects results on the long-term effects of childhood work on grade attainment and school-cycle transitions

| | *Model 1 (Poisson)* | | *Model 2 (REOL)* | | *Model 3(Poisson)* | | *Model 4 (REOL)* | | *Model 5(Poisson)* | | *Model 6 (REOL)* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | grade attained | | School transition | | grade attained | | School transition | | grade attained | | School transition | |
| Covariates | *IRR* | *Std. Err.* | *OR* | *Std. Err.* | *IRR* | *Std. Err.* | *OR* | *Std. Err.* | *IRR* | *Std. Err.* | *OR* | *Std. Err.* |
| Work-starting age | 1.179 | 0.325 | 1.523* | 0.350 | | | | | | | | |
| Age squared | 0.991 | 0.019 | 0.970* | 0.0165 | | | | | | | | |
| Hours worked | | | | | 0.991 | 0.014 | 0.986* | 0.008 | | | | |
| Hours squared | | | | | 1.000 | 0.000 | 1.000 | 0.0001 | | | | |
| Work-school combinations[1] | | | | | | | | | | | | |
| Combining both | | | | | | | | | 0.985 | 0.313 | 0.994 | 0.154 |
| Work-only | | | | | | | | | 0.473*** | 0.136 | 0.187*** | 0.0285 |
| Child is male | 1.484 | 0.396 | 1.777*** | 0.226 | 1.465* | 0.301 | 1.665*** | 0.174 | 1.396* | 0.278 | 1.620*** | 0.181 |
| Birth order[2] | | | | | | | | | | | | |
| 2nd eldest | 1.054 | 0.412 | 0.900 | 0.126 | 0.888 | 0.252 | 0.754** | 0.0871 | 0.953 | 0.265 | 0.823 | 0.103 |
| Youngest | 0.933 | 0.371 | 0.695** | 0.126 | 0.776 | 0.209 | 0.557*** | 0.0918 | 0.936 | 0.251 | 0.819 | 0.141 |
| Wealth quintiles[3] | | | | | | | | | | | | |
| Poorer | 0.902 | 0.131 | 1.104 | 0.251 | 0.925 | 0.091 | 1.009 | 0.207 | 0.859 | 0.099 | 0.904 | 0.187 |
| Middle | 1.563*** | 0.215 | 2.547*** | 0.577 | 1.237** | 0.113 | 1.607** | 0.351 | 1.300** | 0.15 | 1.707** | 0.386 |
| Richer | 1.321* | 0.198 | 2.374*** | 0.596 | 1.13 | 0.115 | 1.481 | 0.362 | 1.045 | 0.144 | 1.385 | 0.333 |
| Richest | 1.752*** | 0.253 | 3.256*** | 0.818 | 1.439*** | 0.149 | 2.058*** | 0.515 | 1.207 | 0.162 | 1.604** | 0.386 |
| Head is male | 0.993 | 0.112 | 0.965 | 0.193 | 0.986 | 0.08 | 0.957 | 0.156 | 0.963 | 0.087 | 0.859 | 0.144 |
| Age of the head | 0.994* | 0.003 | 0.990* | 0.0060 | 0.999 | 0.003 | 0.996 | 0.0060 | 1.003 | 0.004 | 1.002 | 0.0058 |
| Changes in HH size | 0.984 | 0.015 | 0.942* | 0.0330 | 1.003 | 0.016 | 0.969 | 0.0315 | 1.004 | 0.017 | 0.974 | 0.0291 |
| Prop. of children | 0.801 | 0.364 | 0.734 | 0.388 | 0.789 | 0.27 | 1.042 | 0.471 | 0.675 | 0.266 | 0.721 | 0.373 |
| Off-farm work | 0.892 | 0.087 | 0.905 | 0.156 | 0.860** | 0.059 | 0.842 | 0.138 | 0.819** | 0.076 | 0.824 | 0.129 |
| Adult left the HH | 0.963 | 0.088 | 0.955 | 0.152 | 0.904* | 0.055 | 0.921 | 0.126 | 0.899 | 0.063 | 0.867 | 0.113 |
| Land expectation | 1.14 | 0.099 | 1.028 | 0.152 | 1.256*** | 0.083 | 1.237 | 0.175 | 1.279*** | 0.118 | 1.294* | 0.201 |
| Soil fertility | 0.831** | 0.063 | 0.743* | 0.114 | 0.801*** | 0.047 | 0.739** | 0.103 | 0.927 | 0.069 | 0.879 | 0.124 |

*Table 16. Continued.*

| | *Model 1 (Poisson)* | | *Model 2 (REOL)* | | *Model 3(Poisson)* | | *Model 4 (REOL)* | | *Model 5(Poisson)* | | *Model 6 (REOL)* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | grade attained | | School transition | | grade attained | | School transition | | grade attained | | School transition | |
| Covariates | *IRR* | *Std. Err.* | *OR* | *Std. Err.* | *IRR* | *Std. Err.* | *OR* | *Std. Err.* | *IRR* | *Std. Err.* | *OR* | *Std. Err.* |
| Head is literate | 1.226*** | 0.094 | 1.267 | 0.186 | 1.194*** | 0.061 | 1.221 | 0.168 | 1.109 | 0.075 | 1.103 | 0.153 |
| Education quality | 1.222** | 0.107 | 1.489** | 0.231 | 1.258*** | 0.08 | 1.453*** | 0.201 | 1.147 | 0.096 | 1.119 | 0.163 |
| Ethnicity[4] | | | | | | | | | | | | |
| Argoba | 0.698 | 0.243 | 0.535 | 0.279 | 0.473*** | 0.122 | 0.387*** | 0.134 | 0.413*** | 0.116 | 0.274*** | 0.111 |
| Gedeo | 0.847 | 0.094 | 0.848 | 0.175 | 0.672*** | 0.064 | 0.637** | 0.137 | 0.707*** | 0.082 | 0.773 | 0.151 |
| Oromo | 0.043*** | 0.016 | 0.017*** | 0.0114 | 0.073*** | 0.023 | 0.0384*** | 0.0212 | 0.082*** | 0.024 | 0.0914*** | 0.0543 |
| Village distance | 0.564*** | 0.035 | 0.476*** | 0.0600 | 0.645*** | 0.036 | 0.579*** | 0.0564 | 0.639*** | 0.032 | 0.644*** | 0.07 |
| Drought proneness | 6.072*** | 1.417 | 12.87*** | 5.604 | 3.846*** | 0.679 | 6.519*** | 2.475 | 3.332*** | 0.641 | 4.208*** | 1.724 |
| Shock before age 15 | 0.703 | 0.283 | 0.708** | 0.118 | 0.733 | 0.192 | 0.87 | 0.153 | 0.739 | 0.211 | 0.787 | 0.136 |
| Head health | 0.923 | 0.102 | 0.910 | 0.194 | 0.861* | 0.072 | 0.693*** | 0.0917 | 0.801** | 0.08 | 0.703** | 0.0984 |
| Migration status | 4.155*** | 0.864 | 5.915*** | 1.139 | 4.347*** | 0.881 | 6.230*** | 1.061 | 3.871*** | 0.723 | 6.776*** | 1.259 |
| Transfers to the HH | 1.042 | 0.203 | 1.086 | 0.351 | 0.995 | 0.149 | 0.956 | 0.256 | 1.171 | 0.183 | 1.149 | 0.293 |
| Child age cohort[5] | | | | | | | | | | | | |
| 9-11-year-old | | | | | 0.918 | 0.244 | 1.031 | 0.126 | 0.758 | 0.192 | 0.676*** | 0.0876 |
| 12-14-year-old | | | | | 0.721 | 0.185 | 0.706** | 0.12 | 0.578** | 0.141 | 0.477*** | 0.0759 |
| Constant | 387.801*** | 429.932 | - | | 301.03*** | 201.44 | - | | 389.56*** | 257.904 | - | |
| LR test, α=0, F-test | 508.75*** | | | | 609.24*** | | | | 343.28*** | | | |
| Cut 1 | | | -6.108*** | 1.455 | | | -6.017*** | 1.104 | | | -5.879*** | 1.177 |
| Cut 2 | | | -4.732*** | 1.456 | | | -4.795*** | 1.098 | | | -4.335*** | 1.177 |
| Cut 3 | | | -3.557** | 1.457 | | | -3.560*** | 1.099 | | | -3.107*** | 1.179 |
| Cut 4 | | | -2.432* | 1.460 | | | -2.423** | 1.103 | | | -1.939 | 1.179 |
| Observations | 456 | | 456 | | 632 | | 632 | | 493 | | 493 | |
| RESET test | 0.4298 | | 0.1608 | | 0.4110 | | 0.2957 | | 0.3048 | | 0.3677 | |

*Robust standard errors clustered at the households level, panel fixed effects; Significance levels: *P<0.10, **P<0.05, ***P<0.01.*
*Comparison groups: [1]School-only children; [2]First born child; [3]Children from the poorest households; [4]Amhara; [5]4-8 years old sibling.*

The last childhood work indicator involves combinations of childhood work and schooling. The results presented in Models 5 and 6 in Table 16 suggest that by controlling for other variables at their observed values, compared to schooling-only, full-time work is associated with a lower attainment incidence ratio in the long term. This means that, by adjusting for all variables included in the model, work-only children during childhood are expected to attain 0.527 times fewer years of schooling than school-only children, when observed after 16 years. It also suggests that the odds of being observed at the higher school-cycle than the baseline level for work-only children is 0.187 times lower relative to school-only peers, keeping all other variables constant. Putting it differently, the odds of remaining at lower school-cycles are 5.3 times greater for work-only children than schooling-only children in the long term, assuming all other factors unchanged. On another note, although combining work and school is associated with positive odds of schooling transition between successive school-cycles, the differences are insignificant; that is, both school-only and multitasking children are expected to progress equally in the long term. This also implies that childhood work and schooling could be complementarities.

Tables 17-19 present disaggregated estimations based on child gender and the types of childhood work. In Table 17, it is indicated that the odds of long-term schooling transition among girls is affected by the age at which they started working, the number of hours worked, and whether or not they were full-time workers. On the other hand, boys' long-term transition in terms of school-cycles is significantly impeded by exclusive childhood work, but other aspects of childhood work in this regard are likely to exert minimal effects. The estimates indicate that, controlling for other variables at their values, delaying the age at which girls start working until they turn six could double the odds of their transition to higher school-cycles from what has been observed at the baseline. Then again, keeping all variables constant, work-only girls and boys are expected to attain 0.345 and 0.614 times fewer years of schooling, respectively, than school-only peers over the same period of time.

The results also reveal that the odds of being observed at a higher school-cycle among working-only girls and boys are 0.10 and 0.273 times lower than their respective school-only peers, keeping all other variables constant. In other words, in the long term, work-only girls and boys have about ten and three times more risks, respectively, of being observed at lower school-cycles than their school-only peers. These results also point to considerable gender differentials regarding the long-term effects of childhood work on school progression, in that the effects of full-time work could be more pronounced among girls than boys.

Table 17. Random effects Poisson regression model on the effects of childhood work on long-term grade attainment by child gender

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | grade attained | | Schooling transition | | grade attained | | Schooling transition | | grade attained | | Schooling transition | |
| | IRR | Std. Err. | OR | Std. Err. | IRR | Std. Err. | OR | Std. Err. | IRR | Std. Err. | OR | Std. Err. |
| **Females** | | | | | | | | | | | | |
| Work-starting age | 1.559 | (1.176) | 2.265** | (0.881) | | | | | | | | |
| Age squared | 0.968 | (0.052) | 0.934** | (0.028) | | | | | | | | |
| Hours worked | | | | | 0.987 | (0.027) | 0.972** | (0.012) | | | | |
| Hours squared | | | | | 1.000 | (0.000) | 1.000 | (0.000) | | | | |
| Work-school combinations | | | | | | | | | | | | |
| Combining both | | | | | | | | | 0.907 | (0.523) | 0.845 | (0.203) |
| Work-only | | | | | | | | | 0.345** | (0.170) | 0.100*** | (0.027) |
| Constant | 445.3** | (1317.2) | | | 1929.5*** | (2935.6) | | | 472.1*** | (844.1) | | |
| LR test, α=0, F | 350.55*** | | | | 385.45*** | | | | 233.95*** | | | |
| Observation | 216 | | 216 | | 301 | | 301 | | 230 | | 230 | |
| **Males** | | | | | | | | | | | | |
| Work-starting age | 0.994 | (0.165) | 1.180 | (0.346) | | | | | | | | |
| Age squared | 1.002 | (0.012) | 0.989 | (0.020) | | | | | | | | |
| Hours worked | | | | | 0.991 | (0.007) | 0.989 | (0.009) | | | | |
| Hours squared | | | | | 1.000 | (0.000) | 1.000 | (0.000) | | | | |
| Work-school combinations | | | | | | | | | | | | |
| Work and school | | | | | | | | | 0.996 | (0.143) | 0.984 | (0.197) |
| Work-only | | | | | | | | | 0.614*** | (0.090) | 0.273*** | (0.056) |
| Constant | 296.3*** | (309.4) | | | 97.78*** | (74.7) | | | 138.7*** | (93.62) | | |
| LR test, α=0, F | 101.43*** | | | | 144.64*** | | | | 61.23*** | | | |
| Observation | 240 | | 240 | | 331 | | 331 | | 263 | | 263 | |

*Note: Robust standard errors clustered at the household level, panel fixed effects; Significance levels: *P<0.10, **P<0.05, ***P<0.01. The models controlled all child-related variables, household and head related variable and village-specific factors used in Table 16.*

The results reported in Table 18 and 19 suggest that those who combined domestic chores and farming activities with schooling expected to attain about 2.787 and 1.550 times more years of schooling later in life, respectively, compared to work-only children, keeping other variables constant. However, the study does not find significant effects of the age at which children started working and the hours worked when activities are disaggregated by type.

Table 18. Random effects Poisson regression model on the effects of childhood work on long-term grade attainment among chores participants

| | IRR | Std. Err. | IRR | Std. Err. | IRR | Std. Err. |
|---|---|---|---|---|---|---|
| Work-starting age | 1.449 | (0.544) | | | | |
| Work-starting age square | 0.974 | (0.025) | | | | |
| Hours worked | | | 0.988 | (0.016) | | |
| Hours worked square | | | 1.000 | (0.000) | | |
| Combining both w.r.t. | | | | | | |
| Work-only | | | | | 2.787*** | (1.040) |
| Constant | 531.9*** | (829.5) | 512.2*** | (573.1) | 265.8*** | (274.4) |
| LR test, α=0, F | 401.33*** | | 449.82*** | | 250.16*** | |
| Observation | 319 | | 372 | | 293 | |

*Note: Robust standard errors clustered at the baseline household level, panel fixed effects*
*Significance levels: *P<0.10, **P<0.05, ***P<0.01. The models controlled all variables included in Table 16.*

Table 19. Random effects Poisson regression model on the effects of childhood work on long-term grade attainment among farming participants

| | IRR | Std. Err. | IRR | Std. Err. | IRR | Std. Err. |
|---|---|---|---|---|---|---|
| Work-starting age | 0.961 | (0.191) | | | | |
| Work-starting age square | 1.001 | (0.014) | | | | |
| Hours worked | | | 0.990 | (0.010) | | |
| Hours worked square | | | 1.000 | (0.000) | | |
| Combining both w.r.t. | | | | | | |
| Work-only | | | | | 1.550** | (0.302) |
| Constant | 859.72*** | (966.3) | 500.3*** | (474.1) | 725.7*** | (649.1) |
| LR test, α=0, F | 100.58*** | | 117.0*** | | 75.61*** | |
| Observations | 220 | | 253 | | 218 | |

*Note: Robust standard errors clustered at the baseline household level, panel fixed effects*
*Significance levels: *P<0.10, **P<0.05, ***P<0.01. The models controlled all variables included in Table 16.*

Some results are robust across several estimations. First, the long-term effects of the age at which children started working on the transition to a higher school-cycle for the pooled

sample could be driven by girls (Table 17). Yet, contrary to the standard age-based definition of child labor, the results show consistently that work-entry age to various childhood jobs, on average, could be detrimental to long-term transition between school cycles, but only before the age of seven. Second, hours worked in the previous seven days appear to have minimal effects on long-term grade attainment, but significantly impede transitions between school-cycles for girls. Third, it is also revealed that while multitasking children have progressed equally in their long-term human capital formation as much as their school-only peers, full-time childhood work could lead to significantly lower human capital formation and trap children at comparatively lower human capital level. Broadly speaking, we have substantial evidence that exclusive childhood work could be a strong long-term predictor of lower educational mobility among rural youth in Ethiopia, which, in turn, is a prescient signal for poor adult labor market outcomes and the high incidence of adulthood poverty.

***How do school-children progress compared to their work-only peers?***

The study examines this question by switching the reference group from school-only to work-only children and investigates how schoolchildren—school-only or combined with work—fare in their long-term human capital formation in light of work-only peers. The results, presented in Table 20, show that in spite of participating in various works, schoolchildren have progressed in schooling way ahead of work-only peers in the last 16 years.

Looking at the effects of combining childhood work with schooling on long-term education progression, we find similar effects for the whole sample and boys, which means that for the pooled sample, in general, and for boys, in particular, either exclusively schooling or multitasking are equally likely to improve the incidence ratio of long-term grade attainment. However, school-only girls are slightly better in grade attainment relative to multitasking peers. In contrast to these, several studies, although often from a short-term perspective or using cross-section data (Beegle et al., 2009, 2008; Gunnarsson et al., 2006; Khan & Lyon, 2015; Psacharopoulos, 1997; Ravallion & Wodon, 2000), conclude that child labor may impede human capital formation. Several factors may explain why childhood multitasking and schooling-only in this study could lead to higher grade attainment compared to full-time work. However, what matters most, even for the school-only children, is whether they are actually learning, which rightly sets the foundation for further progression. The effects of childhood work on school progression could also be affected by school systems (Orkin, 2013; Pankhurst et al., 2016) and the quality of education (World Bank, 2017).

Table 20. Random effects Poisson regression model on the differential effects of childhood work on long-term education progression among school-children by sex of the child

| | *Full sample* | | *Females* | | *Males* | |
|---|---|---|---|---|---|---|
| *grade attainment* | IRR | Std. Err. | IRR | Std. Err. | IRR | Std. Err. |
| Work-school combinations | | | | | | |
| School-only | 2.114*** | (0.606) | 2.900** | (1.431) | 1.628*** | (0.240) |
| Combining both | 2.081*** | (0.475) | 2.630** | (1.237) | 1.622*** | (0.223) |
| Constant | 184.3*** | (105.45) | 162.8*** | (312.70) | 85.21*** | (55.03) |
| *School-transition* | OR | Std. Err. | OR | Std. Err. | OR | Std. Err. |
| Work-school combinations | | | | | | |
| School-only | 5.355*** | (0.818) | 10.052*** | (2.739) | 3.670*** | (0.757) |
| Combining both | 5.323*** | (0.762) | 8.490*** | (2.010) | 3.610*** | (0.646) |
| Observations | 493 | | 230 | | 263 | |

*Note: Robust standard errors clustered at the baseline household level, panel fixed effects*
*Significance levels: *P<0.10, **P<0.05, ***P<0.01. The models also controlled all variables included in Table 16. The LR test, α=0, F-tests, from the previous models are directly applicable for these models too.*

The fact that school-only and multitasking children show similar progression could also mean that simply getting children to school and instructing them for long hours may not necessarily lead to learning (Cruz, Loureiro, & Sa, 2017) and result in different scales of long-term progression. It also seems that in the rural areas of developing countries, such as in this study settings, children learn entrepreneurial skills (Abebe & Kjorholt, 2009), responsibility, and disciplines (Fors, 2012), and make their schooling possible (Patrinos & Psacharopoulos, 1997) through working, which seems a form of cross-fertilization with schooling.

#### 3.5.6.3 Robustness check

The main results, presented in Table 16, are estimated based on several modeling and measurement assumptions. The sensitivity of these results due to the violation of one or more of the assumptions, and key variable relationships should be examined to ensure consistent and reliable estimates. The robustness of results is checked for the inclusion and exclusion of critical confounding factors, and the sensitivity of the random-effects ordered logistic model results for alternative quadrature approximation. As discussed below, the main results are robust to these tests, and it is believed that the main findings are reliable and valid under alternative modeling conditions.

***Including village fixed effects***

One of the major concerns in this chapter is whether the results are driven by village-level unobserved effects, due to the unique nature of each survey village in terms of agro-ecology, proximity to urban areas and different intensities of urban exposure, potential heterogeneity in the quality of education, and village-level changes occurring in the last 16 years. It was learned from series of focus group discussions with farmers' representatives in the villages that the communities on the whole experienced substantial changes after 1999/2000, mainly related to education. As a robustness check of estimates of these changes and any other unobserved village effects, the study includes village-level effects as a regressor in the base model. The results (Appendix 3) show that when the village-level fixed effect is included as a regressor, the main results remain equally significant, and the coefficients are almost identical. The model summaries including Wald statistics and the LR test results are also consistent. This shows that the estimates are robust for changes at the village levels.

***Checking the sensitivity of quadrature approximation***

The random-effects ordered logistic regression model uses a quadrature approach to calculate estimates. It is an approximation procedure using integration points, with the default employing 12 integration points. Thus, changing the default approximation to other integration points, and comparing the results, shows the accuracy of estimates and the sensitivity of the study results. As a rule of thumb, if the coefficients' relative difference (RD) between the fitted and the comparison estimates is no more than $10^{-4}$ (0.01%), then the quadrature approximation used (default integration points) does not significantly affect the study results, thereby indicating that the estimates are insensitive to quadrature approximation change and stand for interpretation. On the other hand, any changes to the RD by more than $10^{-2}$ (1%) in the estimates cast doubt, and we therefore have to increase the integration points or switch to adaptive quadrature or a different random-effects model whose likelihood is not approximated through quadrature approximation.

Accordingly, the study fitted the main results generated by using the random-effects ordered logistic model, and checked the stability of the estimates. The test refits the base models for eight and 16 integration points and then compares the different solutions. The results show significantly lower relative differences (RDs), with the highest RD being 3.27E-07, or (0.0000003266), associated with the variable 'proportion of children in households'. The test once again ensures the stability of the estimates and the robustness of model results.

Therefore, the study provides strong grounds to believe that the results can be interpreted confidently, and reliable inference can be made accordingly.

#### 3.5.6.4 Novelty and caveats of the study

One of the main novelties of this study is that we conducted a follow-up survey of children after 16 years and successfully tracked about 83 percent of them, thus leading to a unique dataset to address key development policy questions, which otherwise would not have been possible. The study uses this opportunity to address the most important issue, the long-term effects of childhood work on human capital formation. The other strength of the study rests on the detailed village-level qualitative narratives showing changes at the community level for over 20 years (1994-2015/2016). The study is a relevant piece of work that follows individuals and sets the foundation for further studies that will examine the long-term stability of the main results and conduct intergenerational analyses.

The study also has some caveats, one of which emanates from the random-effects model assumption. While the fixed-effects model assumes that unobserved individual effects are correlated in some way with right-hand side variables, the random-effects model, on the contrary, assumes that unobserved effects are random, and do not contain elements that are correlated with the regressors. However, whereas we could estimate the model with time-constant regressors, using the random-effects model, this quality does not exist in the fixed-effects model, and so constant regressors are omitted in the fixed-effects model. Therefore, since childhood work is time-invariant, by definition, we cannot use the fixed-effects model to generate causal effects. Nonetheless, the study uses the advantage of the random-effects model to make inferences beyond the sample.

In addition, the study has inadequate information regarding the changes that happened during the 16 years period between the baseline and follow-up surveys, but had we had the opportunity to conduct mid-period individual level surveys, inferences would have been even better and stronger. Nonetheless, the study tried to collect retrospective information related to health and non-health-related shocks and migration experiences, among others.

## 3.6 Conclusions

The main objective in this chapter is to examine the long-term effects of childhood work on human capital formation in rural Ethiopia. The results show that full-time childhood workers attained significantly lower human capital when adults compared to schoolchildren.

Moreover, contrary to the assumption that child labor and schooling are mutually exclusive, while children who combined work and study have completed, on average, more years of schooling than any of their peers, the difference in relation to school-only counterparts was insignificant. In addition, the study also finds that the age at which the child started working non-linearly affects the long-term transition to higher schooling-cycles. Furthermore, early starting (before the age of seven) of work may impede the transition between school-cycles, and any further delays are associated with lagging in long-term human capital formation. More importantly, these results are heterogeneous by gender and childhood work type.

One of the key implications of the study is that the chances of achieving education development goals, backing the national economy with high-skilled labor, and accelerating structural transformation relay on children enrolled into school also complete key education milestones. However, while eliminating exclusive child labor seems categorically to be a pre-condition to achieving these objectives, no convincing evidence emerged to support a complete ban on child labor to achieve similar objectives. The study also finds no evidence that children who combined work, albeit excluding all the worst forms of child labor such as child trafficking, debt bondage, prostitution, and others, with schooling are left behind in long-term human capital formation; instead, the findings imply the reverse. In other words, a balanced work regime may boost long-term school progression, provided that children also enroll in schools at the right age. The fact that school-only children do not progress further than the rest may signal either the long-term advantages of skills cross-fertilizing between the skills obtained from working with schooling among multitasking children, or poor education quality. Finally, it is needless to say that our actions on child labor and schooling will have vital consequences on future labor market outcomes for children and the structure of the economy, by affecting children's long-term human capital accumulation and occupational transition.

## 4. Effects of childhood work on long-term village out-migration decisions in rural Ethiopia

### 4.1 Introduction

The spatial and sectoral mobility of labor is an integral part of economic development and structural transformation processes. Labor migration can drive economic growth and help reduce poverty (de Brauw, 2015; de Brauw & Mueller, 2012; Deshingkar & Grimm, 2004) but it also contributes to urbanization (Hailemariam & Adugna 2011; Todaro 1997) with all its pros and cons for economic development. Ethiopia is no exception in this regard, since historically, either in organized or isolated instances, people have migrated both within and across regions in response to farmland shortages, production difficulties and environmental pressure, and low economic opportunities. Accordingly, most of the past internal migrations in the country have been from densely populated and areas where farmland is in short supply, often parts of the Ethiopian highlands, to places where farmland is plentiful, usually in the lowland areas (Ezra & Kiros, 2001; FDRE, 2003; Webb & von Braun, 1994).

A number of factors characterize recent internal labor migration in Ethiopia. Since 1991, the Ethiopian government has embarked on a series of economic and political reforms, culminating in momentous implications for rural labor out-migration. Among other policies, the government lifted systematic and regulatory restrictions on labor mobility which were imposed by the Dergue regime on the grounds of security (Bigsten et al., 2000), and liberalized road transport, trade, and rural labor markets (Abegaz, 1999). As a result, the mobility of labor across occupations and economic sectors during the early 1990s seemed to be induced mainly by economic and institutional reforms, new economic policies, and subsequent improvements in the performance of the economy. Accordingly, in 1994, about 14.1 percent of the population (6.91 million individuals) was classed as an internal migrant, which increased to about 16.6 percent (12.22 million) in 2007 (Kuffa, 2014). Yet, both the transitional government (TGE) in the early 1990s, and later rural development policy and strategies discouraged rural-to-urban migration on the grounds that it was a rather "unproductive" move (FDRE, 2003; TGE, 1993). Further controls were imposed on isolated rural-to-rural migration and large and unstructured resettlements, due to potential negative consequences for the environment, the possible incitement of inter-ethnic conflicts, and limited effects on food security (FDRE, 2003). Nonetheless, voluntary resettlement program is still considered as one of the more effective ways to realize national food security strategies (FDRE, 2003).

As part of its wider efforts to end poverty and accelerate sustainable development, the government also made tremendous changes in the education sector, decentralized the administration system, invested in infrastructure, and reformed service delivery. These and other changes might have had both short-term and long-term effects on children, with some effects being persistent and profound in their development. For instance, following the 1994/95 abolition of school fees, overall primary school enrollment in 1995/96 increased by about 23 percent (World Bank, 2009). In the following years, the country saw considerable growth in the net enrollment rate in primary schools, increasing from 27 percent in 1996/97 to 48.8 percent in 2000/01 (MoE, 2002). However, Ethiopia also has one of the highest rates of child labor. The 2001 Ethiopian child labor survey indicates that about 42.3 percent of 5-14-year-old children work both in productive and housekeeping activities (CSA, 2002). The current study was therefore motivated to unravel the effects of the prevalence of pervasive child labor in rural parts of the country on future migration decisions and patterns of children.

In this regard, despite the above changes, a limited quantity of labor has left the country's agriculture sector (World Bank, 2016a). Over more than two decades, despite the rural population growth rate due to high fertility, the employment share of agriculture has declined by about 5 percentage points, from 80 percent in 1990-1997 (IMF, 1999) to 75 percent in 2015/2016, and it is expected to be about 67.5 percent by 2019/2020 (National Planning Commission, 2016). This might be an important policy concern to realizing the structural transformation in the economy and attaining the middle-income status by 2025. As far as returns to migration are concerned, recent evidence shows that the migration of labor from farm to non-farm sectors led to improvements in the per capita income growth during 2005 and 2013 by about 25 percent (World Bank, 2016c), which indicates the enormous potential of migration for poverty reduction. Other studies have also found a substantial rise in consumption expenditure among migrants—about 110 percent compared to non-migrants (de Brauw et al., 2013). One can pose a policy question: "Why Ethiopia witnessed limited labor transferring from farm to non-farm sectors if migration has higher potential returns?"

Taking childhood work and education as alternative forms of parents' human capital investment in their children, the study identifies the causal effects of childhood work on long-term village out-migration decisions. Using a multi-valued treatment effects framework and a doubly robust estimation method to control observable factors, it finds that full-time childhood work compared to schooling-only, to a large extent, could reduce village out-migration decisions later in life. Similarly, using a childhood work index—a new approach in

the related literature—, it also finds that compared to non-working children, those with a high work index are more likely to stay in their villages when adults. The results also illustrate that childhood multitasking compared to full-time work is positively associated with economic village out-migration. It is, thus, argued that childhood work, when combined with schooling, in consonance with the human capital theory of migration (Sjaastad, 1962), may provide children with the opportunity to acquire transferable and marketable skills, and increase their tendency to out-migrate and work in non-farm economic activities when adults. However, contrary to the imperfect credit and risk markets argument of migration (Stark & Bloom, 1985; Stark & Taylor, 1991a), in which poorer families could be disproportionally affected, the study does not find an increasing proportion of children from the poorest households compared to those from more affluent ones in the aggregated migrant population.

This chapter is organized as follows. Below, it discusses the theoretical explanations linking childhood work and schooling decisions to long-term village out-migration decisions, which is proceeded by review of literature. Then, the study describes the data and presents the analytical model. This is followed by discussion on the results, potential mechanisms, and caveats of the study. The chapter concludes with main findings.

### 4.2 Theoretical and conceptual frameworks

The unlimited supplies of labor theory (Lewis, 1954) argues that the disequilibrium in a dual economy—higher urban wage rates and surplus rural labor—drives labor from rural to urban areas. However, this theory does not account unemployment risks, and it assumes individual migration decision-makers. The Harris-Todaro model (Harris & Todaro, 1970; Todaro, 1969) states that rural-to-urban migration decisions are made based on wage differential, and the decisions to migrate take the unemployment risk in urban areas in to account. According to this theory, laborers will migrate to urban areas despite the prevalence of high unemployment rates, as long as they expect higher returns net of migration costs and the unemployment risks. This means that wage differentials net of migration cost, unemployment risk, and discount future earnings collectively determine the decisions to migrate. The New Economics of Labor Migration (NELM) theory (Stark & Bloom, 1985; Stark & Levhari, 1982; Stark & Lucas, 1988; Stark & Taylor, 1991b) extends these theories in many ways. It argues that migration is a collective decision made by the household, not individuals alone. It also argues that migration serves as a strategy to reduce income risk and diversify sources of income, where credit and insurance markets are imperfect and inexistent. It is a risk-sharing strategy based on agreements (implicit) between the migrant (remitter) and the household. Although

NELM also considers the migration feedback effects through remittances, it does not give insights on how the reruns to migration, information about the labor market, and the 'valuable skills' in the urban labor markets could affect parent's investment decision in children anticipating the prospect of migration. The effects from labor markets through return migrants, for example, may change parents' expectations, perspectives, and life goals for their children. Figure 15 presents how the forward-looking child education and work decisions could be linked to the prospect or fear of migration.

The framework begins with the human capital formation decisions. The theoretical framework presented in Chapter Three explains how investments in early childhood human capital formation could affect the adulthood human capital accumulation. The dynamic human capital and skill formation frameworks by Cunha and Heckman (2007, 2009, 2010) and Heckman (2007; 2006) state that human capital investments in early life (childhood) are likely to have profound effects on adulthood outcomes. It is argued that "[t]he skills produced at one stage augment the capabilities attained at later stages," (Cunha & Heckman, 2007, p. 35), and "[…]capabilities are self-reinforcing and cross-fertilizing and […] the effects of investment persist" (Heckman, 2007, p. 13252). This means that the skills and the human capital attained during childhood may facilitate the adulthood human capital formation. As a result, investments in early human capital (working or schooling) can account for the emergence of socioeconomic differentials later in life, including adult human capital.

On the other hand, in an attempt to explain the link between adult human capital and migration decisions, the human capital theory of migration (Sjaastad, 1962) gives insights on how educated labor has a higher incentive to migrate to the urban areas, where skills are highly rewarded, than uneducated labor. This shows that investment in human capital is as important as the process of migration, and that rural-to-urban migration is likely to be easier for educated individuals. The theory also argues that migration is a strategy through which individuals use their skills to gain better returns, the decision being made after cost-benefit analysis and comparing future discounted and current earnings. This shows that migration is selective in terms of human capital: Skills, knowledge, and experiences. This view is also supported by Fields (1975) who also argues that better-educated migrants enjoy preferential treatment by employers than unskilled ones in the urban labor markets—urban 'murky sector'. That means higher rewards to human capital or preferential treatment in the urban sector may, in turn, encourage rural households to boost investment in human capital. Individuals may also respond in human capital formation to the prospect of migration. The

migration prospect theory (Czaika, 2015) assumes that individuals consider not only the present but also the future economic situations of origin and destination areas in their migration decisions.

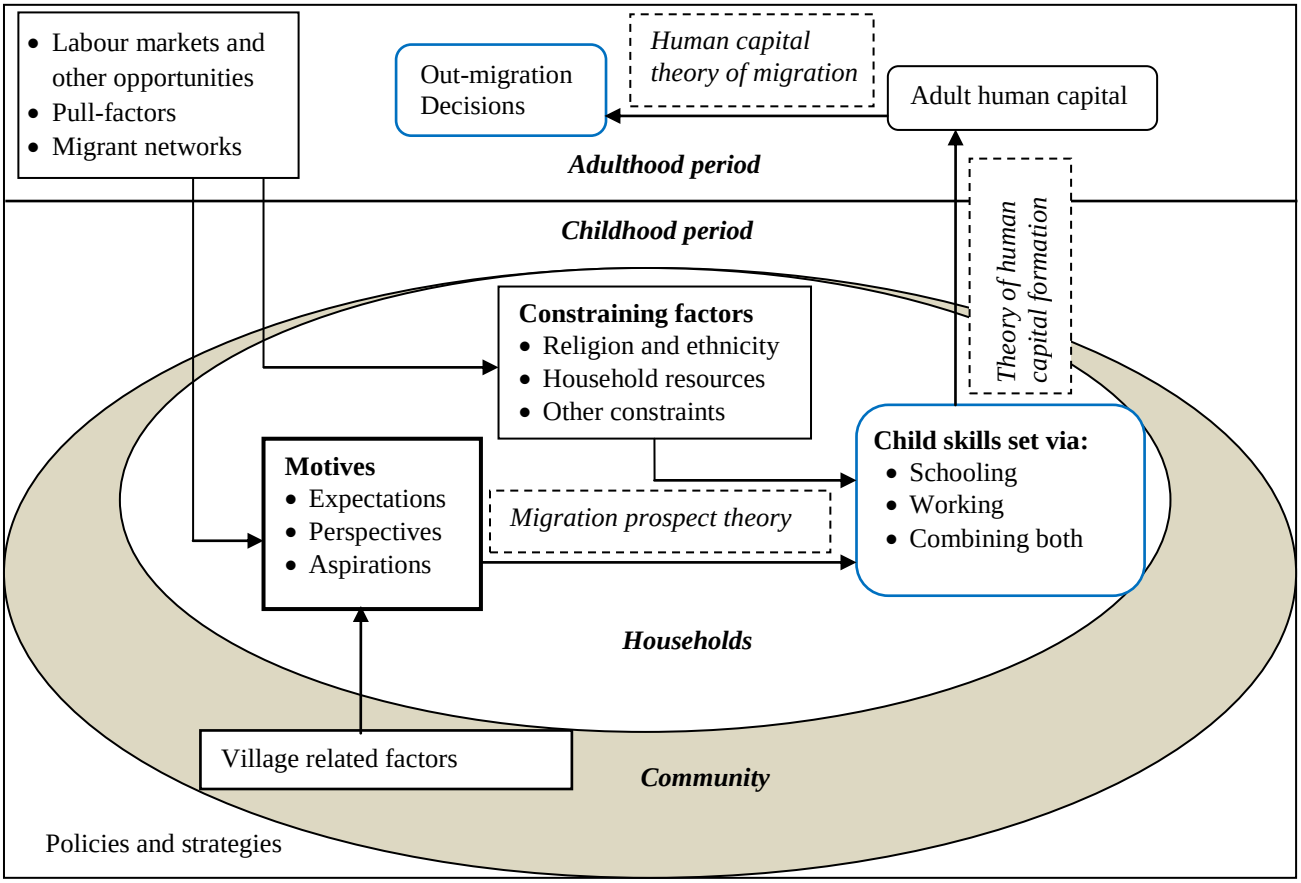


Figure 15. Childhood skills formation and long-term migration decisions, own conceptualization

A closely related concept but focusing on the feedback effects in the international migration context, the prospect of migration argument by Stark (2004) and Stark and Fan (2011) also indicates that higher reward to human capital in the destination areas may induce more adult human capital formation in the origin areas. This shows that the prospect migrant's human capital formation effort is highly reliant on the return to skills in the destination areas. In other words, the larger the wage differential or return between the destination and origin areas, the stronger the incentive to accumulate human capital. Further, Stark and Fan (2011) also indicate that a higher probability of migrating to the areas where the wage returns to schooling is higher may induce more schooling in the origin areas.

However, besides the prospect of migration theory is applied originally to explain the link between migration prospect and human capital formation in the origin country, it also assumes adult or matured decision makers who rationally calculate the returns to schooling

through migration and respond accordingly. However, what is empirically neglected and theoretically less explored path is the feedback effect of prospect migration on parent's decision regarding human capital investments in children. An original contribution to a scant literature and knowledge in the area, this chapter investigates if the prospect of migration (developed by parents through constant interaction with outside world and learned from return migrants and migrant networks) nudges the decisions on child human capital formation in rural Ethiopia. Thus, the main argument here is that when parents make childhood work and education decisions, they take into account the migration prospects of children when adults. An altruistic parent who cares for child's future develop perspectives, expectations, and aspirations for the child through information from labor markets, return migrants, and migrant networks, and accordingly chooses the 'right' child skill sets through full-time schooling, full-time working, or engaging the child in both activities. Therefore, it is argued that the migration prospect and the expected returns or fear of migration by the child when an adult may result in rural households to either keep the child in school or discourage schooling. This is highly applicable in rural Ethiopia where schooling is strongly associated with future civil service job in the urban areas. It is a widely prevalent view and long-lived societal attitude that an educated individual is expected to work as a civil servant, commonly called 'Brain work', often migrating to the urban areas. When a parent decides to enroll a child in school or at least during progression, the parent tends to consider the fear or prospect of migration by the child when an adult. For instance a World Bank social sector report shows that 87 percent of household heads believe that "[c]hildren who finish school usually want to leave the village and go to a town or city to find work" (World Bank, 1998, p. 83).

Village out-migration is not related only to childhood schooling. Parents may also follow how to raise a child and satisfy what is expected by the society. For instance, a girl to be 'a good' wife and to get 'a good' husband in the marriage market; she is expected to know how to cook, raise a child, respect elders, and others. As a result, some parents may decide to engage a gilr in domestic chores to equip her with these socially 'desirable' skills. A child grew in this way also tends to migrate often to other areas through marriage. In both ways, an altruistic parent is assumed to maximize the future wellbeing of the child and expected reruns which are constantly changing due to feedback effects from labor markets, village related factors, policies, and strategies. These may affect the parent's decisions on the human capital investment in the next child. Thus, depending on the information about migration and job opportunities in the urban labor markets along with non-farm job opportunities in the village, household resources, and other factors including religion and ethnicity together may affect the decisions to invest in children and the type of investment: child education or child labor.

### 4.3 Review of related empirical literature on Ethiopia

Previous empirical studies have reported various factors that could affect migration decisions and patterns in rural Ethiopia. Earlier studies indicate that population growth and insufficient access to food (Ezra & Kiros, 2001), population-to-resources imbalances (Hailemariam & Adugna, 2011), ecological degradation and drought (Berhanu & White 2000; Ezra & Kiros 2001; Mberu 2006), and state-led resettlement and 'villagization' programs in response to recurrent drought, famine and environmental degradation (Kassa, 2004; Kloos & Aynalem, 1989) have contributed to the migration of labor in rural Ethiopia at different times.

Recent studies also show that rural out-migration of labor can be explained by credit constraints and agricultural productivity (de Brauw, 2015), farmers' opportunistic behaviors due to emerging job opportunities in other areas (Hailemariam & Adugna 2011; Kassie & Aye 2017; Mberu 2006; Tadele et al. 2006), and overall destitution of households and poverty (Atnafu et al., 2014; Gebru & Beyene, 2012). Studies have also found that farmland scarcity or lower productivity (Bezu & Holden 2014; Morrissey 2008), the need to diversify livelihoods (Gebru & Beyene, 2012; Gibson & Gurmu, 2012; Tadele et al., 2006), sibling competition over limited household resources such as farmland (Gibson & Gurmu, 2012), and natural catastrophes, war and pestilence (Mberu, 2006) push labor away from rural areas.

Drought continues to be one of the main causes of migration of farm labor away from rural villages (Ezra & Kiros, 2001; Gray & Mueller, 2012; Morrissey, 2008; Murendo et al., 2011). For instance, Ezra and Kiros (2001) have found that rural out-migration from 1984 to 1994 in Ethiopia was higher from communities that were perceived to be more vulnerable to shocks. In line with the idea of migration as a risk-sharing strategy (Stark & Bloom, 1985; Stark & Taylor, 1991a), households in drought-prone areas also use migration to mitigate income risks (Gibson & Gurmu, 2012).

Other socioeconomic factors such as marriage (Ezra & Kiros, 2001; Hailemariam & Adugna, 2011), family dissolution, and religious activities may also lead to gender and age-differentiated migration. Through a tracking survey in rural Ethiopia, de Brauw and Mueller (2012) have found that between 2004 and 2009, while fewer than half of the migrants left various Ethiopian rural villages for employment purposes, marriage was generally the main reason. In addition to reasons for village out-migration, several factors, such as human capital level, may distinguish migrants from non-migrants. In relation to this notion, de Brauw (2015) and Blunch and Ledechi (2015) assert that better-educated individuals and those from wealthier households (de Brauw, 2015) were more likely to participate in rural-urban or

internal migration. Similarly, in a study conducted in Northern Ethiopia, Tegegne and Penker (2016) also indicate that while short-term migration could be the result of location advantages and food insufficiency, human capital endowment at the household level may drive long-term migration decisions. Although these studies assume homogeneity in the migrants' childhood conditions and analyze migration at the household level, their findings show the critical role of education in the internal migration process.

The debate also continues as to whether the current Ethiopian land tenure system triggers or inhibits rural labor out-migration in the country. Some studies have argued that the current farmland tenure system has discouraged landholders from participating in rural-to-urban migration, due to the fear of farmland confiscation by local government (de Brauw & Mueller, 2012; Rahmato, 2004; Teklu, 2003). On the other hand, Ezra and Kiros (2001) and Bezu and Holden (2014) indicate that Ethiopia's land tenure policy triggers the out-migration of rural labor, mainly the youths. However, a study by de Brauw and Mueller (2012) illustrates that improved farmland ownership may result in less out-migration of labor in rural Ethiopia. These conflicting and mixed results suggest that the empirical evidence is still too sparse to conclude that the current agricultural land tenure system is an obstacle to the spatial and occupational mobility of labor (World Bank, 2016a), although we cannot rule out its future effects on labor out-migration. The government also believes that the land tenure system does not impede labor mobility; instead, the availabilities of land and rainfall and economic returns guide farmers' migration decisions (FDRE, 2003). It stresses further that limited rural labor mobility could be explained by meager job opportunities in non-farming sectors, and not due to the land tenure system (FDRE, 2003).

However, no previous study has examined the effects of human capital investment in children and childhood labor market participation on long-term migration decisions in rural Ethiopia. As discussed using the theoretical and conceptual frameworks, individuals in the rural areas may also respond in human capital formation (own or in children) to the potential returns outside agriculture, mainly in the urban areas, through migration. The prospect of migration for children when adults may also affect the child human capital investment decisions by rural households. However, this feedback effect has remained unexplored. Thus, this study investigates the effects of childhood work and schooling participation on rural village out-migration decisions later in life. It uses a panel dataset constructed by tracking 4-14-yearl-old children studied in 1999/2000, as part of a longitudinal Ethiopian rural household survey, after 16 years in 2015/2016.

## 4.4 Methods of analyses

### 4.4.1 Sampling design and sources of data

Like the previous analytical chapters, this chapter also relies on the dataset explained in the introductory chapter. Unlike the other chapters, however, the analyses here depend on all but deceased children, leading to a sample size of 764 for issues such as migration decisions, though only 652 successfully re-surveyed children are considered for the extended issues such as reasons for migration and migration destination.

While the baseline households were re-surveyed with non-migrant and continuing member children, tracking forms were completed for migrant children, in order to locate their current addresses and to administer the survey. We filled out the forms with the assistance of remaining household members, neighbors, friends, and village chairpersons. Non-household members were often asked whenever the baseline household had migrated entirely or dissolved and no member was available for the interviews. As a result, while the follow-up survey was administered to the tracked RTs (both migrants and non-migrants from the baseline village), the study also collected basic data—though could not be verified due to far-flung migration—on the reasons for and year of migration, migration destination, and the household formation statuses of those who could not be accessed for the full survey.

### 4.4.2 Multi-valued treatment models

Childhood work participation is treated as exposure, and the study attempts to investigate its long-term effects on village out-migration decisions, using a conditional independence assumption (CIA). Unlike the Rosenbaum and Rubin's (1983) binary treatment effects model, treatments can also be multi-valued, ordered or continuous. Monte Carlo simulation analysis and empirical studies (Linden et al., 2016; Uysal, 2013) show that when treatment is multi-valued, doubly robust estimators (augmented inverse probability treatment weighting (AIPTW) and inverse probability treatment weighting with regression adjustment (IPTWRA)) produce unbiased estimates, even when either the treatment assignment or the outcome equation is mis-specified. Linden et al. (2016) also compared the performances of alternative methods, to estimate the multi-valued treatment effects, and recommended these doubly robust methods, whereby both the treatment assignments and the outcome equation are estimated within the same framework (Linden et al., 2016). Therefore, following Imbens (2000) and Lechner (2001), and as proposed by Uysal (2013) and Linden et al. (2016), the study employs IPTWRA to estimate the long-term effects of childhood work on the decision to out-migrate from a respective baseline villages.

### 4.4.3 Econometric model specification

The doubly robust weighting estimator for multi-valued treatment (participation) effects is specified based on Imbens (2000), Lechner (2001), Uysal (2013), and Linden et al. (2016). For a sample of $N$ observations identified by $i$, $i=1,\ldots, N$, we observe $Y_i$ (the decision to migrate), $T_i$ (multi-valued participation–childhood work indicator variables), and $X_i$ (vector of pre-participation covariates). We denote the childhood work participation indicator variable for child $i$ participating in childhood work $t$ by $D_{i(t)}$, expressed as:

$$D_{i(t)} = \begin{cases} 1, & \text{if } T_i = t \\ 0, & \text{otherwise} \end{cases} \tag{4.1}$$

For child $i$ and participation level $T_i = t$, where $t \in \tau = \{0, \ldots, K\}$, we have corresponding potential outcomes (migration) denoted by $Y_{i(t)}$, $(Y_{i0}, \ldots, Y_{iK})$. Based on participation level $t$, we observe only one potential migration outcome for each child. Thus, in line with Rubin's (1974) potential outcomes framework, using the participation indicator, $D_{i(t)}$, and potential outcome, $Y_{i(t)}$, and following Linden et al. (2016), we write the observed outcome, $Y_i$ as:

$$Y_i = \sum_{t=0}^{K} D_{i(t)} Y_{it} \tag{4.2}$$

Accordingly and based on Lechner (2001), among several pairwise participation effects, given two work participation levels, $m$ and $l$, the average child-level effect of participation level $m$ versus $l$ is given by $Y_{im}$-$Y_{il}$. The population (all children) average work participation effect using the two potential migration outcomes is computed as:

$$\Delta_{ml} = E[Y_{im} - Y_{il}] = \mu_m - \mu_l \tag{4.3}$$

The value $\Delta ml$ could have been estimated using the sample means of observed migration outcomes, had we obtained the long-term village out-migration outcomes from a random experiment. However, in an observational study, estimating $\Delta ml$ requires additional conditioning on $Xi$, which is assumed to include all pre-participation covariates associated with the work participation assignment and potential outcomes. By conditioning on $Xi$, we assume that children's work participation assignment is as good as a randomization and replicates the randomization process. This assumption, also called weak 'unconfoundedness', as defined by Imbens (2000), can be stated as follows:

$$Y_{it} \perp D_{i(t)} \big| X_i, \quad \text{for all } t \in \tau \text{, where } \perp \text{ denotes orthogonality} \tag{4.4}$$

It is assumed that all $X_i$ that affect children's work participation and migration later in life are observed. In combination with the unconfoundedness assumption, whereby Rosenbaum & Rubin (1983) refer to the combinations of unconfoundedness and overlap as "strong ignorability," we also assume a complete overlap in the distribution of pre-participation covariates between participation groups. The assumption is expressed as follows:

$$0 < \Pr\left[\mathrm{T_i} = t \middle| X_i = x\right] \text{ for all } t \in \tau \text{ and for all } x \text{ in the support of } X \tag{4.5}$$

Under these assumptions, Imbens and Wooldridge (2009) specify that for participation level *t*, the conditional expectation of the potential outcome, using the conditional expectation of observed outcomes of those who participated and given covariates, is:

$$E\left[Y_{it} \middle| X_i\right] = E\left[Y_{it} \middle| D_{i(t)}, X_i\right] = E\left[Y_i \middle| D_{i(t)}, X_i\right] \tag{4.6}$$

$$= E\left[Y_i \middle| T_i, X_i\right] \tag{4.7}$$

where averages of conditional means give us $\mu_t \equiv E\left[Y_{it}\right] = E\left[E\left[Y_{it} \middle| X_i\right]\right]$ unconditional means. Alternatively, when participation is multi-valued and $X_i$ are highly dimensional, conditioning directly on *Xi* can be conducted by using the generalized propensity score (GPS) approach (Imbens, 2000). Imbens (2000) defines the GPS as "[…] the conditional probability of receiving a particular level of the participation given the preparticipation variables" (Imbens, 2000, p. 708), and it is expressed as follows:

$$r(t, x) \equiv pr\left[T_i = t \middle| X_i = x\right] = E\left[D_{i(t)} \middle| X_i = x\right] \tag{4.8}$$

By weighting the observed migration outcomes when adults by the conditional probability of the childhood work participated *t*, one can also identify the means of potential outcomes as:

$$E\left[\frac{Y_i D_{i(t)}}{r(t, X_i)}\right] = E\left[Y_{it}\right] \tag{4.9}$$

Based on the nature of the participation variable, we estimate the GPS, *r*(*t*, *Xi*), by discrete response or ordered response models (Imbens, 2000; Linden et al., 2016; Uysal, 2013). The weighting strategy (to balance covariates) using generalized propensity scores (GPSs) makes the outcome (migration decision) conditionally independent of the participation assignment.

Linden et al. (2016) have carried out a Monte Carlo simulation analysis and specified the doubly robust estimator. Having the conditional independence and strict overlap assumptions in mind, the unconditional mean is estimated as follows:

$$\hat{\mu}_t = \frac{1}{N}\sum_{i=1}^{N}\left[\frac{Y_i D_{i(t)}}{\hat{r}(t, X_i)} - \frac{D_{i(t)} - \hat{r}(t, X_i)}{\hat{r}(t, X_i)}\hat{m}_{t(xi)}\right] \tag{4.10}$$

where $\hat{m}_{t(xi)}$ is computed as $m_{t(xi)} = E[Y_{it}|X_i] = E[Y_i|T_i = t, X_i] = \beta_{0t} + X_i'\beta_{1t}$, $\forall t \in \Im$.

Accordingly, the unconditional mean is estimated by using the estimated GPS from the first step, $\hat{r}(t, X_i)$, and the estimated conditional mean functions, $\hat{m}_{t(xi)}$. The study reports IPTWRA results that estimate the GPS, by using the participation model and combining it with the outcome model. The method generates estimates for the participation model and computes the weights as the inverse of the GPS, i.e. $D_{i(t)} \big/ \hat{r}(t, X_i)$, for each participation level. Then, for each participation level, using the estimated inverse probability participation weight, the regression adjustment is fitted by a weighted regression for the outcome model. Using the estimates from the weighted regression, we can obtain the participation-specific predicted outcomes. Lastly, we compute the means of participation-specific predicted outcomes, meaning that ATEs is the contrasts between these averages (Linden et al., 2016).

## 4.5 Results and Discussion

### 4.5.1 Village settings: Mobility of people and linkages to nearby areas

The study villages are drawn from three major regions: Dinki, Shumsheha, and Debre Berhan villages from Amhara, Adele Keke from Oromia, and Adado from the SNNP regions. Dinki, Ankober district, is a remote village, prone to drought and famine, mountainous, and highly deforested. Agro-ecologically, it can be classified as mostly *Kolla* (lowland) in nature. The village has several gotts (sub-villages) and is connected to Aliyu Amba, the nearest main town (10 km), through an all-weather gravel road. Dinki is also located at about 25 km away from the district capital, Ankober, located next to Aliyu Amba.

Shumsheha, Lasta district, is located near Lalibela Airport, about 11 km far from Lalibela town, the nearest main marketplace for the village and a major tourist destination in the country. The village is connected to Lalibela town via a dirt road, in one side, and an all-weather gravel and partly asphalt road, in another. Shumsheha is a drought and famine-prone village, with mostly flat but occasionally hilly terrain, and has both *Kolla* and *Woina Dega*

agro-ecologies. It has an on-going safety net program in which food-insecure households enroll and participate in productive public works in exchange for food and cash payments.

Villages around Debre Berhan (Kormargefia, Milki, Karafino, and Bokafia) are located near an expanding town in Amhara region. After the baseline survey, Karafino and Bokafia were included in the Debre Berhan urban district, whereas Kormargefia and Milki continued to be part of the Basona Werena rural district, previously known as Debre Berhan Zuria district. Kormargefia is located along the highway connecting Addis Ababa and Debre Berhan, whereas Milki is situated farther from the highway, but connected with Debre Berhan town by gravel and dry-weather road. Karafino and Bokafia, on the other hand, are extensions on the outskirts of Debre Berhan to the rural areas. They are found along the opposite sides of the Debre Berhan–Addis Ababa highway. Many households in Debre Berhan villages engage in non-farming works such as selling dried cow dung, firewood, charcoal, and straw, as well as daily labor jobs within the villages and in Debre Berhan. In recent times, many youths (forming youth associations) have started working in irrigation agriculture and produce tomatoes, cabbages, and carrots for supply to hotels, restaurants and open markets in Debre Berhan. However, it is noteworthy that many individuals would also like to gain access to irrigable land, though this is in very short supply. Some places such as the village milling house and those closer to the town have access to electricity.

Adele Keke, in Kersa district, is found along the highway connecting Haramaya to Dire Dawa, also to Addis Ababa, and extends farther away from the main road. The village, with several sub-villages, is hilly and partly flat, has a *Woina Dega* climate, and is characterized by a large area of *khat* (trees with mild stimulant leaves) farms employing irrigation. It also has an ongoing productive safety net program like Shumsheha.

Part of the Bule district, Adado is a remote village dependent on *enset* (a banana-like food crop) and coffee farming, and linked to nearby towns (Bule within 10 km and Dilla at about 25 km) by gravel roads. The village nestles in mountainous terrain, covered with lush vegetation of coffee, *enset*, and other types of trees, *Woina Dega* agroecology, though it is very short of any form of farmland. During the follow-up survey, a bridge was under construction across the river that divides the village into two halves. It is expected to facilitate the village's future linkages and improve the local economy by promoting trade with nearby towns and reducing the cost of transportation. Although not all households have benefited so far, electricity was installed in 2008 and non-farm works have started to flourish, such as small shops and teahouses. Some people also engage in blacksmithing. Table 21 presents youth out-migration trends in the villages, before and after the baseline survey.

Table 21. Rural youth village out-migration trends in the villages, before and after 1999/2000

| Survey site | Labor mobility in the villages before 1999/2000 (Sources: Ethiopian Village Studies*) | Labor (Youth) village out-migration, linkages, and activities during 1999/2000 and 2015/2016 (Follow-up survey) |
|---|---|---|
| Dinki, Ankober | In many respects, the village is poorer than the surrounding rural areas.<br>Apart from very few temporary migrations to Aliyu Amba and Gachene to look for daily labor and through marriage, seasonal or long-term migration was unknown to the villagers.<br>Non-farm work in Dinki includes spinning, yarn-making, and weaving, mainly by the Argoba community.<br>There was no 'villagization' in the community, although the Amhara people originally migrated from the surrounding highlands.<br>Dinki had crop failures in 1977 and 1986, and it was hard hit by the 1985 nationwide famine, and another in 1994. | Landlessness has become a serious problem, mainly among the youth, forcing many of them to migrate to nearby towns, including Aliyu Amba, Gachene, and Awash, to search for jobs.<br>Among non-migrants, some youths (mainly males) participate in irrigation agriculture through traditional land-sharing arrangements, and female youths engage in brewing and selling local drinks and petty trade at the Chibte (Hagere Selam) village market.<br>Non-farm business is generally too limited.<br>Female youths also migrate to Gachene, Dulecha, Aliyu Amba, Zego, and Debdebo rural and peri-urban areas through marriage and very few to Addis Ababa to work as housemaids.<br>Male youths also migrate to Adama and Gachene for Quran study.<br>The village was affected by a drought during the follow-up survey. |
| Shumsheha, Lasta | Households work on some non-farm jobs, including handicrafts, spinning, selling local drinks (*Tella* and *Araki*), and selling firewood. Some households also participate in food for work programs.<br>High poverty and land shortage led to frequent seasonal migration, often from February to June, sometimes involving all household members, for wage labor.<br>Important migration destinations are neighboring towns, including Gondar, Rayana Kobo, occasionally to Setit Humera, and Keffa (coffee harvesting) for agricultural wage labor, and sometimes to Addis Ababa. | Migration has become more common among youths in response to land shortages, lack of local non-farm jobs, marriage, and to work in formal jobs outside the village.<br>Lalibela is the nearest and main destination for youths working in formal jobs, daily labor works, and non-farm business activities.<br>Mainly males migrate to Humera for wage farm work during the sesame weeding and harvesting seasons.<br>Youths also migrate to Woldeia, Dessie, and Kombolcha towns.<br>It was also noted that some youths also migrate to Addis Ababa, Bishoftu, Bahir Dar (regional capital city), Wollega, and abroad, mainly to Arab countries. |

| | | |
|---|---|---|
| | Early marriage among girls, mostly at 10-13 years of age, leads to many female school dropouts and out-migration.<br>The village has been hit by a series of famines since the early 1980s, of which the 1984 famine was the most severe. During these times, households out-migrated to manage the risks.<br>There were resettlements in 1978 and 1985 to Wollega and Bale, but no sizable 'villagization' has been carried out. | In addition to small daily and weekly markets and shops in the village, Lalibela continues to be the main market area for Shumsheha.<br>Youths travel to Lalibela to sell grain, livestock and livestock products, buy industrial products and spend some free time.<br>The village has been, even during the follow-up survey, under the influence of droughts and lack of adequate rain, which often affects agricultural production and livestock. |
| Adele Keke, Kersa | The village is linked to Dire Dawa (30 km) (City administration), Alemaya (now called Haramaya) (5 km) and Awoday (15 km) (both in the Oromia region), and Harar (25 km) (Harari region).<br>Few people migrate to Alemaya for labor work in July and August.<br>The village was affected by famine in 1989.<br>In 1976, there was involuntary 'villagization' program which was followed by an epidemic that killed many people and livestock. | Although people do not out-migrate often, youth out-migration is noted through marriage and living with extended families.<br>Individuals migrate to work (often *khat* trading) in nearby towns, including Haramaya and Awoday, Harar, Dire Dawa, and Jigjiga.<br>Youths also migrate to Arab countries (often illegally) through Somalia, to South Africa, and also to Djibouti to seek jobs.<br>Migration from this village to Addis Ababa is not common.<br>Youths (mainly females) migrate to nearby rural villages such as Lange and Gende Mude and urban areas including Harar, Dire Dawa, Haramaya, Bati, and Jigjiga through marriage. |
| Adado, Bule | The village had off-farm job opportunities in farmers' cooperatives doing coffee-washing and harvesting.<br>Due to growing land shortages, and also as an additional source of income, people migrate to Shakiso (in Oromia region) often between April and September, characterized by fewer farming activities in the village, for gold-mining and sometimes for farming. Migrants work as daily laborers in the mines, or they mine for themselves.<br>Migration to urban areas is not common.<br>Women work in trade, sell food, and prepare local drinks. | Many more youths than before migrate to the gold mining area at Shakiso (350 km). This migration path, and generally youth village out-migration, has become a commonplace. Some female youths also migrate to this area, get married, and reside there permanently. Males work as daily laborers or mine by themselves, with most of them moving back to the village after three months.<br>It was also noted that farmland shortages in the village are believed to have been the main factor in increasing youth village out-migration to other rural areas and towns.<br>Girls are also now migrating to other towns to work. |

| | | |
|---|---|---|
| | People also permanently migrate to other districts, to Kibre Mengist and Solomo, looking for farm work. However, these individuals often maintain links with their relatives at Adado, visit them once in a while, and retain their coffee and *enset* farms at Adado.<br>A major famine affected the village in 1983, leading to the scarcity of *enset*, a plant deemed to be drought-resistant. | Youths also migrate to Bule and Dilla towns for schooling, to work in formal jobs, through marriage, and to work in non-farm jobs.<br>Youths, sometimes along with the entire household, also migrate to Wenago and nearby towns (Dilla, Bule, and Dilla Zuria) and other destinations in the Oromia region (Solamo, Tero, Gedeb, Kibre mengist, and Adola) to work as daily laborers, in formal jobs (few), or through marriage.<br>People have a great deal of respect for migrants, regardless of the jobs they engage in, and have a good attitude about migration in general. |
| Villages around Debre Berhan (Kormargefia, Milki, Karafino, and Bokafia) | Non-farm income sources in the villages include selling dried cow dung and livestock products.<br>Except for a few migrations to Addis Ababa, to work as laborers, out-migration is generally not common here.<br>The areas around the villages were also hit by two famines, in 1984 and 1991, causing the out-migration of people to Addis Ababa, Debre Berhan, and Dessie to work.<br>The first famine was followed by 'villagization' in 1988, although some households returned to their old homes in 1992.<br>There were also resettlement programs to Jimma and Wollega before the current government took power in 1991. | Youth rural out-migration has increased significantly, due mainly to lack of farmland in the villages and also due to aspirations to work and the attractions of an urban lifestyle. Many youths (mainly females) also out-migrate, mostly to other rural and urban areas through marriage.<br>Debre Berhan town is the main destination for most youths, who migrate to work in construction sites, industrial jobs often in brewing factories, and domestic jobs (females).<br>Addis Ababa is also one of the major destinations, albeit mainly for females. While most of them work as daily laborers and housemaids, males work on construction sites or as guards for private households.<br>Youths also migrate to Debre Berhan to continue schooling. |

(*****) Sources for the people's mobility in the villages before 1999/2000: (Ali & Tafesse, 1996; Bevan & Pankhurst, 1996; Gashaw et al., 1996; Gebre, Berhanu, & Kenenie, 1996; Getu et al., 1996; Kenaw & Tegegne, 1996)

To summarize, at village-level over the last 16 years, rural out-migration has increased due to a number of reasons. Searching for jobs elsewhere, farmland shortages in the villages, getting married, income diversification, and also to some extent continuing education were recurring drivers of migration in the study villages. Moreover, village out-migration has now become a common phenomenon, even in areas where it was previously rare and uncommon. In addition, distance of the village from highways, proximity to expanding and urbanizing towns, construction booming in urban areas, and the high demand for housemaids in urban areas have also facilitated the out-migration of youths from the survey villages.

While villagers at almost all sites pool their labor through traditional work and labor-sharing arrangements, seasonal wage labor is common around Debre Berhan, mainly during peak agricultural seasons (farming, weeding, and harvesting), leading to the mobility of many people, mainly youths, to work for other households in nearby villages. Youths also access farmland through traditional arrangements such as sharecropping and renting.

Households respond differently to shocks such as droughts and famines, and migration is one of these solutions. An earlier study conducted by Webb et al. (1992), following the 1984 and 1989 droughts and famines in Debre Berhan villages, Dinki, and Adele Keke, concluded that the nature, responses, and damages related to droughts were felt differently across these villages. During such stress periods, some households, in this case fewer than 10 percent, fled the areas, although the mobility of people was restricted by laws, and they were weakened significantly by disease (Webb et al., 1992).

### 4.5.2 Understanding individual migration patterns and basic characteristics

Households, in general, and individuals, in particular, participate in various migration practices: Rural to rural, rural to urban, and in some cases across country borders. The discussions on migration in this chapter focus on village out-migration, either to other rural villages or urban areas. Rural out-migration, involving relatively many people, and often youths, is critical to understanding the mobility of an active farm labor force, designing appropriate human capital and labor market policies, and to envisaging the role of the migrant labor force in the development and structural transformation processes. By ‘non-migrants’, the study refers to individuals who have not left the baseline village, even if they left the baseline households and formed their own families within the same village at the time of follow-up survey. As pointed out in the background section, internal rural out-migration could be driven by variables related to the migrant, household, and residence villages. Below, the study discusses some key factors in relation to long-term migration statuses of the RTs.

Table 22 presents the migration characteristics of children, disaggregated by gender and birth order. The study finds statistically significant associations between these child-specific factors and the decision to out-migrate or remain in their baseline village. Village out-migration is generally dominated by females, with almost twice as many leaving compared to males. The results show that about 44.83 percent and 33.55 percent of females are migrants when considering all and tracked females, respectively. On the contrary, 25.58 percent of males migrate regardless their tracking statuses, with tracked migrant males constituting about 15.34 percent of all re-surveyed males.

Table 22. Migration characteristics of children by gender and siblings' birth order

| | Gender (N=764) | | | | Birth order (N=720) | | |
|---|---|---|---|---|---|---|---|
| | All surviving children | | | t-Test by | First | Second | Later- |
| Migration characteristics | Pooled | Male | Female | gender | born | born | born |
| Out-migrated, all migrants (N=764*) | 35.08 | 25.58 | 44.83 | 5.68*** | 29.01 | 33.75 | 36.36 |
| Out-migrated and tracked (N=652) | 24.08 | 15.34 | 33.55 | 5.55*** | 17.86 | 24.29 | 24.71 |

*Note: the value excludes children who died after the baseline survey.
*Significance levels: *P<0.10, **P<0.05, ***P<0.01*

Village out-migration also significantly associates with birth order, in that later born children are more likely to leave the villages, and they also constitute the higher proportion among the re-surveyed targets. The results indicate that 36.36 percent of a third or later born children were migrants; migrants also constitute about 24.71 percent among tracked later-born targets. Several factors may have led to a relatively higher tendency of migration among such a group of children. For instance, in-household resource competition and difficulties in accessing farmland through inheritance or via traditional land arrangements outside, on the one hand, and better access to child education, on the other, may have contributed to their out-migration.

With regard to migration destinations, as illustrated in Table 23, other districts, mainly nearby urban areas, are most important destinations for about 43.31 percent of the re-surveyed children. From a gender perspective, the results show that other rural or urban districts in the respective regions are also the main destinations for more than 40 percent of males and females alike. In this regard, it is found that urban districts neighboring the villages, such as Debre Berhan town for Kormargefia and Milki (both from Debre Berhan villages), Lalibela, Woldia, Kombolcha, and Dessie towns for Shumsheha, Haramaya and Awoday towns for Adele Keke, and Dilla town for Adado are the major urban destinations. Moreover, children

also migrate to other regions, such as from Adado to the Oromia region around Shakiso, Kibre Mengist, and Adola to work in gold mining areas. They also move from Adele Keke to Harar and Dire Dawa cities, mainly for business and marriage, and from Dinki to Argoba and Dulecha districts in Afar region. It is also noted that females also migrate to other rural villages or towns, mainly for marriage. Moreover, unlike males, females also tend to migrate abroad, mainly to Arab countries, including Saudi Arabia, Lebanon, and United Arab Emirates.

Table 23. Migration destinations by gender and siblings' birth order among tracked children

| Migration destinations, Tracked only (N=157) | Gender group (%) | | | Birth order (%) | | |
|---|---|---|---|---|---|---|
| | Pooled | Male | Female | First | Second | Later |
| Another village or town in a district | 20.38 | 17.31 | 21.90 | 22.78 | 13.04 | 25.00 |
| Another district in a region | 43.31 | 44.23 | 42.86 | 48.10 | 36.96 | 40.63 |
| Another region and abroad | 14.01 | 17.31 | 12.38 | 13.92 | 13.04 | 15.63 |
| Addis Ababa | 22.29 | 21.15 | 22.86 | 15.19 | 36.96 | 18.75 |
| Total number of tracked migrants | 157 | 52 | 105 | 79 | 46 | 32 |

Migration destinations based on birth order show a similar pattern to gender. Based on birth order, while other districts in each region are major destinations for all migrants, many second-born children also leave and travel to Addis Ababa, while a substantial proportion of other children also move to other rural villages or nearby towns within the baseline districts. In this regard, the systems theories of migration argue that migration patterns could be guided by the dynamic links between migration origin and destination area contexts (Bakewell, 2014). The study also notes the role of collective behavior of returning migrants in Adado village by providing information to villagers regarding the nature of work from where they have returned—in this case the Shakiso gold mining area—and the cyclical or reciprocal migration that leads to a continuous flow of migrants from Adado to this area.

In line with birth order and migration associations, the descriptive analysis also reveals that about half of all out-migrations occur during the age of 20-24 years, with the average of 21 years at the time of the first village out-migration (Table 24). Moreover, about 27.61 and 28.66 percent of migrations are made before the age of 20, for all migrants and tracked children, respectively.

Table 24. Migration characteristics by age group at the time of their first out-migration

| Migration characteristics (%) | Age (year) during first out-migration* | | | All _ age (Mean) |
|---|---|---|---|---|
| | Under 20 | 20-24 | Above 24 | |
| Ratio of out-migrants (N= 224) | 27.61 | 52.99 | 19.40 | 21.41(3.9) |
| Ratio of tracked out-migrants(N=157) | 28.66 | 52.23 | 19.11 | 21.38(4.0) |

**Note: the values except the last column indicate the proportion of targets by age cohorts*.

The study also examines the main reasons for village out-migration decisions and presents these in Table 25. Results show that a combined three-quarters of all migrations are made due to marriage and to seek gainful employment or casual work. Gender-disaggregated results indicate further that while about 65.38 percent of migrant males (28.57 percent for females) migrated in order to work or search for jobs, almost half of migrant females (23.08 percent for males) left the villages to move to other rural or urban areas for marriage and/or the formation of new families. For males, migration through marriage may mean that after marriage they can move and gain better access to farmland, start non-farm jobs, or, rarely, migrate to live near the bride's family. These gender-specific insights are contextually plausible, in that females are more likely to follow their spouses in rural Ethiopia than to out-migrate for work purposes.

Table 25. Reasons for village out-migration among tracked re-surveying targets, 2015/2016

| Reasons for migration for tracked RTs | | Group by gender (%) | | Age (years) at first migration (%) | | |
|---|---|---|---|---|---|---|
| | Pooled | Males | Females | Under 20 | 20-24 | Above 24 |
| To work or looking for job | 40.76 | 65.38 | 28.57 | 42.22 | 37.80 | 46.67 |
| Marriage or divorce | 39.49 | 23.08 | 47.62 | 33.33 | 42.68 | 40.00 |
| Schooling and others | 19.75 | 11.54 | 23.81 | 24.44 | 19.51 | 13.33 |
| Number of RTs in the group | 157 | 52 | 105 | 45 | 82 | 30 |

Twice as many re-surveyed females as males tend to out-migrate for schooling. Similarly, schooling and related issues are the main reasons for one in every four re-surveyed children migrating before turning 20. Unlike the results from the focus group discussions in each community, the individual level analyses do not reveal farmland shortage as the main driver of long-term out-migration decisions. However, agricultural land shortages could be one of the underlying factors for the above reasons, as it may play an important role among married

targets, and we cannot rule out its potential effects on marriage decisions. The results also indicate that while the odds of job-oriented migration increase with age, children who migrate at or after the age of 20 will equally likely out-migrate for marriage and related reasons.

Table 26 reports the associations between mutually exclusive combinations of work and school activities and children's migration profiles when adults. The results show that while the relative ratios of schoolchildren increase among migrant individuals, there is a significant reduction in the share of inactive children and a slight decrease in the proportion of full-time childhood workers in the migrant population.

Table 26. Childhood work conditions by long-term migration regardless of tracking status

| Childhood work and schooling combinations, *proportions* | Pooled sample | Non-migrants (A) | Migrants (B) | *t*-Tests (A) & (B) |
|---|---|---|---|---|
| School-only | 10.9(0.01) | 10.3(0.01) | 13.1(0.02) | -1.15 |
| Combining both | 22.8(0.01) | 20.2(0.02) | 29.1(0.03) | -2.80*** |
| Work-only | 43.5(0.02) | 44.4(0.02) | 40.7(0.03) | 0.98 |
| Inactive | 22.8(0.01) | 25.2(0.02) | 17.2(0.02) | 2.55** |

*Note: Values in the parentheses are standard errors for proportions. Significance levels *** p<0.01, ** p<0.05, * p<0.1. The test results show that 41.1 percent of schoolchildren out-migrated which is significantly higher (P<1%) compared to the migration rate among non-schoolchildren, 29.8 percent. However, we did not find a significant difference in terms of the hours worked between migrant and non-migrant targets.*

Mean test results show that the reduction in the proportion of full-time childhood workers in migrant compared to their share in the non-migrant children is statistically insignificant. That is, work-only children still make up the larger proportion of migrants. On the other hand, while those who combined work and study are highly likely to migrate, inactive children tend to stay in the villages.

To recap, migration patterns based on childhood characteristics show that migrant and non-migrant children are tend to be different according to gender, birth order, and some childhood-work conditions. Accordingly, migrants are more likely to be females, later-born siblings, and schoolchildren (relative to their proportion), with or without some form of work. However, economic migration is male-dominated, and females are more likely to migrate due mainly to marriage. Moreover, many of the first migration instances took place after the targets have turned 20. Previous studies also conclude that youths and better-educated individuals dominate labor migration in developing economies. In these countries, males dominate work-related labor migration. Moreover, the fact that rural out-migration is

relatively higher among schoolchildren suggests that human capital and higher expected income might also drive the decision to out-migrate; hence, the migration decision is less likely to be made on a random basis. These findings are in line with the human capital theory of migration discussed by Sjaastad (1962) and Todaro (1980).

***Household characteristics and children's adulthood migration status***

Hypothetically, migrants should come mainly from large households, where labor can be easily released with minimal strain on farming and other labor-intensive activities. Affluent households could also bear the monetary cost associated with migration of a member, but children may also migrate from households with stringent farmland shortages. Theoretically, on the other hand, the new economics of labor migration theory (Stark & Bloom, 1985; Stark & Levhari, 1982; Stark & Lucas, 1988; Stark & Taylor, 1991a), assuming households as migration decision-makers, explains migration as a strategy used to reduce income risk and diversify income sources, where credit and insurance markets are imperfect and nonexistent. In this regard, many migrant children could come from lower wealth quintile households, to reduce income shocks and smooth consumption through remittances. This means that children both from poor and wealthier households may out-migrate, albeit driven by different purposes. In this study, results presented in Table 27 show that despite such structural and behavioral differences in terms of the drivers of migration, the study notes that regardless of parent wealth status, children are equally likely to out-migrate. However, looking at it further, although statistically insignificant, it is noted that while the share of children from second quintile households increases by about 6 percentage points among migrants, the share of children from other wealth groups show slight reductions (except children from fifth quintile) among migrant children.

In relation to previous migration experiences in the households of an adult household member between 1997 and 1999, children from such households are 10 percentage points more likely to leave their villages later in life, i.e. they are more likely to migrate compared to those who are not in this kind of households. The other major family backgrounds that are associated with migration status include whether the household have accessed farmland through government land redistribution in the village, if the household took any amount of loans as small as 20 Birr in the two years prior to 1999/2000, and the head of the family's physical health conditions. The findings show that children from households that accessed farmland through redistribution, took loans in the previous two years, and had heads with

some kind of physical health problems are more likely to have out-migrated in the last 16 years compared to their peers in the comparison households. Contrary to the expectation, the mean tests show that there is no statistically significant difference in the household size between migrant and non-migrant children. This suggests that household size—availability of family labor—may play insignificant role in village out-migration decisions among children.

Table 27. Household characteristics of the migrant children

| | The proportion of migrants | | |
|---|---|---|---|
| Household characteristics (N=764) | No | Yes | Mean test (*t*-values) |
| Child is from the poorest households | 35.47(0.02) | 33.33(0.04) | 0.48 |
| Child is from poorer households | 33.97(0.02) | 40.14(0.04) | -1.37 |
| Child is from middle households | 35.71(0.02) | 32.43(0.04) | 0.75 |
| Child is from richer households | 35.68(0.02) | 32.93(0.04) | 0.66 |
| Child is from the richest households | 34.57(0.02) | 36.84(0.04) | -0.55 |
| Adult member left since 1997 | 32.89(0.02) | 42.85(0.04) | -2.39** |
| HH accessed land via redistribution | 29.02(0.02) | 43.49(0.03) | -4.04*** |
| Soil fertility decreased | 32.7(0.02) | 37.0(0.03) | -1.26 |
| Head expects diminishing size of land | 36.6(0.02) | 30.5(0.03) | 1.52 |
| Household took loans since 1997 | 39.6(0.02) | 30.3(0.03) | 2.69*** |
| Head had physical health problem | 32.2(0.02) | 43.2(0.03) | -2.32** |
| Household size (number) in 1999 | 7.38(0.11) | 7.41(0.15) | -0.15 |

***Note:*** *For all binary variables, yes=1 and no=0. Values in the parentheses are standard errors. *** p<0.01, ** p<0.05, * p<0.1. The values show the proportion of migrants from the respective household specific variables. The last column tests the mean or proportions of migration between the two variable responses. The poorest households refer the first quintile, and the richest households are from the fifth quintile in the wealth distribution.*

***Village characteristics and children's migration at later ages***

Rural out-migration and rural labor out-migration are two related concepts. While all out-migrations from a specific place to other places, regardless of the purposes, are categorized as 'rural out-migration', labor migration involves the mobility of those exclusively seeking for jobs or employment opportunities (de Brauw & Mueller, 2012). In this regard, split-off households, for example, can be non-migrants if they continue staying in the baseline villages as their parent households, out-migrants if they leave the villages and travel to any other areas, or labor migrants if they move out mainly to work or look for gainful employment.

However, the focus of most classical economic models in migration theories is labor migration, migrant labor which aims at employment (de Brauw & Mueller, 2012).

Figure 16 demonstrates the proportions of migrant children from the total number of baseline children, excepting deceased targets, in the respective villages. The results show the rates of migration for each village, regardless of tracking status. It is noted that, except in Adele Keke, while more than a third of children in the villages have out-migrated, the highest village out-migration is observed from Debre Berhan villages, followed by Adado and Shumsheha. In Debre Berhan villages, constituting four sub-villages, almost half of children left the villages over the last 16 years. This could also be attributed to, on top of child and household characteristics, village proximity to Debre Berhan town and Addis Ababa, about 132 km.

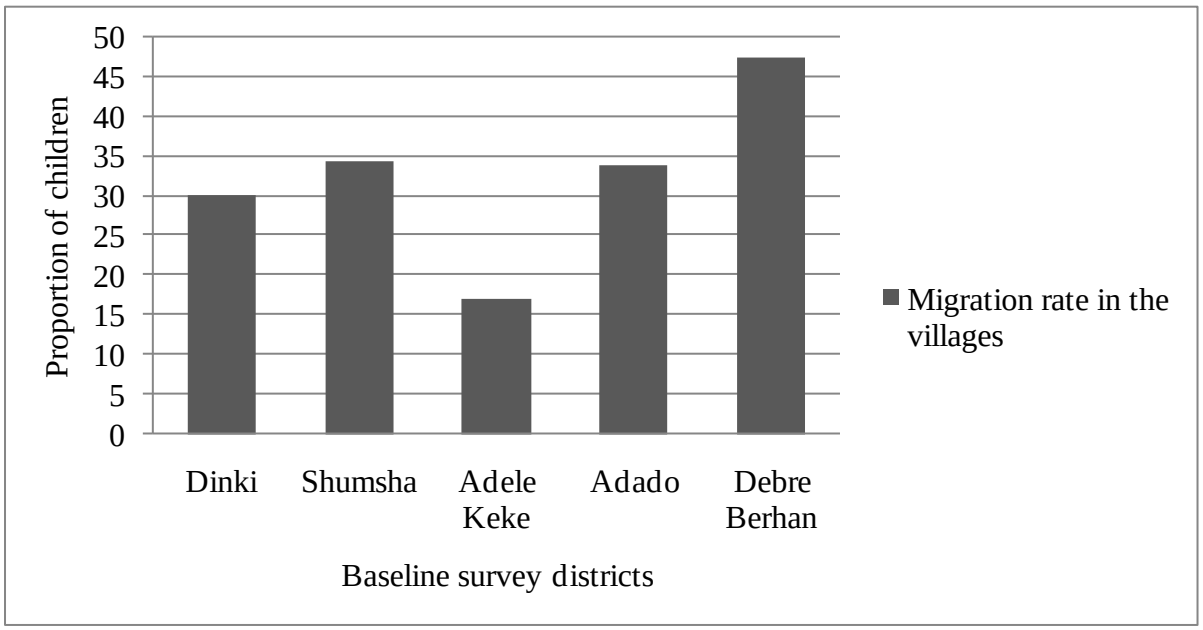


Figure 16. The proportions of children from each village to total sample size (N=764) and the rate of migration in each village to village sample size

On the other hand, although Adele Keke shares some similar characteristics with Debre Berhan villages such as in terms of proximity to urban areas and children's access to schools during childhood, only about 17 percent of the baseline children migrated in the last 16 years. However, other important differences including religion, main economic activities, ethnic composition, and youth aspiration to urban life may have led to variations in the migration rates. On the other hand, while Shumsheha, a village near Lalibela town and the airport, and Adado, a remote village near Dilla town, experienced equivalent migration intensities, the

villages are different on many accounts. But, while the nearby urban areas such as Lalibela, Kombolcha, Dessie, and Woldia were the main destinations for migrants from Shumsheha, most migrants from Adado move to Shakiso, a distant gold mining area. Generally, the results suggest that although migration intensities might be similar across villages, the purposes of migration could be different.

As presented using Table 28, local agro-ecological characteristics of villages may affect the decisions of households and individuals in relation to migration. It is found that a third of migrants are from drought-prone villages and 40.83 percent from highland villages, historically profiled as highly populated and severely farmland scarce areas, mainly to the youths. It is notable that migration is observed equally in the villages, regardless of whether the communities have seasonal out-migration and in-migration experiences. In this regard, more than a third of migrants are from villages where there is seasonal out-migration or in-migration of people.

Table 28. Village characteristics and children's migration in later life

| Baseline village characteristics | Proportion in the sample | Proportion of migrants |
|---|---|---|
| Village is prone to drought (=1, if yes) | 28.64 | 32.72 |
| Highland sites /Dega or W/ Dega climate, (=1, if yes) | 56.14 | 40.83 |
| Orthodox Christianity is major religion, (=1, if yes) | 46.13 | 42.58 |
| Islam is major religion, (=1, if yes) | 26.24 | 22.68 |
| Protestant is major religion, (=1, if yes) | 27.63 | 33.80 |
| Community has seasonal out-migration, (=1, if yes) | 82.38 | 35.24 |
| Community has seasonal in-migration, (=1, if yes) | 61.34 | 36.54 |

*Note: Values show the proportion of children in the respective values corresponding to yes=1*

Religion may also play an important role in individuals' migration decisions. Three major religions dominate the survey villages: Orthodox Christianity, Islam, and Protestantism. The study finds that in the villages where Orthodox Christianity is the main religion (origins for 46.13 percent of the targets), 42.58 percent of the targets left the villages. On the other hand, a third and close to a quarter of the children from Protestant and Islam majority villages have out-migrated, respectively, suggesting that Muslims seem to be less mobile compared to others. In general, in terms of origin villages, two-thirds of migrants are from Debre Berhan villages and Adado, characterized as non-drought prone, highland, and highly populated

areas. In addition, children from Orthodox Christian majority villages are twice as likely to out-migrate as those from Islam majority villages.

### 4.5.3 Econometric results and discussion

#### 4.5.3.1 Diagnosing covariate balancing

Covariate balancing is a diagnostic procedure that provides a useful indicator as to whether the weighting strategy through propensity scores creates plausible counterfactuals. In this chapter, childhood work is measured in two ways: (1) using mutually exclusive childhood work and school combinations, and (2) the childhood work index. In the first approach, school-only children constitute the comparison group (involving no work), while the working children are those who combined work and study, and full-time workers. In the second approach, the comparison children are those who have a non-positive work index, and the rest are grouped into three levels of work participation, namely lower, moderate, and high work intensities.

A covariate is said to be balanced when its distribution is similar across all work participation levels. According to Rubin (2001), the standardized scores mean differences between two work participation groups should generally be less than 0.25, and the variance ratios of the propensity scores in the two groups should be close to 1 or generally between 0.5 and 2 (Rubin, 2001). The results presented using Appendix 4 Table *e* show that of all 18 covariates, except for three covariates for multitasking children and two for work-only children, the standardized mean differences are all less than 0.25 and mostly close to zero. On the other hand, while all variance ratios are between Rubin's acceptable ranges, ten variables, for both multitasking and work-only children, are close to one. Graphical diagnostics also suggest that the comparison children are identical to the work participant children on the observables, and thus their long-term migration decisions are conditionally independent of these observables. Appendix 4 Table *f* presents similar diagnostics when work is measured using indices. While all the standardized mean differences of all covariates are close to zero for moderate-intensity workers, all covariates, except one for low-intensity and seven for high-intensity childhood workers, are close to zero. For the latter, the maximum standardized difference is 0.49 for the gender of the baseline household head. On the other hand, the variance ratios show that covariates for work participation levels are between 0.6 and 1.3, except for children from the poorer household wealth quintile and with high-intensity working childhood, which is 0.49.

#### 4.5.3.2 Checking for overlaps

When the overlap assumption is met, each child could have any work participation levels with similar level of probability. Rubin (2001) proposed a set of criteria based on comparing the distribution of the propensity score between treated and untreated subjects in a sample, in order to determine whether regression adjustment adequately eliminates bias when comparing outcomes between groups. Some authors have also proposed that a comparison of baseline covariates may be complemented by comparing the distribution of the estimated propensity score between treated and untreated subjects in the matched sample (Ho et al., 2007). In our multi-valued work participation, the overlap assumption is satisfied when there is an equal chance of observing each child across all levels of work participation. Unlike binary participation, we scrutinize the overlap graphs, displaying the estimated density of the predicted probabilities that a non-working child is a non-working child and the estimated density of the predicted probabilities that a working child is a non-working child.

The GPS plots show that school-only child (comparison) is equally likely to combine study with work and be a full-time laborer. Moreover, subsequent graphical analyses also show no evidence of the violation of the overlap assumption. In none of the graphs do the estimated GPS density distributions have too much mass at around zero or one. Similarly, we also examine GPS density distributions for work participation based on the intensity of the childhood work index. The GPS plots indicate that non-working (non-positive work indices) children have similar odds of being observed across low, moderate, and high intensities of childhood work, suggesting there is no evidence that the overlap assumption is violated. However, it was found that in terms of achieving overlap between comparison and participant children, combinations of work and school seem to perform better than the index approach.

#### 4.5.3.3 Childhood work and school combinations and long-term migration

The study estimates the long-term effects of childhood work on migration decisions using various combinations of work and study and the childhood work index as multi-valued work participations. The childhood work participation and long-term village out-migration (outcome) models are estimated in the same framework, using IPWRA, and the auxiliary equations in the work participation effects estimation procedure are presented in Table 29.

***Work participation model variables*:** The work participation models, in columns 7 and 8, are estimated using a multinomial logit regression model, with school-only children as a comparison group. The comparison children were exclusively studying during childhood, while multitasking and work-only peers engaged in work to different extents. The study

controls for child-related, family background, and village-specific covariates in the participation models, which are identical and common in the average work participation effects, analogous to average treatment effects (ATE) and average work participation effects among working children, analogous to average treatment effects on the treated (ATET) estimations; the only changes are in their migration equations.

In order to control for effects of prospect of migration on parent's decisions regarding child work and school participation (child human capital formation), the participation models include two important variables: Whether an adult household member left the household in the previous two years (1997-1999), and if at least one household member works in off-farm jobs. The results suggest that being a child from a household where an adult member left in the previous two years is significantly, at 5 percent significance level, associated with the probability of being a multitask child compared to school-only. However, those from similar households were equally likely to be full-time worker as much as being a school-only child. It is also found that, at 5 percent significance level, children from off-farm working households were more likely to be multitasking than studying full-time. The results clearly show that previous migration experience in the households and participation in off-farm jobs, both informing parents about the child's prospect of migration, tend to affect the decisions on child human capital formation. It also means that prospect of out-migration could induce children's human capital formation in rural areas in anticipation for future migration. While theoretically, the fear of migration could also lead to children to be full-time workers, this is not found in this study. Perhaps, disaggregated estimates by type of migration may result in heterogeneous effects. Although the direct effects on long-term migration decisions associated with each childhood work participation are mixed, the results suggest that being from an off-farm participating household is associated with higher probability of long-term village out-migration by school-only and multitasking children. On the other hand, the direct effect of previous migration experience on long-term out-migration is significant among full-time childhood laborers. The insignificant direct effects for schoolchildren suggest the effects of prospect of migration on children's long-term migration could be established through other mechanisms. Section 4.5.4 discusses the potential causal mechanisms.

Among child-specific controls, the results show that the child's age is statistically significant in multitasking children's work participation equations. The estimates indicate that for every one year increase in a child's age, the relative risk of combining work with study, relative to the school-only condition, will increase by about 1.3 times (exponentiated value). Unlike child-specific covariates, many of the household-level and head-related variables

significantly explain the likelihood of children working and participating in school. The results indicate that while an increase in the proportion of children in the household reduces the odds of combining work and study and full-time childhood work, the relative risk of children combining work with study increases for those from households where any adult household member has left in the previous two years, or participates in off-farm activities. Furthermore, it is also found that children with heads who are not satisfied with the quality of education at schools have a higher relative probability of multitasking or work-only in various jobs, compared to the odds of being a school-only child.

Household wealth also explains some of the variations in the work participation levels. Using children from the poorest households (first quintile) as comparison group, those from poorer and wealthier households are less likely to combine work and study or work full-time compared to being a school-only child. In other words, going from children in the poorest households to those in better-off households, they seemed to specialize in schooling instead of either combining work with study or full-time work compared to their peers from the poorest households. The results provide insights into the notion that work and study combinations may also reflect parents' wealth status. In this regard, for those who engage in work to meet household economic needs, parent's economic improvement could ease their tasks.

Lastly, some village-specific variables are also included to account for village-level variations in children's work and school lives. The results show an increase in the average wage rate will likely reduce the relative risk of children being exclusive workers, as the income effect of the increase in the wage rate might lead to parents investing more in schooling. On the other hand, a village's distance from the nearest main town, and the presence of a safety net program and its local agroecology play insignificant roles in work and school combinations.

***Migration model variables*:** outcome equations constitute the second part of the estimations. The outcome estimators are produced using a logit model, along with the migration status of the child when an adult. We have three migration outcome equations corresponding to the three work participation levels. Controlling for relevant observables, the estimations are conducted for the full sample of children. Unlike the participation models, the migration equations differ across the type of participation effects estimated (see the table description for details).

Looking at the critical factors in the population average work participation effects and specific to working children, we find that long-term village out-migration decisions for children across different participation levels are associated with the gender of the child and

partly with birth order, and age, gender, literacy status of the head, participation of an adult household member in off-farm economic activities at the baseline, migration or the death of an adult member in the two years prior to 1999/2000, a decline in soil fertility, whether the household has grown a new crop variety in the previous seven years, and household wealth status. Among several key variables that explain migration decisions by work participation level, the study finds that multitasking and full-time childhood working boys have 0.446 and 0.353 times (exponentiated values), respectively, lower chances of migrating compared to the odds for females in the respective groups. From the descriptive statistics, it can be recalled that girls, in general, are more likely to out-migrate, but they were less likely to combine work and study, compared to boys. Moreover, using children from the poorest households in the respective participation levels, while wealth status does not play a significant role in migration decisions by work-only children, school-only and multitasking children from better-off households have several times more probability of out-migrating.

Moreover, the results also suggest that the probabilities of long-term out-migration increases (decreased) significantly with a village's distance away from the nearest main town among work-only (multitasking) children. Besides, migration among multitasking children highlights significant and positive associations with the presence of a productive safety net program in the village and whether the local agro-ecology is *Dega* (3000m above sea level) or *Woina Dega* (1500-3000m above sea level), and the seasonal average village farm wage rate at baseline. Intriguingly, village-related factors are weakly associated with long-term migration decisions among school-only children. To reiterate, the results suggest that several factors at various levels interplay to shape children's long-term migrations decisions based on childhood conditions. Since we have achieved balance in most of these variables and created comparable children with an equal probability of being in the alternative work participation groups, the participation effects on the outcome are less likely to be due to these variations.

The findings contribute to the long-established discussion regarding the drivers of labor migration, mainly from a long-term perspective. Unlike other empirical studies that assume homogeneous childhood conditions among individuals, and then try to explain their decision to migrate, this study provides evidence that child-, household-, and village-related factors play varying roles in the long-term migration decisions based on childhood conditions. It also implies that rural-urban wage differences in a dual economy (Lewis, 1954) alone may not drive rural-urban labor migration. Childhood work and schooling conditions may also affect long-term migration decisions through their effects, for instance, on human capital formation and future employability in the non-farm economic sectors.

Table 29. The long-term effects of work and school combinations on migration decisions—IPWRA estimation method

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | *Outcome (Migration) Equations* | | | *Outcome (Migration) Equations* | | | *Participation (work) equations* | |
| Covariates | School-only | Multitask | Work-only | School-only | Multitask | Work-only | Multitask | Work-only |
| Child is male | -0.393 | -0.807* | -1.040*** | 0.731 | -0.820** | -0.656* | -0.315 | -0.412 |
| | (0.979) | (0.457) | (0.269) | (1.301) | (0.404) | (0.364) | (0.299) | (0.270) |
| Age of the child | | | | | | | 0.233*** | -0.0180 |
| | | | | | | | (0.0767) | (0.0701) |
| Child birth-order | | | | | | | | |
| 2nd born child vs. eldest | -0.385 | -0.438 | -0.0017 | -0.941 | -0.186 | -0.310 | 0.629 | 0.352 |
| | (0.761) | (0.477) | (0.345) | (1.150) | (0.451) | (0.458) | (0.399) | (0.358) |
| Youngest vs. eldest | -0.412 | 0.442 | -0.649 | -1.211 | 1.233* | -1.067** | 0.697 | 0.777 |
| | (0.919) | (0.889) | (0.416) | (1.198) | (0.732) | (0.530) | (0.649) | (0.563) |
| Age of the head in 1999 | -0.035 | -0.005 | 0.027** | -0.175** | -0.0127 | 0.040** | 0.008 | 0.020 |
| | (0.043) | (0.023) | (0.012) | (0.069) | (0.021) | (0.019) | (0.015) | (0.014) |
| Head is male | -7.546*** | -0.134 | -0.0237 | -8.472*** | -0.299 | 0.369 | -0.123 | -0.125 |
| | (2.397) | (0.637) | (0.405) | (1.955) | (0.651) | (0.583) | (0.473) | (0.438) |
| Head is literate | -1.158 | -0.0611 | 0.212 | -4.320*** | -0.388 | 0.571 | 0.198 | -0.442 |
| | (0.865) | (0.474) | (0.334) | (1.553) | (0.440) | (0.465) | (0.358) | (0.325) |
| Head satisfied with Edu. quality | | | | | | | 0.274 | -0.744* |
| | | | | | | | (0.446) | (0.380) |
| Household size in 1999 | -0.101 | -0.0678 | 0.0841 | -0.200 | -0.0800 | 0.0748 | -0.0855 | 0.0195 |
| | (0.308) | (0.122) | (0.0768) | (0.446) | (0.105) | (0.115) | (0.0753) | (0.0674) |
| Proportion of children in the HH | -2.468 | 2.266 | 1.415 | -3.714 | 3.141* | 2.479 | -3.979*** | -3.910*** |
| | (4.749) | (1.857) | (1.303) | (7.040) | (1.753) | (1.701) | (1.524) | (1.439) |
| A member works in off-farm jobs | 2.035** | 1.445** | -0.0496 | 3.641** | 0.791 | -0.0788 | 0.858** | 0.515 |
| | (0.874) | (0.617) | (0.335) | (1.661) | (0.535) | (0.453) | (0.427) | (0.396) |
| Adult HH member left since 1997 | 1.871 | -0.0564 | 0.697* | 4.632** | -0.0190 | 0.999* | 1.079** | 0.591 |
| | (1.260) | (0.457) | (0.368) | (1.981) | (0.433) | (0.511) | (0.430) | (0.420) |
| Head expects decline in land size | -0.257 | -0.823* | -0.339 | 0.814 | -0.709 | -0.777* | 1.143*** | 0.998*** |
| | (1.203) | (0.496) | (0.328) | (1.650) | (0.431) | (0.429) | (0.393) | (0.363) |

*Table 29. Continued.*

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | *Outcome (Migration) Equations* | | | *Outcome (Migration) Equations* | | | *Participation (work) equations* | |
| | School-only | Multi-task | Work-only | School-only | Multi-task | Work-only | Multi-task | Work-only |
| Soil fertility declined | 2.048** | 0.378 | -0.154 | 3.390*** | 0.347 | 0.0856 | -0.267 | 0.455 |
| | (0.858) | (0.620) | (0.336) | (1.046) | (0.500) | (0.428) | (0.341) | (0.322) |
| HH grew a new crop since 1992 | 3.873*** | -0.395 | 0.373 | 6.254** | 0.246 | 0.596 | 0.479 | -0.0103 |
| | (1.368) | (0.492) | (0.397) | (2.430) | (0.471) | (0.481) | (0.412) | (0.404) |
| HH used same land size since 1994 | -0.0615 | -0.142 | 0.0414 | 1.962* | -0.320 | 0.164 | | |
| | (0.776) | (0.470) | (0.388) | (1.172) | (0.435) | (0.513) | | |
| HH wealth quintiles | | | | | | | | |
| Poorer vs. Poorest | 3.772 | 2.141*** | -0.395 | 4.577 | 1.959*** | -0.723 | -2.029*** | -1.959*** |
| | (2.294) | (0.702) | (0.502) | (3.234) | (0.705) | (0.752) | (0.625) | (0.579) |
| Middle vs. Poorest | 4.460* | 1.393 | 0.285 | 8.260*** | 1.595** | 0.852 | -1.818*** | -1.712*** |
| | (2.281) | (0.864) | (0.487) | (2.976) | (0.790) | (0.570) | (0.624) | (0.581) |
| Richer vs. Poorest | 3.110* | 3.056*** | -0.256 | 5.757*** | 2.881*** | -0.0353 | -1.350** | -1.794*** |
| | (1.588) | (0.879) | (0.489) | (1.869) | (0.848) | (0.639) | (0.663) | (0.612) |
| Richest vs. Poorest | 4.461** | 2.770*** | -0.0797 | 8.449*** | 2.517*** | 0.0414 | -1.421** | -2.476*** |
| | (2.199) | (0.928) | (0.528) | (2.682) | (0.936) | (0.672) | (0.650) | (0.614) |
| Distance of the village | 0.324 | -0.377*** | 0.131** | 0.407 | -0.188 | 0.171** | -0.015 | -0.011 |
| | (0.264) | (0.125) | (0.0591) | (0.333) | (0.126) | (0.076) | (0.067) | (0.058) |
| Village has no PSNP | 1.722 | 4.209*** | 0.583 | 5.092** | 3.401*** | 0.308 | 0.338 | -0.520 |
| | (1.473) | (0.960) | (0.373) | (2.018) | (0.881) | (0.505) | (0.407) | (0.361) |
| Avg. farm real wage rate | -0.836 | 1.098*** | -0.0658 | -0.644 | 0.830*** | -0.277 | 0.200 | -0.266* |
| | (0.510) | (0.304) | (0.160) | (0.490) | (0.293) | (0.198) | (0.162) | (0.151) |
| Constant | 3.761 | -6.115*** | -4.180** | 3.163 | -5.865** | -5.478*** | -0.256 | 5.639*** |
| | (3.681) | (2.201) | (1.710) | (6.141) | (2.323) | (2.089) | (1.728) | (1.619) |

*Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Columns (1)—(3) are the outcome (migration) equations for the ATE and those (4)—(6) are outcome equations for the ATET. Columns (7) and (8) are participation equations for ATE. The participation-effects estimations are done on 572 observations using IPW regression adjustment method. The outcome is modeled using logit regression while multinomial logit is used for the work participation estimation.*

***Work participation effects:*** In addition to identifying the drivers of long-term migration decisions based on childhood work conditions, the study also estimates the causal effects of being a multitask child relative to school-only as well as work-only child relative to school-only on their respective long-term migration decisions. Table 30 reports the effects of work and school combinations on migration decisions, using school-only as comparisons.

The average childhood work participation effect suggests that the likelihood of migration among work-only children is about 12.9 percentage point lower than the potential outcome (POM) of 44.8 percent, which would have been observed had they studied full-time. The effect is statistically significant. However, the result does not show evidence that going from school-only to multitasking significantly changes the odds of long-term migration decisions, meaning that schoolchildren, despite their childhood work conditions, are equally likely to out-migrate.

Table 30. Average childhood work participation effects on migration decisions

| *Childhood work conditions* | *β* | *Robust SE* | *[95% Conf. Interval]* | |
|---|---|---|---|---|
| (Combining both) | -0.0461 | 0.0552 | -0.1542 | 0.0621 |
| (Work-only) | -0.129** | 0.0506 | -0.2280 | -0.0298 |
| POM for Comparison group | 0.448*** | 0.0433 | 0.3627 | 0.5325 |

*Note: Significance levels: *P<0.10, **P<0.05, ***P<0.01*

Furthermore, the study also estimates the average work participation effects on the working children, in order to understand to what extent the likelihood of migration would change for actually working-children in line with different levels of work participation (Table 31). Using multitasking children as controls, the probability of long-term migration among full-time working children would be about 8 percentage point less ($P \leq 0.1$) than the counterfactual 40 percent, which could have occurred if full-time working children had studied while working.

Table 31. Average work participation effects among childhood workers

| | *For work-only children* | | *For multitasking children* | |
|---|---|---|---|---|
| *Childhood work conditions* | *β* | *Robust SE* | *β* | *Robust SE* |
| (School-only) | 0.0496 | 0.0673 | 0.1480*** | 0.0554 |
| (Work-only) | -0.0811* | 0.0493 | ***Comparison group*** | |
| (Combining both) | ***Comparison group*** | | 0.0980** | 0.0498 |
| POM estimates | 0.4000*** | 0.0425 | 0.3206*** | 0.0358 |

*Note: Significance levels: *P<0.10, **P<0.05, ***P<0.01*

The findings in Table 31 also show that using work-only children as controls, both school-only and multitasking children are 14.8 and 9.8 percentage point, respectively, more likely to migrate in the long term compared to the counterfactual level of migration, which is estimated at 32 percent, had they been full-time workers. However, the last estimation might be driven by a child's education, which is common across work participations but not for the control. This result is in agreement with the concept that investment in human capital is as important as the process of migration (Sjaastad, 1962). In other words, despite large rural-urban or farm and non-farm wage gaps, we might observe fewer migrants, perhaps due to the requirements of some form of human capital. In addition to the role of adult human capital on migration, this study argues that village out-migration decision could also be a form of long-term decision that gets its foundation earlier in childhood through participation in work and study.

The results, in general, show that there is strong evidence that work-only children are more likely to stay in villages compared to their peers who have attended schooling, while they are comparable in observables. This also implies that—as implied using Table 32—work-only children are more likely to continue working in subsistence farming when adults. On the other hand, schoolchildren are more likely to leave their villages and take up non-farm jobs in other areas. This evidence reaffirms the lively debate that educated youths are leaving the agricultural sector and rural areas. When the rural labor market is imperfect and fails to absorb the fast-growing rural youth population, migration could be the next option for schoolchildren when they reach adulthood.

What, then, is the association between various forms of childhood work and school combinations, the reasons for migrating, and the destinations of migration among migrants? The study estimates logit regression models for reasons for migrating and the migration destinations (Table 32). The results show that compared to work-only children, those who combined work and study are more likely to migrate for economic reasons, i.e. to look for a job or to work, while no significant difference is found among school-only relative to work-only peers in this regard. Schoolchildren and full-time childhood workers are equally likely to migrate by getting married and related social issues later in life. Results associated with migration destinations show that differences in childhood work and school conditions are not sustained by differences in migration destinations. This shows that once children have decided to out-migrate (crossing the hurdle—the decision to migrate), they are likely to go to similar destinations regardless of childhood work differentials. Perhaps location advantages,

on the one hand, and the origin and destination location contexts, on the other, could dictate migration destinations in the villages. For example, most children from Adado, regardless of their childhood work conditions, migrate to a gold mining area in Adola, though it doesn't necessarily mean that they also work similar jobs when they get there.

Table 32. The associations between childhood work and migration reasons and destinations

| | *Migration reasons* | | *Migration destinations* | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Covariates | Economic (job search) | Marriage-related | Within districts | Within regions | Other regions or abroad |
| Work-school combinations[a] | | | | | |
| School-only | -0.0361 | -0.251 | -0.453 | 0.0987 | -0.0219 |
| | (0.760) | (0.684) | (0.840) | (0.526) | (0.512) |
| Combining both | 1.240* | -0.409 | 0.0567 | 0.0251 | 0.130 |
| | (0.651) | (0.613) | (0.708) | (0.433) | (0.438) |
| Other variables[1] | | | | | |
| Child controls | Yes | Yes | Yes | Yes | Yes |
| Head and household controls | Yes | Yes | Yes | Yes | Yes |
| Village-level controls | Yes | Yes | Yes | Yes | Yes |
| Observations | 136 | 136 | 185 | 198 | 198 |

*Note: Significance levels: *P<0.10, **P<0.05, ***P<0.01, [a]Reference group: Work-only*

Moreover, assuming that migration is a way of efficiently allocating resources, Sjaastad (1962) has also argued that migration is a strategy through which individuals use their skills to get a better return in other areas, the decision being made after a cost-benefit analysis and comparing future discounted and current earnings. In this regard, those who combined work and study may have the skills advantage when adults to earn a better income somewhere in non-farm economic activities, thereby leading to higher probability of economic migration among this cohort. The results also indicate that migration is selective in terms of human capital, namely skills, knowledge, and experiences.

[1] *Child controls [sex and birth order interactions and age of the child ], head and household controls [age, sex, and literacy status of the head, if the head satisfied with the quality of education, household size, proportion of children in the household, off-farm participation. adult migration, expectation on future land size, soil fertility, adoption of new crop verities, and wealth status in quintiles], village related controls [distance from the nearest town, real wage rate, having PSNP and local agro-ecology]*

To sum up, the results thus far suggest that using how children combined work and study during childhood, the study finds significant effects of childhood work on their long-term migration decision and patterns. Moreover, the results also suggest that multitasking children are more likely to migrate for economic reasons compared to their peers, who worked full-time or studied exclusively.

#### 4.5.3.4 Childhood Work Index (CWI)

While childhood work and school combinations could be one of the options to measure childhood work, it does not show the intensities of children's work, for instance, among those who combined work and study. Moreover, school-only children in the previous 12 months as their main or additional occupation are assumed to have not participated in childhood works as of the baseline observation. This could be a strong assumption given that child labor is a common practice in rural Ethiopia and farming is dependant highly on family labor than hired labor. As an alternative strategy, using 17 childhood work indicator variables (Appendix 2), a childhood work index was constructed to partly address these limitations. The index counts on the commonly used child labor variables in farming communities, including work and study combinations, the age at which the child started working, the number of hours the child worked in the previous seven days, and other variables indicating potential child labor use in a typical rural household. While the approach needs further examination, not only from its empirical convenience viewpoints, but also from a policy dimension, it is a more stable indicator than other proxy variables, which can be prone to measurement errors and recall biases.

After constructing the index using principal component analysis (PCA), children were categorized into four work participation groups. Those with zero and negative indices are used as comparisons, i.e. non-working children, while those who have positive indices are assigned into three equal-sized work participation groups: Low, moderate, and high work intensities (Figure 17). In the end, the study uses 447 children (56.65 percent) as controls and 114 children (14.45 percent) in each of the three participation levels. Accordingly, these groups are used to denote work participation levels and conduct a similar analysis using the IPWRA method, to identify how working at one of the working levels affects long-term village out-migration decisions relative to non-working children.

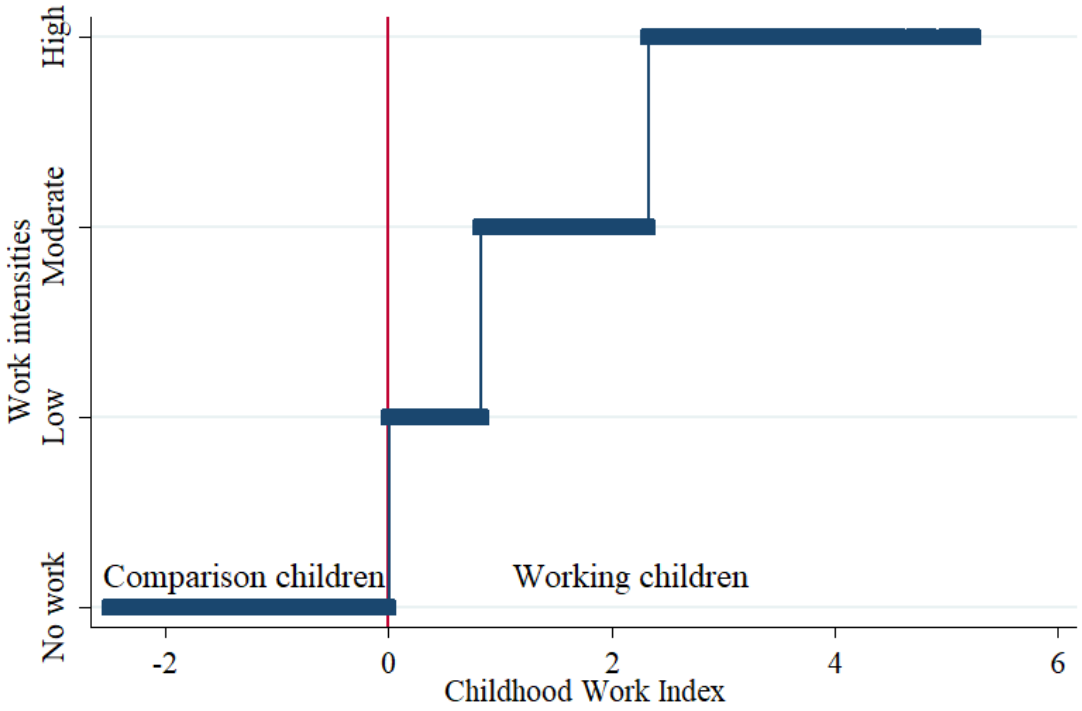


Figure 17. Grouping children into comparison and work participant categories using CWI

Controlling variables similar to those used in the previous IPWRA models, and including age-adjusted grade attainment, the results show that going from non-working to high-intensity workers, the probability of long-term out-migration reduces by about 13.34 percentage point (Table 33) compared to the average of 33.56 percent which would have been observed had they been non-working children. However, the study does not find significant differences among children working at low to moderate intensities compared to the comparison children. This corroborates the previous conclusion that work-only children are more likely to stay in their villages.

Table 33. Average work participation effects of childhood work on migration decisions

| Childhood work index | *β* | *SE* | *[95% Conf. Interval]* | |
|---|---|---|---|---|
| (Low vs. No work) | 0.0922 | 0.0606 | -0.0266 | 0.21107 |
| (Moderate vs. No work) | 0.0388 | 0.0505 | -0.06029 | 0.137841 |
| (High vs. No work) | -0.1334*** | 0.0328 | -0.19771 | -0.06916 |
| POM for No work | 0.3356 | 0.0232 | 0.29018 | 0.38093 |

*Note: Significance levels: *P<0.10, **P<0.05, ***P<0.01*

A simple cross-tabulation also reveals that about 81 percent of the high-intensity working children are identified as work-only children based on how they combined work and study. Furthermore, about 92 percent of school-only children are found in the non-working child group based on the index, thereby implying a substantial level of overlap between the two work measurement strategies in identifying working and non-working children.

Results on the effects of childhood work among those who actually work at low, moderate, and high-intensities (corresponding to ATET estimation) are reported using Table 34. Using low-intensity working children as controls, the probability of long-term migration could have been about 16.30 percentage point less among moderately working children than the average of 52.41 percent, which would have been observed had they worked at the low-intensity level.

Table 34. The average childhood work participation effects among childhood laborers

| | *Moderate work intensity* | | *High work intensity* | |
|---|---|---|---|---|
| *Childhood Work Index* | *β* | *SE* | *β* | *SE* |
| (No work vs. Low) | -0.2198*** | 0.0671 | -0.1405** | 0.0646 |
| (Moderate vs. Low) | -0.1630** | 0.0733 | -0.0015 | 0.0960 |
| (High vs. Low) | -0.2263*** | 0.0712 | -0.1765*** | 0.0643 |
| POM for Low | 0.5241*** | 0.0605 | 0.4195*** | 0.0508 |

Note: *Significance levels: *P<0.10, **P<0.05, ***P<0.01*

Furthermore, using the same comparison children, the likelihood of migration for high-intensity working children would have been 17.65 percentage point lower than the counterfactual value of 41.95 percent had they engaged in low-intensity work. The impact estimations using children at a low-work-intensity as a comparison group further reveal that as we go from low to high levels of childhood work intensity, the likelihood of out-migration, on average, declines.

### 4.5.4 Causal mechanisms

This section presents the potential mechanisms through which childhood work and schooling participation (early human capital formation) could affect the long-term decisions to out-migrate from the villages in rural Ethiopia. Particularly, the study explores the effects of childhood work and schooling participation on long-term human capital formation and social capital of children when adults.

### *Adulthood human capital formation*

As it has been discussed in the theoretical framework, the most direct effect of childhood work and schooling is likely to be on adulthood human capitals formation, through which the decisions to out-migrate from villages could be impacted. The dynamic human capital and skill formation frameworks proposed by Cunha and Heckman (2007) and Heckman (2007; 2006) explain that the effects of human capital investments during childhood persist and likely to determine the adulthood human capital. The frameworks also show that skills and capabilities are self-reinforcing and cross-fertilizing. This means that the skills and the human capital attained during childhood may facilitate the adulthood human capital formation.

Table 35 shows the associations, linear probability model (LPM) estimates, between childhood work and schooling and the indicators of adulthood human capital: Grade attainment and completing four and eight years of schooling. The results show that 16 years after the baseline survey, a full-time childhood laborer has a lower human capital compared to a full-time schoolchild. Being full-time childhood worker is associated with about 3.3 years lower adulthood grade attainment, 33 percentage point lower probability of completing four-year schooling, and 23 percentage point lower probability of completing primary education compared to childhood school-only child. The differences are statistically significant at 1 percent significance level.

Table 35. The associations between childhood work and schooling on adult human capital

| | (1) | (2) | (3) |
|---|---|---|---|
| Covariates | Grade attained | Completed four-yar schooling | Completed eight-year schooling |
| Work and school combnations▪ | | | |
| Combining both | 0.440 | 0.0550 | 0.0636 |
| | (0.514) | (0.0565) | (0.0719) |
| Work-only | -3.272*** | -0.330*** | -0.230*** |
| | (0.456) | (0.0534) | (0.0616) |
| Constant | 4.218** | 0.571*** | 0.178 |
| | (1.840) | (0.199) | (0.216) |
| Observations | 504 | 504 | 504 |
| R-squared | 0.421 | 0.387 | 0.237 |

*Robust standard errors in parentheses, clustered at baseline household level, LPM estimates.*

▪ *- Reference group: School-only children*

*Significance levels: *P<0.10, **P<0.05, ***P<0.01*

*The models are estimated controlling for all participation variables in Table 29.*

However, the results do not show significant differentials in these human capital indicators between school-only and multitasking children. This means that the two groups of children—collectively identified as schoolchildren—have more or less equal level of long-term progression in human capital formation. According to the human capital theory of migration (Sjaastad, 1962) and Fields (1975), the results suggest that those who studied full-time and combining both during childhood have the comparative advantage to out-migrate to urban (non-farm) labor markets where better-educated labor enjoys preferential treatments. In contrast, it also implies that full-time childhood workers, who end up with lower adult human capital, have a propensity to remain in the villages. Therefore, although these results may not explain the reasons of migration and migration destinations, the impact of childhood work and schooling on adulthood human capital formation seems to explain partially the long-term effects of childhood work and schooling on the probability of long-term village out-migration decisions. Particularly, the results suggest that full-time childhood work may impede long-term human capital formation and hence likely to reduce the long-term probability of migration, while in contrast, childhood schooling tends to encourage long-term village out-migration due to better accumulation of adulthood human capital.

**Social capital: Access to information**

Childhood work and schooling participation may also impact the elements of long-term social capital of the child differently, with implications on the probability of village out-migration. Table 36 shows the linear probability model estimations on the impacts of childhood work and schooling on children's ownership of mobile phones and radios. The results, once again from the perspective of these social capital indicators, show that the parents' decisions on childhood work and schooling likely to have substantial effects on the long-term social developments of the child which could also limit his or her functioning in the economic activities including the ability to migrate and work in non-farming jobs. In particular, the results show that being a full-time childhood worker is strongly associated with 18.9 and 10.3 percentage point lower probabilities of adulthood mobile phone and radio ownerships, respectively, compared to their peers who studied full-time. However, no significant differences are found between those who combined work and study and school-only peers. With respect to implications to long-term village out-migration decisions, we can anticipate that those who own mobile phones and radios when adults have access to labor market and migration related information and likely to participate in non-farm economic activities, which are likely to involve village out-migration. In particular, based on this understanding, the

results suggest that while full-time childhood laborers may remain in the villages, due mainly to lack of information regarding the labor markets and opportunities related to low or unskilled jobs, schoolchildren are likely to in migration when adults.

Table 36. The impacts of childhood work and schooling on some social capital indicators

| Covariates | (1)<br>Owns mobile phone | (2)<br>Owns radio |
|---|---|---|
| Work and school combinations▪ | | |
| Combining both | 0.0345 | -0.0400 |
| | (0.0758) | (0.0646) |
| Work-only | -0.189*** | -0.103* |
| | (0.0714) | (0.0584) |
| Constant | 0.201 | -0.0831 |
| | (0.236) | (0.175) |
| Observations | 448 | 448 |
| R-squared | 0.230 | 0.122 |

*Robust standard errors in parentheses, clustered at baseline household level, LPM estimates.*

▪ *- Reference group: School-only children*

*Note: Significance levels: *P<0.10, **P<0.05, ***P<0.01*

*The models are estimated controlling for all participation variables in Table 29.*

### 4.5.5 Caveats of the study

Selection bias is the main identification problem in work and school participation during childhood, as well as in migration when adults. The study has some caveats worth mentioning. First, although we attain a balance between children on observables, there could be some unobserved factors such as innate abilities which may relate to the error terms. Besides, the selective nature of parents' decisions to assign children to work and study, based on their expected returns, might also affect the reliability of our estimates. Both selection problems may result in estimation biases, and the study does not account for biases arising from such unobserved effects. Second, in the work-school combinations, we have very little information on how multitasking children actually allocate their time between work and study. Due to a lack of data on the specific time utilization for the competing activities, the study is unable to identify trade-offs for these specific children, and reflect on the optimal combination level. Finally, while the study utilizes the pooled data to do the main analysis, detailed evidence could have been presented if disaggregated analyses were conducted by gender, work type, parent wealth status, and location. However, due to small sub-samples to draw proper comparison groups, the study does not explore that particular avenue.

### 4.6 Concluding remarks

The chapter investigates the long-term effects of childhood work and schooling conditions on children's village out-migration decisions and patterns. The data are analyzed by using an inverse-probability weighted regression adjustment, a doubly robust estimation method. The descriptive analyses show that schoolchildren are relatively more likely to leave the baseline villages. Moreover, females were found more likely to migrate than their male counterparts. Econometric results show that full-time childhood work may trap children in villages later in life compared to schoolchildren. Given limited availability of non-farm jobs in the villages, this also implies that while full-time childhood workers are more likely to continue farming when adults, schoolchildren are more likely to out-migrate. The study has also found that children who combined work with schooling are more likely to out-migrate from the villages to seek for non-farm employment. It is argued that this could be possibly because the condition may have given multitasking children the opportunity to acquire relevant work skills and build their entrepreneurial spirit, thus leading them to out-migrate and work in non-farm economic activities. In addition to commonly understood drivers of migration in developing countries, the study gives new evidence that childhood work and schooling conditions may also affect children's long-term village out-migration decisions. As a result, the assumption of homogeneity in childhood conditions while studying adulthood migration decisions needs to be revisited.

The findings also imply that investment in schooling might be as relevant as enabling youths to out-migrate from rural areas, and it likely cross-fertilizes with childhood work. Therefore, investment in rural education should also be accompanied by supportive and expansionary labor market policies in rural areas, in order to absorb youths, or in the urban areas, to avoid non-gainful rural-urban migration.

## 5. Long-term effects of childhood work on earnings in rural Ethiopia

### 5.1 Human capital formation and labor market outcomes

Nationally representative labor force surveys show that children in rural Ethiopia participate widely in various low-intensity activities, such as herding and domestic chores, and to some extent in physically demanding jobs such as farming. For instance, the 2011 Demographic and Health Survey report shows that about 27 percent of 5-14-year-old children have engaged in farm and non-farm related works (CSA & ICF International, 2011). Moreover, other empirical studies, including the baseline, have also showed that child labor is highly prevalent in rural Ethiopia. As discussed in the introductory and second chapters, Admassie (2002) has found that work is the main responsibility for more than a third of rural children, and slightly more than a quarter have to combine work and study. Looking at it in relation to the child's age, Admassie and Bedi (2003) have also indicated that as many as one in every five 4-5-year-old children engages in certain labor-based activities, and almost all children in their tenth year are involved in some form of work. Their study also shows that, on average, rural children toiled for 29-30 hours per week in various working activities (Admassie & Bedi, 2003).

Various studies argue that child labor may jeopardize the physical development, health, and human capital formation of child laborers, and this in turn may lead to a cycle of poverty and precarious employment later in life (FAO, 2015). It has been widely recognized that skills and knowledge play valuable roles in the labor markets, explaining much of variations in lifetime earnings (Becker, 1964; Keane & Wolpin, 1997). Recently, in this regard, using dynamic human capital and skill formation frameworks, Cunha and Heckman (2007, 2009, 2010) and Heckman (2006; 2007) have provided extensive theoretical explanations, which might be applicable to this study. The main idea of the frameworks is that human capital investments in early-life are likely to have effects on outcomes later in life. On the subject of self-productivity, which is one of the key elements of the frameworks, they state that "[t]he skills produced at one stage augment the capabilities attained at later stages" (Cunha & Heckman, 2007, p. 35), and that "[…] capabilities are self-reinforcing and cross-fertilizing and that the effects of investment persist" (Heckman, 2007, p. 13252). This means that skills, human capital in general, attained during childhood augment skills and human capital in adulthood. In this regard, while childhood work could be detrimental to lifetime earnings if work impedes the human capital (skills) formation process through schooling, it could also facilitate the same process by providing children with opportunities to learn soft skills and cross-fertilizes with the skills acquired through formal schooling.

However, most child labor-related studies in Ethiopia (Admassie, 2002; Admassie & Bedi, 2003; Cockburn, 2002; Cockburn & Dostie, 2007; Haile & Haile, 2012) focus mainly on its short-term effects such as on child's school enrollment and grade attainment, and the trade-offs. While the long-term effects can be anticipated accordingly, no published empirical work has examined explicitly the long-term penalties on adulthood labor market outcomes such as earnings. Therefore, the major objective in this chapter is to contribute filling this evidence gap. To this effect, a sample of 4-14-year-old rural children, studied in the fifth round of the Ethiopian rural household survey (ERHS) from five rural districts in 1999/2000, were followed-up and tracked after 16 years, in 2015/2016. The findings show that childhood work, in relation to the number of hours worked per week, could significantly and non-linearly affect long-term earnings. The results indicate that an additional hour of childhood work per week may raise earnings by about 13.8 percent in adult labor markets later in life, before it exhibits diminishing returns at about five hours of daily work. However, full-time childhood workers earn substantially lower income later in life compared to schooledchildren. In addition, the study has also found that childhood work could affect adulthood earnings through its differential effects on the likelihoods of completing primary schooling and transiting into non-farm economic activities later in life.

The chapter is organized as follows. The next section presents a review of related empirical literature, followed by theoretical framework, and main model specification. Then, the consecutive sections discuss the results, examine a couple of effect pathways, and reflect upon the robustness of the results. Finally, the conclusions are put forward.

## 5.2 Review of the empirical literature

The bulk of child labor studies focus mainly on short-term associations such as between child labor and schooling outcomes (Chapter Two discusses this strand of the literature). However, different fields of studies stress the presence of strong causal relations between childhood circumstances and how one fares later in life (Currie & Rossin-Slater, 2015). This means that adulthood labor market outcomes such as earnings can be traced to the human capital investments individuals made in their early years. While the current empirical evidence is scant in this regard, there is a growing policy and empirical interest in understanding this aspect. However, identifying the causal effects of childhood work on long-term outcomes is a complex venture, due mainly to the lack of a sufficiently long period of prospective panel data to address the identification challenges that emanate from such as innate abilities, and other unobserved confounders. Although with some shortcomings, few recent and related studies

(Beegle et al., 2009; Beegle et al., 2008; Emerson & Souza, 2011; Ilahi et al., 2005) have tried to unearth insightful findings. Some of these studies use retrospective data (Emerson & Souza, 2011; Ilahi et al., 2005) with the potential for systematic errors due to recall biases. Others use occupational choices to proximate adult labor market outcomes, without complementing it with actual performances such as earnings (Beegle et al., 2009, 2008).

The studies from Brazil exploit the national sample survey of households, *Pesquisa Nacional por Amostra de Domicílios* (PNAD). For instance, Ilahi et al. (2005) use the 1996 version of the PNAD, as well as retrospective information about respondents' childhood labor market participation, to estimate the impact of child labor on lifetime earnings and poverty status. The study has found that early entry into the labor market in Brazil tends to reduce earnings later in life by as much as 13 to 20 percent, and may increase the likelihood of being poor during adulthood by 13 to 31 percent (Ilahi et al., 2005). Using the 1988 and 1996 rounds of the PNAD, and retrospective information on the age at which heads and spouses originally entered the child labor market, Emerson and Souza (2011) have extended Ilahi et al.'s (2005) study and concluded that being a childhood laborer before the age of 12 is associated with a lower level of earnings later as adults. They go on to argue that this negative association could be established due to a potential trade-off between child labor and child educational attainment. In contrast, a study by Beegle et al. (2009) has asserted that child labor is likely to increase wage employment among Vietnamese schoolchildren, based on a revisit conducted after five years. However, the fact that the study focuses on 8 to 13-year-old schoolchildren five years later—when they turned 13 to 18 years—provides less insight on long-term outcomes such as occupational trajectories and earnings. Another study, covering much longer period compared to the above, by Beegle et al. (2008) in Tanzania also shows that child labor may increase the probability of working in farming ten years later. Their study is related closely to our own endeavor by using prospective longitudinal data, but it also differs in some aspects. While our study includes all children between 4 and 14 years old, Beegle et al. (2008) considered 7 to 15-year-old children, arguing for very low child labor among those younger than seven. However, low level of participation does not mean that they do not work at all and necessarily unaffected by their work. Therefore, such age restriction may introduce selection bias in identifying the long-term effects of early exposure to childhood work on human capital formation (education and health), which may ultimately affect earnings. Moreover, unlike our study, Beegle et al. (2008) have examined the chances of children working in farming or wage jobs ten years later, instead of their earnings. Their

approach, thus, does not provide clear evidence regarding children's actual performance in terms of earnings in those occupations conditional on their childhood works.

This study is conducted in rural Ethiopia, where child labor is widely practiced, and yet no empirical evidence on the long-term penalties of childhood work on adulthood earnings is available. The evidence gap, thereby, possibly resulted in a policy disconnect between early and adult human capital policy interventions to improve earnings and reduce poverty. In addition to the discussion on the causal links between childhood work and adulthood earnings, the suggestive pathways through which childhood work could affect adulthood earnings are also identified and discussed.

### 5.3 Theoretical framework

This study follows the theoretical framework developed by Cigno and Rosati (2005), and is modified based on Cunha and Heckman (2009) and Doepke (2013). The framework considers child labor as one of an altruistic parent's sequential domestic decisions. Although Cigno and Rosati (2005) discuss the decision stages from the birth plan until the child enters adult life, this chapter uses only the last two stages, namely school age (stage 2) and adulthood (stage 3). Period 1 in the current study starts when the child reaches school age, the time when parents make children's schooling and work decisions along with consumption. This period determines the stock of early human capital and other assets with which the child will enter adulthood. Period 2 starts when the child has grown-up, entered adulthood, and become an independent decision-maker. However, before children reach school age, parents make several decisions including birth controls and determine the number of births (assumed to be exogenous to our two-period model), children's food and non-food consumption, and parental consumptions (Cigno & Rosati, 2005), together creating some forms of early human capital.

Following Cigno and Rosati (2005) and Doepke (2013), the Becker and Barro (1986, 1988) type of dynastic household utility function can be written as:

$$U = \sum_{i} \left(u_i\left(a_i\right)\right) + \beta U^*\left(c_1, h, y\right)n, \qquad 0 < \beta \leq 1 \tag{5.1}$$

where $a_i$ denote consumption by adult $i$ (incl. parents); $c_1$ and $h$ denotes child consumption (excl. education) and early human capital in period 1, respectively. Adulthood earnings is denoted by $y$ and $n$ is the number of school-aged children (unlike the three-period framework of Cigno and Rosati (2005), fertility in our model is assumed to be exogenous) and all children are assumed to be adults in period 2. Both $u_i(.)$ (adults' utility) and $U^*(.)$ (children's

utility—identically for all children) are increasing and concave. The parameter $\beta$ denotes the degree of parents' altruism towards children.

Following Fan (2004), Edmonds (2007), and Phoumin (2008), it is also argued that child labor (denoted as $l_c$), in addition to education (denoted as $s_c$), can also be one of the strategies parents use to impart occupation-specific skills to their progenies, and through possibly more resources, improved child nutrition, and schooling, child labor may facilitate human capital formation. Accordingly, the child's human capital formation (production), $h$, based on Cunha and Heckman (2009) and Doepke (2013), can be specified using the constant elasticity of substitution (CES) function as:

$$h = h_0 + A\left[\gamma\left(s_c\right)^{\phi} + \left(1-\gamma\right)\left(l_c\right)^{\phi}\right]^{\frac{1}{\phi}} \quad \phi \le 1,\ 0 \le \gamma \le 1 \tag{5.2}$$

$$h \ge h_0 \tag{5.3}$$

where $h_0$ is the non-negative constant innate ability and early human capital stock, $A$ denotes factor productivity, and $l_{c,}$ and $s_c$ denote childhood work and schooling, respectively. The parameter $\gamma$ denotes the proportion of time assigned to schooling and (1 - $\gamma$) for working and used as skill multipliers. Depending on the type and intensity of work, childhood work and schooling could interact harmoniously or adversely. The elasticity of substitution between the two is denoted by 1/(1-$\phi$). Equation (5.2) shows that the stock of child's human capital depends mainly on how parents use children's time between work and schooling in period 1.

In period 2, it assumed that, although in reality some children may still be part of the parents' utility function (5.1), all children left the baseline household (split-off), and as in a dynamic dynastic setting, their utility functions will be identical to their parents' utility function (Doepke, 2013). The earnings function for a typical split-off child in the adult labor markets, assuming no financial transfers to and from parents, is assumed to take the form:

$$y = h\omega = \left(h_0 + A\left[\gamma\left(s_c\right)^{\phi} + \left(1-\gamma\right)\left(l_c\right)^{\phi}\right]^{\frac{1}{\phi}}\right)\omega \tag{5.4}$$

where $\omega$ measures returns to human capital (cognitive and non-cognitive skills). If $\phi$=1, perfect substitutability, $\partial h/\partial l_c = \left(1-\gamma\right)A$ and $\partial y/\partial l_c = \omega\left(1-\gamma\right)A$, implies that while the effects of childhood work on early human capital formation depend on the time allocated for childhood work, its effects on earnings depend on how the adult labor markets reward the skills acquired in addition to the level of childhood work.

The parental consumption in period 2 can be expressed as:

$$a_2 = sr \tag{5.5}$$

where *s* is the amount saved by parents in period 1 and *r* is the interest rate, parents are also assumed to have no transfers to and from split-off children, admittedly a strong assumption.

Moreover, assuming that $E_1$ denotes the sum of parental earnings and assets in period 1, the parents' budget constraint in period 1 is written as:

$$a_1 + [c_1 + Q(h)]n + s = E_1 + w_c(l_c)n \tag{5.6}$$

$$s_0 \leq s \leq s_1 \tag{5.7}$$

where $a_1$ denotes parent consumption in period 1 and $w_c$ measures the opportunity cost of a child's time (child wage rate, shadow wage rate if higher than the market wage). The function *Q(h)* denotes investment in child human capital. The left-hand side denotes the cost of the household with *n* school-aged children and the right-hand side is the disposable income if all members of the family work full-time and children supply $l_c$ labor at $w_c$ marginal wage rate. Thus, given *n*, parents now choose $(a_1, c_1, s, s_c, l_c)$ to maximize utility in period 1,

$$\max_{a_1, c_1, h, s} U_1 = u_1(a_1) + u_2(sr) + \beta U^*(c_1, h(s_c, l_c)\omega)n, \tag{5.8}$$

Subject to equations (5.3) and from (5.5) through (5.7)

Subsistence constraints, $a_1 \geq a_s, a_2 \geq a_s, c_2 \geq c_s$ (5.9)

While the value of returns to human capital ($\omega$) is not yet objectively known, parents are subjectively certain about its future values and can be affected by their attitudes to risk.

## 5.4 Methodology

### 5.4.1 Analytical strategy

The Mincer's (1974) earnings function, which presents wages as a function of schooling and years of experience (quadratic form), serves as a standard starting point for the earnings and schooling literature. Since its introduction, the function has been extended to incorporate other factors that determine earnings, such as school and teacher quality (Card & Krueger, 1992). The study adopts a two-period approach, using a Mincerian-type earnings function that includes childhood work, instead of experiences as in the standard Mincer regression, and schooling in period 1, and adult earnings in period 2.

The expression can be written as:

$$Y_i^2(W,S,X) = \beta_0 + W_i^1\beta_w + S_i^1\beta_s + X\beta_x + \varepsilon_i^2 \quad (5.10)$$

where superscripts 1 and 2 stand for period 1 and period 2, respectively, $Y^2_i$ represents earnings in period 2, $W^1_i$ and $S^1_i$ denote childhood work and schooling (grade attainment), respectively—both in period 1, and $X$ is a vector of relevant observable factors in both periods related to the child, household, and village-specific characteristics. Among others, the model controls for child age, gender, and birth order, household wealth, head-related demographic variables, village distance from the nearest main town, agro-ecology and having a social safety net, child's occupational mobility, and exposure to shocks after the baseline survey.

Equation 5.10, however, is likely to suffer from endogeneity problems, due mainly to unobserved attributes (e.g. child's innate ability, motivation, aspirations, and so on) that affect childhood work and schooling, as well as earnings, and simultaneity between childhood work and schooling decisions. Thus, an OLS model may provide biased and inconsistent estimates for the endogenous variables (Cameron & Trivedi, 2005).

To begin addressing the main endogeneity problem due to unobserved attributes, we write the following equations simultaneously for the endogenous variables:

$$W_i^1 = X_i\varphi_x^w + S_i^1\varphi_s^w + \Pi_i^1\varphi_\Pi^w + \varepsilon_i^w \quad (5.11)$$

$$S_i^1 = X_i\varphi_x^s + W_i^1\varphi_w^s + \left(W_i^1\right)^2\varphi_{w^2}^s + \Gamma_i^1\varphi_{\Gamma i}^s + \varepsilon_i^s \quad (5.12)$$

$$\ln Y_i^2 = X_i\beta_x^y + W_i^1\beta_w + \left(W_i^1\right)^2\beta_{w^2} + S_i^1\beta_s + K_i^2\varphi_{Ki}^y + \varepsilon_i^2 \quad (5.13)$$

where the error terms capture unobserved individual characteristics such as the child's ability, $W^1_i$ denotes the number of hours worked in the previous seven days, $(W^1_i)^2$ denotes hours worked squared, and $S^1_i$ denotes a child's schooling controls (age-adjusted grade attainment). The variable $X$ denotes a vector of time-invariant controls that appear in all the equations. The variables that are included in an equation and excluded from the others are used as internal instruments (Stock and Watson, 2017). We thus include $\Pi_i^1$, $\Gamma_i^1$, and $K_i$, which are specific to childhood work, schooling, and earnings equations, respectively. These variables facilitate the identification of coefficients in the earnings equation.

The hours worked variable has several estimation advantages. It helps to measure the intensity of children's work, explore the potential non-linear associations between children's

work and adulthood earnings, and introduce sufficient variability into the treatment exposure[1]. However, while the age at which children start working could have been alternative childhood work indicator, grade-attainment (the other endogenous variable) is adjusted for the age of the child, which is strongly correlated with the age at which the child started working. Instead, the empirical results are augmented by looking at the associations between different combinations of childhood work and schooling and a childhood work index with earnings[2].

The systems of equations (Equations 5.11 through 5.13) contain endogenous variables in their list of explanatory variables, and so the dependent variables are assumed to be correlated with the disturbances terms. Therefore, these systems of equations are estimated using the three-stage least squares (3SLS) (Zellner & Theil, 1962) estimation method. The approach is a combination of a seemingly unrelated regression (SUR) and two-stage least squares (2SLS) estimations; thus, it has a superior quality in relation to both methods. Unlike the 2SLS approach, 3SLS accounts the fact that the disturbance terms across equations are covariate, taking into account the cross-equation error correlation caused by the simultaneity of endogenous variables. The underlying assumption in this model is that a multitude of unobserved factors, decisions, and actions resulted in the observed endogenous outcomes.

### 5.4.2 Description of the data

The dataset for the chapter comes from the 5$^{th}$ round of the Ethiopian rural household survey (1999/2000) and from the follow-up tracking survey conducted in 2015/2016 (the data is elaborated in the introductory chapter). The follow-up tracking survey was conducted on a total of 789 children. Through a tracking study, 652 children were re-surveyed (17.37 percent individual-level attrition rate) as continuing members of the baseline households, split-off household, or members of other host households, as employees or household members and earnings data were collected. The current chapter thus depends on these re-surveyed children.

## 5.5 Results and Discussion

### 5.5.1 Linking childhood work with adulthood characteristics (2015/2016)

The adulthood characteristics include their migration experiences after the baseline survey, household formation status (split-off), shocks, their current main occupations, and transfer to other occupations from childhood main jobs (Table 37). Through the follow-up survey, it is

[1] Other authors (Beegle et al., 2003, 2009; Beegle et al., 2008; Bhalotra, 2007; Bhalotra & Heady, 2003; Edmonds & Pavcnik, 2005; Haile & Haile, 2012; Heady, 2003; Patrinos & Psacharopoulos, 1995; Phoumin, 2008; Rammohan, 2014) also use hours worked per week to measure child labor.

[2] The indicator variables and the childhood work index construction procedure are included the appendix.

noted that about 24.1 percent of re-surveyed children left the baseline villages and moved to other areas (other rural villages and towns in the same district, other districts both within and in other regions or abroad, discussed in Chapter Four). It is pointed out that while marriage has been the main driver for the majority of village out-migration, mainly for girls, boys are more likely to participate in economic migration, i.e. seeking employment. Such kind of gender-differentiated labor mobility may be driven by ever-shrinking farmland (Gibson & Gurmu, 2012), marriage to consumption smoothing (Rosenzweig & Stark, 1989), and also higher expected income from migration, due to unprecedented urbanization in Ethiopia. Moreover, the study also finds that about 58.6 percent of tracked children, almost three-quarters among girls, split-off from baseline households, and formed their own families.

Table 37. Summary statistics for the main characteristics of tracked targets in 2015/2016

| Adult related variables, 2015/2016 | Pooled | Female | Male |
|---|---|---|---|
| Left the baseline village([b]) | 0.241(0.43) | 0.335(0.47) | 0.153(0.36) |
| Has different occupation from childhood work([b]) | 0.742(0.44) | 0.722(0.45) | 0.761(0.43) |
| Had major shocks after 1999/2000([b]) | 0.595(0.49) | 0.578(0.49) | 0.611(0.49) |
| Split-off from baseline household([b]) | 0.586(0.49) | 0.706(0.46) | 0.475(0.50) |
| *Main adulthood occupations* (*ratios*) | | | |
| Farming | 0.1887 | 0.010 | 0.354 |
| Domestic works (paid and unpaid) | 0.2883 | 0.606 | 0.00 |
| Non-farm jobs (formal and informal) | 0.2592 | 0.211 | 0.304 |
| Family farming or studying | 0.2638 | 0.179 | 0.342 |

*Note: Standard deviations in parentheses; for binary variables ([b]), Yes=1 and No=0.*

The targets' current main occupations demonstrate that while about a fifth of re-contacted children, mainly males, continued working as subsistence farmers, slightly fewer than a third, mainly females, and a further quarter have become domestic workers and non-farm laborers, either self-employed or formally employed, respectively. It is also noted that about three-quarters of the targets currently work in occupations different to those from their childhood. On the one hand, occupational persistence, i.e. continuing to work in similar to the childhood job when an adult, may give them potential experience premiums; on the contrary, it may also mean being in a low-skilled, low-income poverty loop. Children may also boost their earnings through occupational mobility, if they have gained relevant and transferable skills from childhood work augmented with schooling. Thus, the effects of occupational persistence or mobility on earnings as a result of childhood work are ambivalent.

In Table 38, the outcome variable—total annual earnings (in Birr), excluding any transfers—is computed by aggregating earnings from different sources, including from main and additional jobs and migration in the previous 12 months. Accordingly, earnings include total sales from crops and residue, livestock and livestock products, migration, wages from formal jobs and daily labor work. Earnings from selling firewood, dried cow dung, local drinks, and others are also added. The table also presents gender-disaggregated earnings profile across different occupations. The results show that the targets earn Birr 7,153.9 (about 357 US dollars) per annum and that males earn three times more than females. Looking at the earnings by occupation, excluding family farmers and currently studying, those who work in skilled and formal jobs earn more than in any other occupation. Moreover, self-employed adults, such as in petty trade, restaurants, and selling local drinks, and engage in low-skilled jobs, also fare way better than adulthood domestic workers and farmers. However, as De Beyer and Knight (1989) have noted, it needs occupationally-specific wage functions to shed light on the roles of skills and childhood work within different occupations.

Table 38. Current occupations and gender-disaggregated earnings of the re-surveyed targets

| Adult occupations, 2015/2016 | Pooled sample | Earnings by gender | |
|---|---|---|---|
| | | Female | Male |
| Farming | 12,724.6(11,787.0) | 4976.7(1,254.8) | 12,926.7(11,871.9) |
| Domestic workers | 838.2(2,197.2) | 838.2(2,197.2) | - |
| Self-employed in low-skill jobs | 15,884.9(13,122.7) | 11,092.3(7,592.6) | 18,945.2(14,920.7) |
| Skilled/formally employed | 19,639.0(12,892.2) | 15,848.2(7,409.7) | 21,985.8(15,039.3) |
| Studying and family laborer | 1006.9(2,981.8) | 522.0(1,148.9) | 1,233.2(3,507.5) |
| Total annual earnings (Birr) | 7,153.9(11,148.4) | 3,181.0(6,064.7) | 10,821.1(13,317.6) |

*Note: Standard deviation in parentheses; Group mean test by gender for total earnings (P<0.001)*

Constituting about 18.87 percent of tracked children, the average earnings among farmers is about Birr 12,724.6, lower than the earnings from non-farm jobs (self-employed and formal employment). The gender earnings gap within occupations might also be due to gender-skill and technical gaps, on top of several factors associated with the structure of the labor markets. These gender-skill and technical gaps, in turn, can also be traced back to childhood school and work conditions. To substantiate this point, for instance, data on the types of activities children participated in the seven days prior to the survey date show that slightly fewer than half of girls and a third of boys worked on domestic chores. Nonetheless, boys were 2.5 times more likely to work in farm-related activities than girls. These differences in childhood work exposure

highlight potential disparities in children's chances of acquiring useful (transferable and marketable) skills which can be used in adult labor markets. In this regard, it can be argued that working in farming activities may provide relatively better useful skills than domestic chores, if children continue working in the same jobs when adults, though it can also be posited that this could also be hampered by potentially substantial negative effects on studying. What is more, resources ownership in the households, where male household head often controls the resource despite productive roles by women, could also contribute to lower earnings among those who become adulthood domestic workers including housewives. Therefore, although the ultimate effects of the potential skills acquired from childhood work on earnings depend on several factors, including grade progression, job type, and the functioning of labor markets, among others, childhood work could also provide important avenues to help gain experience, enhance early socialization, and establish networks that might be useful later in life. At the same time, working children may also be out of school or compromise their schooling and study time, which in turn could negatively affect their early human capital formation. The ultimate effect on earnings, therefore, is uncertain and open to empirical investigation.

Table 39 shows that schooling is generally associated with higher earnings regardless of occupations. In particular, the earnings of schoolchildren working in low-skilled, non-farm, and self-employment substantially exceed what can be earned by non-schoolchildren.

Table 39. Average earnings grouped by childhood and adulthood main occupations

| Adulthood main occupations (2015/2016) | Childhood main occupations (1999/2000) | | t-test (*t*-value) |
|---|---|---|---|
| | Schooling | Working | |
| Farming | 15,751.6(2,043.2) | 11,786.2(1,433.3) | 1.62 |
| Self-employment or low-skill job | 21,635.8(2,110.5) | 12,948.6(1,273.8) | 3.71*** |
| Skilled/formal employment | 20,566.7(2,521.6) | 12,123.5(2,253.1) | *NA*[1] |
| Total annual earnings (Birr) | 12,143.1(1,015.5) | 6,258.9(550.6) | 5.53*** |

***Note**: Standard deviations in parentheses. Significance levels: *P<0.10, **P<0.05, ***P<0.01*

On the other hand, working children, as their main occupation, perform similarly in farming and low-skilled jobs, and yet they have lower earnings than schoolchildren. The results, generally, signal the merits of schooling in all types of occupations, mainly in non-farming activities. Perhaps due to its inherent nature, and particularly due to lower productivity in the

[1] *Due to limited number of formally employed targets who were mainly working during childhood, it was impossible to conduct mean comparison test with their peers who were mainly attending school.*

sector, the study does not find significant earnings differences between schoolchildren and working-children who continued working in agriculture.

Figure 18 depicts the predicted earnings margins according to childhood work and school participation in each occupation. It elucidates further that schooling, with or without simultaneously working, is generally associated to better earnings when adults. However, work-only children continue to earn less income compared to their peers, even when compared with those who worked while studying. Depending on whether schoolchildren were exclusively studying or combining it with work, the diagram also reveals an interesting finding worth highlighting, in that those who combined schooling and work are better-off working in self-employment compared to school-only children.

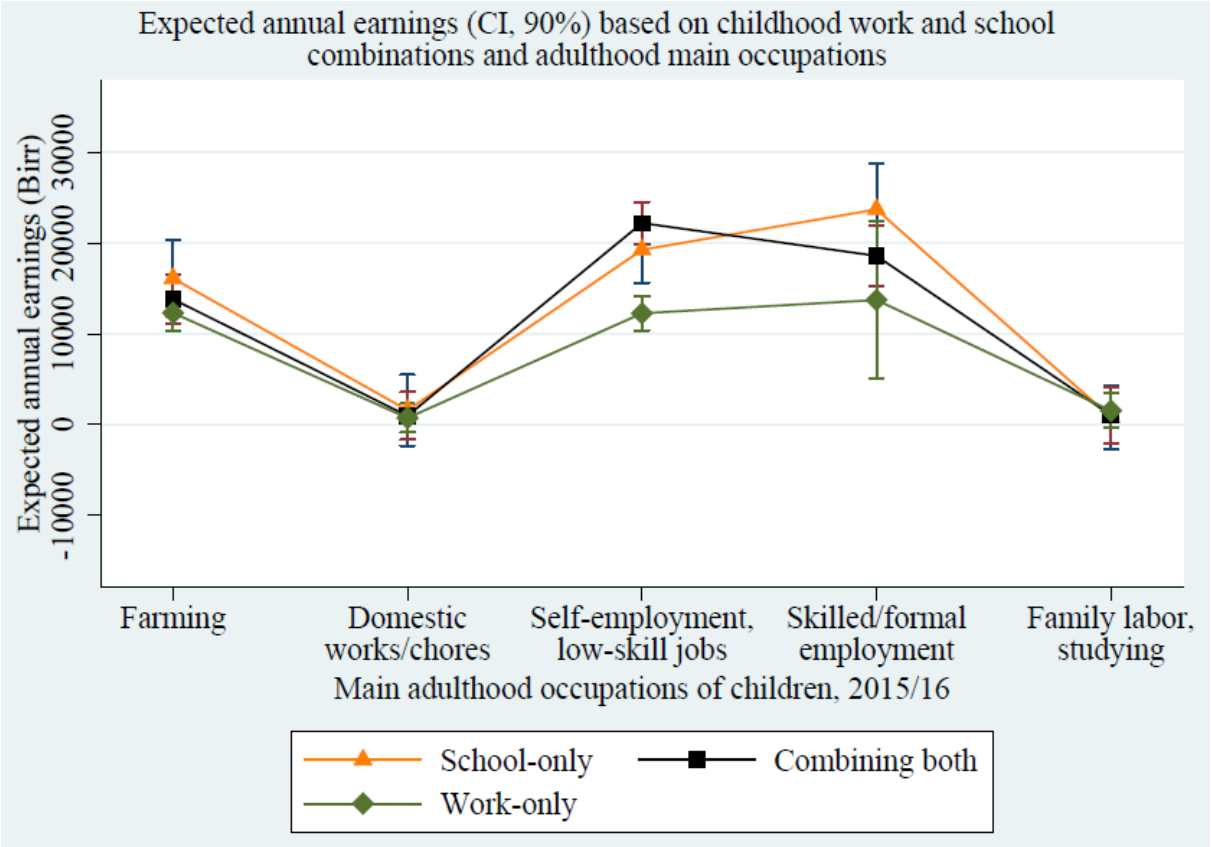


Figure 18. Adulthood earnings grouped by childhood combinations of working and schooling

On the contrary, school-only children working in formal jobs when adults earn better income than their peers who combined both options. This suggests that when work is combined with schooling, it might negatively affect school attainment and result in lower earnings, though the penalty might be limited to children working in the formal jobs when adults. On the contrary, a potential synergy between childhood work and studying is noted for those who work thereafter in non-farm low-skilled jobs; combining both activities (multitasking)

possibly may have helped them to gain entrepreneurial skills. Conceivably, most experiences and skills acquired from childhood work could be more likely used in low-skilled jobs.

The associations between childhood work and adulthood earnings are also examined against parental wealth (Figure 19). The results show mixed evidence that adulthood earnings could be affected by parents' wealth statuses on top of childhood work conditions. It is evident, however, that school-only children from the poorest households (first quintile), followed by the richer ones (fourth quintile), earn by far the highest income compared to school-only peers from other quintiles. On the other hand, multitasking children from middle and more affluent households earn more compared to children from the lower two quintiles (poorest and poor households). The results suggest that the long-term return to combining work and study increases when we go from the poorest to the richest households. However, it is clear that non-school attendance (full-time childhood work) is more likely to lead to lower earnings, regardless of parental wealth statuses.

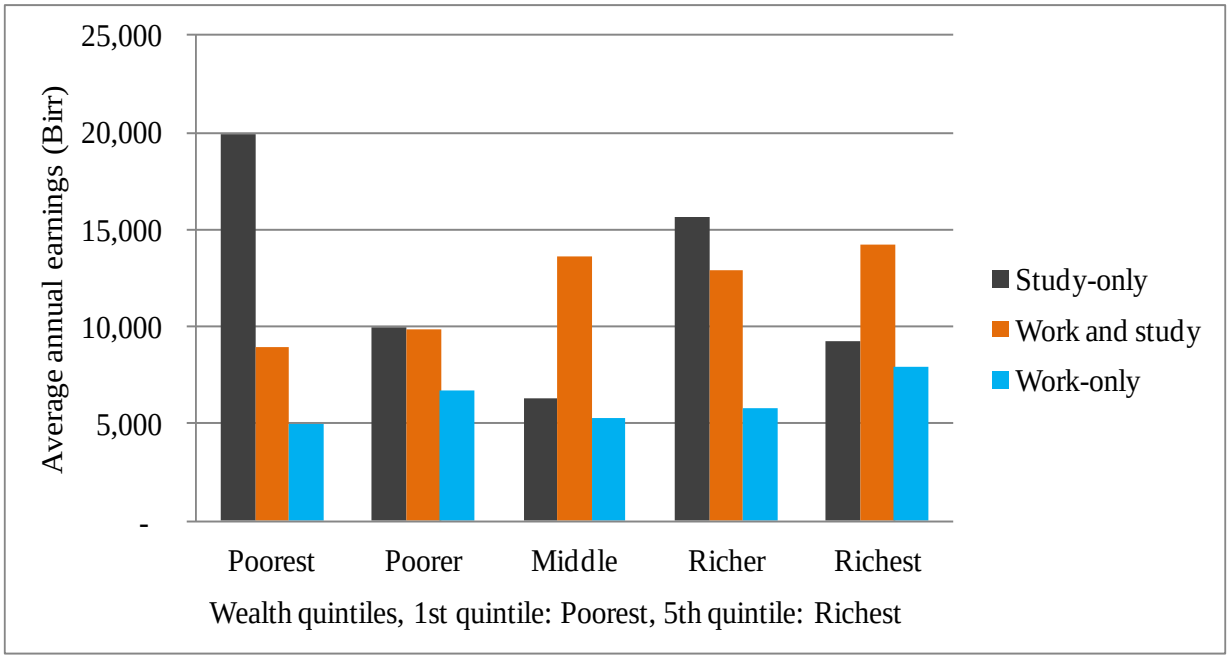


Figure 19. Annual adulthood earnings grouped by parent wealth status and childhood work

The findings also provide important insights into the issue of economic mobility across generations. In view of hat, childhood schooling, mainly when exclusive, seems to be the best strategy for children from the poorest households to move higher up the economic ladder when adults and reduce intergenerational inequality and poverty. However, inequality may persist across generations among the children who combined work and study, although the earnings of such children from the poorest households match those of school-only children

from most affluent parents. While exclusive schooling is most rewarding strategy, childhood work, when combined with study, could be also one of the mechanisms through which mainly children from the poorest households can earn better income in the job markets later in life.

### 5.5.2 The long-term causal effects of childhood work on earnings

***Three-stage least square results***

***Model formulation:*** Three-stage least squares (3SLS) (Zellner & Theil, 1962) estimates childhood work, schooling, and earnings structural equations, accounting for the fact that the equations contain endogenous variables in their explanatory variables. Its estimates also account for the presence of cross-equation interdependences, in that endogenous variables are treated as being correlated with the disturbance terms. The 3SLS uses the generalized least squares (GLS) method to account for the correlation structure in the disturbance terms, and instrumental variables (IV) approach to generate consistent estimates. For comparison purposes, alternative method (SUR and 2SLS) estimates are also reported.

***Model results:*** The results on the earnings structural equation presented in Table 40 are for the pooled sample (Models 1a-3a and 4-5) and disaggregated by the types of childhood work (Models 6-7) and gender (Models 8-9). For the sake of brevity, the hours worked and age-adjusted grade attainment equations for 2SLS and SUR—for the pooled and the disaggregated sample—are not presented herein. The results measure the effects of childhood work on long-term earnings above and beyond its effects on childhood schooling, i.e. grade attainment. The structural equations are independently checked for model misspecifications and any violation of classical regression assumptions, and all the tests ensured that the structural equations are independently well specified and satisfy the basic regression assumptions. Controlling for age-adjusted grade attainment, hours worked has a non-linear and concave type of relationship with adulthood earnings. More specifically, 3SLS estimates show that keeping other factors constant, an hour's increase in childhood work per week, to some extent, could likely increase long-term earnings by about 13.8 percent. The returns to childhood work, however, tend to diminish and become negative after about five hours of daily work in various activities. This signifies that too much childhood work—hours worked, controlling for schooling and other factors—, and assuming the simultaneity of childhood work and schooling decisions, is likely to be detrimental to long-term earnings.

The coefficients associated with hours worked are almost identical, even when the 2SLS approach is employed, where each equation is estimated separately. Nonetheless, taking

into account covariates among the disturbance terms, 3SLS estimates are more efficient than 2SLS estimates. However, assuming the exogeneity of all variables in the left-hand side, the SUR method gives biased estimates, due to the violation of ordinary least square regression assumptions, as a result of which the coefficients include the effects of innate abilities. The SUR underestimates these effects. Therefore, keeping the 3SLS estimates in mind, while the result seems to be in contravention of the general perception that child labor is harmful; it nevertheless, supports the argument that it could also be an alternative way in which children learn relevant skills that can be useful to boost earnings later in life. Childhood work participation may help children develop entrepreneurial spirit, socialize with the world of work through guided work, understand their environment, and establish job networks. In these ways, working children may improve their adulthood earnings. However, as implied by the hours worked squared, childhood work could also be detrimental to long-term earnings, if children previously worked many hours, more specifically beyond five hours per day, perhaps working could interfere with building cognitive skills and general health, or impede school attendance. Other important factors that affect long-term earnings also include gender of the child, parental wealth status in reference to children from the poorest households, and occupational mobility compared to one's main childhood occupation.

Previous related studies have shown mixed results on the effects of child labor on earnings. in Brazil, Ilahi et al. (2005) have found evidence on the positive effects of child labor on occupation-specific human capital formation. However, the study concludes that child labor is likely to have negative cumulative effects on wages and household income, thus raising the likelihood of childhood laborers being poor in later life. On the other hand, in Vietnam, Beegle et al. (2009) have shown that child laborers have a higher chance of being wage workers in the medium-term. They also argue that due to a higher living standard associated with wage work, child laborers could compensate for any loss in schooling through accumulated experiences. In a related study in Tanzania, Beegle et al. (2008) have also noted that male child laborers are largely found in farming, while girls entered into marriage. Extending the work by Ilahi et al. (2005) in Brazil, Emerson and Souza (2011) have concluded that child labor is associated with lower adulthood earnings, mainly for those who worked when younger than 12 years old. Nonetheless, unlike our study, Emerson and Souza (2011) used retrospective data on the child work entry age, which could be affected by recall biases.

Table 40. 3SLS and alternative estimates on the effects of hours worked on earnings

| | 3SLS—pooled sample | | | 2SLS | SUR | 3SLS—Earnings Equations grouped by work type and gender | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variables | (Model 1a) Earnings Eq | (Model 2a) Work Eq. | (Model 3a) School Eq. | (Model 4) Earnings Eq | (Model 5) Earnings Eq | (Model 6) Chores | (Model 7) Farming | (Model 8) Males | (Model 9) Females |
| Hours worked | 0.138*** | | 0.00670 | 0.140*** | 0.0158* | 0.105*** | 0.0516 | 0.140** | 0.0421 |
| | (0.0491) | | (0.0146) | (0.0486) | (0.00922) | (0.0396) | (0.0437) | (0.0563) | (0.0659) |
| Hours worked squared | -0.0019** | | -0.00029 | -0.0020*** | -0.00017 | -0.0012** | -0.00064 | -0.0017** | -0.00039 |
| | (0.00079) | | (0.00024) | (0.00076) | (0.00014) | (0.00059) | (0.00049) | (0.00087) | (0.00113) |
| Age-adjusted grade attained | -0.493 | -36.69* | | -0.487 | 0.0517 | 0.310 | -0.712 | -0.229 | 1.825 |
| | (0.836) | (18.87) | | (0.744) | (0.210) | (1.286) | (0.842) | (0.911) | (1.248) |
| Child is male | 1.282*** | 5.320* | 0.0939 | 1.286*** | 1.242*** | 1.317*** | 0.941*** | | |
| | (0.204) | (2.930) | (0.0718) | (0.198) | (0.157) | (0.251) | (0.293) | | |
| Birth order[1] | | | | | | | | | |
| Second-born | -0.232 | -2.158 | -0.0473 | -0.226 | -0.402** | -0.0929 | -0.475** | -0.0746 | -0.790 |
| | (0.238) | (2.989) | (0.0605) | (0.232) | (0.171) | (0.315) | (0.240) | (0.238) | (0.512) |
| Third-born or younger | 0.00919 | -8.251 | -0.148 | 0.0248 | -0.451** | 0.364 | -0.173 | -0.0353 | -0.409 |
| | (0.375) | (5.874) | (0.128) | (0.358) | (0.210) | (0.511) | (0.441) | (0.348) | (0.637) |
| Wealth quintiles[2] | | | | | | | | | |
| Poorer | 0.125 | 2.352 | 0.0226 | 0.143 | 0.0625 | 0.368 | 0.0523 | 0.0768 | 0.612 |
| | (0.331) | (4.007) | (0.0958) | (0.318) | (0.246) | (0.310) | (0.449) | (0.369) | (0.765) |
| Middle | 0.242 | 12.01* | 0.282* | 0.259 | 0.167 | 0.791** | -0.213 | 0.151 | 0.162 |
| | (0.346) | (6.714) | (0.145) | (0.332) | (0.269) | (0.337) | (0.403) | (0.379) | (0.534) |
| Richer | 0.623* | 10.30* | 0.225** | 0.638* | 0.708*** | 0.891* | 0.176 | 0.320 | 0.969* |
| | (0.352) | (5.573) | (0.107) | (0.347) | (0.259) | (0.473) | (0.428) | (0.414) | (0.508) |
| Richest | 0.607* | 12.01 | 0.281** | 0.614* | 0.719*** | 0.923** | 0.611 | 0.149 | 1.046** |
| | (0.322) | (7.725) | (0.109) | (0.317) | (0.251) | (0.396) | (0.439) | (0.397) | (0.528) |
| Household works in off-farm job | 0.0238 | -1.629 | -0.0303 | 0.0175 | 0.186 | 0.255 | 0.203 | 0.0139 | 0.424 |
| | (0.208) | (3.218) | (0.0562) | (0.204) | (0.150) | (0.320) | (0.290) | (0.267) | (0.389) |
| Adult member left or died (1997-1999) | -0.272 | -5.130 | -0.0235 | -0.271 | -0.438** | -0.109 | -0.187 | -0.0321 | -1.131 |
| | (0.272) | (3.887) | (0.0767) | (0.262) | (0.183) | (0.303) | (0.294) | (0.273) | (0.781) |
| Baseline head is male | -0.132 | 0.524 | 0.0339 | -0.120 | -0.258 | -0.219 | 0.0516 | -0.330 | -0.423 |
| | (0.216) | (4.029) | (0.0852) | (0.215) | (0.168) | (0.315) | (0.255) | (0.337) | (0.423) |
| Baseline mom is literate | -0.0733 | 6.060 | 0.115 | -0.0654 | -0.0655 | -0.145 | -0.0606 | -0.315 | 0.196 |
| | (0.224) | (3.723) | (0.0716) | (0.217) | (0.145) | (0.264) | (0.256) | (0.275) | (0.417) |
| Change in the household size | -0.0620 | 0.0406 | -0.00414 | -0.0630 | -0.0764** | -0.0482 | -0.0428 | -0.0311 | -0.0864 |
| | (0.0423) | (0.703) | (0.0171) | (0.0423) | (0.0363) | (0.0762) | (0.0568) | (0.0677) | (0.106) |
| Village is drought prone | 0.152 | 43.65 | 0.474** | 0.157 | 0.0974 | -0.00311 | -0.145 | -0.269 | -0.274 |
| | (0.318) | (59.03) | (0.199) | (0.293) | (0.170) | (0.537) | (0.483) | (0.360) | (0.398) |
| Soil fertility declines | -0.0665 | 8.353** | 0.100 | -0.0636 | -0.0408 | -0.101 | -0.245 | -0.535 | -0.140 |
| | (0.299) | (3.275) | (0.106) | (0.273) | (0.150) | (0.281) | (0.355) | (0.377) | (0.291) |
| Changed childhood occupation | 0.518** | | | 0.616*** | 0.492*** | 0.699** | -0.122 | 0.00597 | 1.658*** |
| | (0.211) | | | (0.230) | (0.185) | (0.354) | (0.265) | (0.280) | (0.386) |
| RT faced major shocks before age 15 | 0.0163 | | | 0.0331 | -0.0445 | -0.0397 | 0.0386 | 0.131 | -0.232 |
| | (0.171) | | | (0.173) | (0.141) | (0.264) | (0.180) | (0.189) | (0.327) |

*Table 40. Continued.*

| | 3SLS—pooled sample | | | 2SLS | SUR | 3SLS—Earnings Equations grouped by work type and gender | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variables | (Model 1a) Earnings Eq | (Model 2a) Work Eq. | (Model 3a) School Eq. | (Model 4) Earnings Eq | (Model 5) Earnings Eq | (Model 6) Chores | (Model 7) Farming | (Model 8) Males | (Model 9) Females |
| Age of the baseline head | 0.00455 | | 0.00188 | 0.00390 | -0.00222 | 0.00395 | -0.00399 | 0.0125 | -0.0213 |
| | (0.00732) | | (0.00251) | (0.00747) | (0.00557) | (0.0114) | (0.00947) | (0.0105) | (0.0154) |
| Baseline head is literate | 0.0338 | | 0.0669 | -0.00957 | -0.0454 | -0.0694 | 0.0845 | 0.160 | -0.539 |
| | (0.204) | | (0.0625) | (0.203) | (0.143) | (0.286) | (0.290) | (0.221) | (0.436) |
| Split and migration interaction[3] | | | | | | | | | |
| Split but did not migrate | 0.783*** | | | 0.797*** | 0.715*** | 0.808** | 0.535** | 1.087*** | -0.226 |
| | (0.208) | | | (0.239) | (0.168) | (0.324) | (0.254) | (0.230) | (0.437) |
| Split and migrated | 1.064*** | | | 1.068*** | 1.159*** | 1.073*** | 0.861*** | 1.227*** | 0.531 |
| | (0.198) | | | (0.225) | (0.161) | (0.348) | (0.238) | (0.266) | (0.335) |
| Head has phys. health problem | | -0.395 | | | | | | | |
| | | (2.695) | | | | | | | |
| Age of the child at baseline | | 1.185** | | | | | | | |
| | | (0.583) | | | | | | | |
| Household used fertilizer | | 4.224 | | | | | | | |
| | | (4.001) | | | | | | | |
| Village distance from the nearest main town | | -3.335 | | | | | | | |
| | | (6.191) | | | | | | | |
| Village average real wage | | 1.633 | | | | | | | |
| | | (3.294) | | | | | | | |
| Proportion of children in the household | | 17.79 | 0.411* | | | | | | |
| | | (12.75) | (0.213) | | | | | | |
| HH grew new crop varieties | | 0.710 | 0.0588 | | | | | | |
| | | (4.381) | (0.0937) | | | | | | |
| Head expects decline in farm size | | 1.015 | 0.0143 | | | | | | |
| | | (3.200) | (0.0671) | | | | | | |
| Village has no safety net and it has *non-Kolla* agro-ecology | | 20.59 | 0.444** | | | | | | |
| | | (30.46) | (0.197) | | | | | | |
| Village has a religious school | | | 0.424*** | | | | | | |
| | | | (0.153) | | | | | | |
| Head perception on the quality of education in the village school | | | 0.0396 | | | | | | |
| | | | (0.0481) | | | | | | |
| Constant | 5.565*** | -5.537 | -0.859*** | 5.472*** | 6.982*** | 4.719*** | 7.755*** | 6.928*** | 7.260*** |
| | (0.848) | (39.07) | (0.332) | (0.866) | (0.513) | (1.030) | (1.078) | (0.926) | (1.233) |
| Observations | 369 | 369 | 369 | 369 | 369 | 194 | 170 | 240 | 129 |

***Notes:*** *Bootstrapped (100 replications) standard errors in parentheses*

*Significance levels: *** p<0.01, ** p<0.05, * p<0.1*

[1,2,3]*Reference groups: Firstborn sibling, children from the poorest households, and continuing members, respectively.*

The negative association between child schooling and adult earnings, although statistically insignificant, is contrary to the human capital theory—and our expectations. In this regard, although it is long known that educated workers are more productive, Reimers and Klasen (2013) have argued that there could be smaller effects of education on productivity for poorer countries, due to the inherent nature of traditional farming in these less affluent nations. Moreover, the results also indicate that the sample children, at baseline, had very low levels of grade attainment for their ages by any standards, thereby suggesting potentially very little help to boost long-term earnings. It can be recalled from the introductory chapter that children have attained only 21 percent of the highest grade expected for their ages.

***Alternative measurement: Work-school combinations and the childhood work index***

The preceding discussion uncovered the causal effects of childhood work, measured by hours worked, on earnings. While it presents evidence regarding the relationships between hours worked and earnings, it would also be desirable to draw attention to the associations between childhood work measured by combinations of work and study and childhood work index, constructed using principal component analysis (PCA), and adulthood earnings.

Although many Ethiopian rural children combine work and study (Admassie, 2003), its associations with long-term earnings has been studied very little. As pointed out earlier, children are observed as work-only, multitasking, school-only, and inactive (neither studying nor working). Using school-only as a comparison group and excluding inactive children, the results in Table 41 show that work-only children have substantially lower incomes compared to their peers who studied exclusively. However, it is insignificant for multitasking children, in that those who combined work and study during childhood earn, on average, a comparable level of income to their school-only peers. These findings also corroborate the earlier results presented using Figure 18. The findings suggest that compared to school-only children, full-time childhood work is associated with 54.4 and 65.1 percent lower adulthood income for pooled and split-off children, respectively. The fact that the earnings differential between school-only and multitasking children is insignificant also suggests that full-time workers may also earn lower income than their multitasking peers. A number of factors may explain why full-time childhood workers earn considerably less compared to schoolchildren. Among others, the types of adulthood occupations, the likelihood of acquiring relevant skills from childhood work, and the nature of adult labor markets could explain why work-only children may earn significantly lower income than their school-only and multitasking peers.

Table 41. OLS results on the association between work and school combinations and earnings

| Covariates | (1) Pooled | (2) Split-off | (3) Male | (4) Female | (5) Chores | (6) Farming | (7) Poor | (8) Non-poor |
|---|---|---|---|---|---|---|---|---|
| Work–Study Combinations[1] | | | | | | | | |
| Work and study | -0.0707 | -0.224 | 0.122 | -0.164 | 0.300 | -1.456 | -0.654 | 0.113 |
| | (0.258) | (0.265) | (0.340) | (0.473) | (0.749) | (0.976) | (0.521) | (0.326) |
| Work-only | -0.544** | -0.651** | -0.234 | -0.837* | -0.463 | -1.548 | -1.304*** | -0.258 |
| | (0.248) | (0.263) | (0.324) | (0.471) | (0.680) | (0.965) | (0.494) | (0.299) |
| Baseline HH wealth quintiles[2] | | | | | | | | |
| Poorer | 0.260 | 0.305 | 0.378 | 0.288 | 0.376 | 0.224 | 0.112 | |
| | (0.265) | (0.338) | (0.258) | (0.624) | (0.348) | (0.342) | (0.322) | |
| Middle | 0.193 | 0.415 | 0.0807 | 0.162 | 0.492 | -0.186 | | |
| | (0.295) | (0.337) | (0.305) | (0.621) | (0.337) | (0.382) | | |
| Richer | 0.564* | 0.836** | 0.334 | 0.911 | 0.661 | 0.199 | | 0.295 |
| | (0.328) | (0.397) | (0.330) | (0.819) | (0.473) | (0.410) | | (0.251) |
| Richest | 0.733** | 1.107*** | 0.311 | 1.129 | 1.247*** | 0.531 | | 0.529* |
| | (0.330) | (0.394) | (0.361) | (0.818) | (0.465) | (0.418) | | (0.274) |
| Child is male | 1.055*** | 1.408*** | | | 1.048*** | 0.700*** | 1.116*** | 0.946*** |
| | (0.177) | (0.203) | | | (0.238) | (0.226) | (0.360) | (0.225) |
| Age of the child at baseline | 0.0605 | 0.0133 | 0.123*** | -0.0332 | 0.0672 | 0.0700 | 0.0443 | 0.0731 |
| | (0.0367) | (0.0506) | (0.0393) | (0.0881) | (0.0475) | (0.0455) | (0.0653) | (0.0496) |
| Age of the household head | -0.00376 | -0.00945 | 0.00277 | -0.0236 | 0.00655 | -0.00847 | 0.0198 | -0.0180** |
| | (0.00712) | (0.00924) | (0.00772) | (0.0185) | (0.00991) | (0.00894) | (0.0141) | (0.00849) |
| Baseline head is literate | -0.00882 | -0.122 | 0.258 | -0.493 | 0.00322 | -0.0935 | 0.186 | -0.207 |
| | (0.183) | (0.211) | (0.197) | (0.393) | (0.251) | (0.222) | (0.359) | (0.232) |
| Baseline head is male | -0.438** | -0.501* | -0.542** | -0.331 | -0.711** | -0.101 | -1.112** | -0.0920 |
| | (0.220) | (0.278) | (0.251) | (0.459) | (0.316) | (0.259) | (0.459) | (0.258) |
| Village has no PSNP and it has *non-Kolla* agro-ecology | 0.197 | 0.445 | -0.0298 | 1.025 | -0.118 | 0.202 | 0.695 | 0.334 |
| | (0.232) | (0.296) | (0.266) | (0.651) | (0.314) | (0.293) | (0.895) | (0.251) |
| Proportion of children in the HH | -0.682 | -1.088 | 0.360 | -1.493 | -1.895** | 0.309 | -3.551** | 0.880 |
| | (0.619) | (0.772) | (0.687) | (1.835) | (0.913) | (0.703) | (1.438) | (0.767) |
| Change in the HH size | -0.0660 | -0.0808* | -0.0847* | -0.0642 | 0.0339 | -0.0510 | -0.0392 | -0.0942* |
| | (0.0450) | (0.0486) | (0.0487) | (0.121) | (0.0637) | (0.0541) | (0.120) | (0.0510) |
| Adult member left or died | -0.371* | -0.477** | -0.310 | -0.650 | -0.0780 | -0.235 | -0.0870 | -0.219 |
| | (0.190) | (0.214) | (0.213) | (0.430) | (0.237) | (0.243) | (0.446) | (0.236) |

*Table 41. Continued.*

| | (1) Pooled | (2) Split-off | (3) Male | (4) Female | (5) Chores | (6) Farming | (7) Poor | (8) Non-poor |
|---|---|---|---|---|---|---|---|---|
| Head has phys. health problem | -0.0961 | -0.486 | 0.0321 | -0.122 | -0.177 | -0.110 | -0.636 | 0.238 |
| | (0.242) | (0.314) | (0.250) | (0.576) | (0.352) | (0.276) | (0.495) | (0.274) |
| Birth order[3] | | | | | | | | |
| Second-born | -0.326 | -0.451* | -0.104 | -0.994* | -0.297 | -0.295 | -0.370 | -0.223 |
| | (0.214) | (0.258) | (0.219) | (0.549) | (0.345) | (0.293) | (0.474) | (0.237) |
| Third-born | -0.305 | -0.0576 | -0.0805 | -0.683 | -0.0934 | -0.374 | -0.612 | -0.0285 |
| | (0.312) | (0.361) | (0.356) | (0.609) | (0.386) | (0.311) | (0.667) | (0.343) |
| Youngest | 0.188 | 0.789* | 0.315 | 0.0115 | 0.713 | -0.859 | -0.346 | 0.493 |
| | (0.519) | (0.446) | (0.546) | (0.849) | (0.586) | (0.914) | (1.403) | (0.559) |
| Baseline mother is literate | -0.274 | -0.112 | -0.470** | 0.0419 | -0.408* | -0.233 | -0.247 | -0.226 |
| | (0.179) | (0.239) | (0.193) | (0.425) | (0.233) | (0.204) | (0.334) | (0.243) |
| HH uses fertilizer | 0.290 | 0.178 | 0.349 | 0.236 | 0.488* | 0.0574 | 0.670 | 0.121 |
| | (0.191) | (0.210) | (0.212) | (0.389) | (0.255) | (0.222) | (0.436) | (0.213) |
| Average real wage rate | 0.0266 | 0.151* | -0.0831 | 0.236 | -0.0270 | -0.0395 | -0.000511 | 0.0207 |
| | (0.0792) | (0.0852) | (0.0855) | (0.224) | (0.105) | (0.105) | (0.195) | (0.150) |
| Child faced major shock after | -0.242 | 0.0700 | -0.235 | 0.0398 | -0.380* | -0.173 | -0.150 | -0.301 |
| 1999/2000 | (0.151) | (0.184) | (0.165) | (0.352) | (0.213) | (0.184) | (0.325) | (0.199) |
| HH participates in non-farm jobs | 0.112 | 0.197 | -0.0304 | 0.194 | 0.652** | 0.0755 | 0.317 | 0.0561 |
| | (0.184) | (0.207) | (0.205) | (0.463) | (0.286) | (0.224) | (0.333) | (0.250) |
| Village is drought prone | 0.192 | 0.265 | 0.213 | 0.568 | -0.188 | 0.181 | 0.538 | 0.455 |
| | (0.288) | (0.355) | (0.317) | (0.884) | (0.397) | (0.303) | (0.593) | (0.337) |
| Head's perception on educ. | -0.300* | -0.272 | -0.226 | -0.281 | -0.400* | -0.243 | -0.641** | -0.219 |
| quality | (0.171) | (0.210) | (0.180) | (0.399) | (0.240) | (0.191) | (0.318) | (0.215) |
| Soil fertiliy declines | -0.0425 | -0.120 | -0.0508 | 0.0805 | -0.0199 | -0.205 | 0.0198 | 0.00283 |
| | (0.184) | (0.192) | (0.213) | (0.422) | (0.269) | (0.279) | (0.512) | (0.218) |
| HH uses same farm size since | 0.228 | 0.0706 | 0.264 | 0.414 | 0.156 | 0.205 | 0.162 | 0.0764 |
| 1994 | (0.182) | (0.234) | (0.196) | (0.460) | (0.257) | (0.201) | (0.326) | (0.242) |
| Observations | 308 | 216 | 204 | 104 | 178 | 161 | 107 | 201 |
| R-squared | 0.232 | 0.353 | 0.228 | 0.246 | 0.346 | 0.258 | 0.378 | 0.225 |

***Notes:*** *Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;*

[1, 2,3] *Reference groups: School-only, children from the poorest households, and Firstborn sibling, respectively. HH refers to household.*

With regard to adulthood occupations, the study finds that about 42 percent of multitasking, 34 percent of school-only, and 24 percent of full-time childhood working children currently work in non-farm jobs (formal or informal). In contrast, about a third of work-only children are domestic workers, including housewives when adults. Furthermore, it can be also recalled that multitasking children are better-off working in non-farm and low-skilled jobs than school-only peers, thereby suggesting potential synergies between childhood activities and the nature of adult rural and peri-urban labor markets. The finding is consistent with a study in Vietnam by Beegle et al. (2009), who also find that those who worked and attended school during childhood are more likely to be wage earners. The relative magnitudes of the marginal effects of school-only and multitasking on earnings compared to work-only children, however, are conditioned by, *inter alia*, child gender and the wealth status of parents. This study finds that school-only is much more helpful in boosting long-term earnings among children from poor households, based on the wealth index (lower two quintiles, constituting about 34 percent after weighting) (Model 7), and girls, corroborating the descriptive result depicted in Figure 19.

This study also introduces a unique childhood work measurement approach, namely the childhood work index[1]. Controlling for other covariates, and compared to non-working children, it finds that children with moderate work indices seemed to earn better wages in the long term (Table 42). The results are heterogeneous by child gender, work type, and parental poverty status. In Chapter Four, it was found that high-intensity working children compared to non-working peers are more likely to stay in villages—implying lower adulthood earnings.

Table 42. OLS results on the association between childhood work index and earnings

| Covariates | (1) Pooled | (2) Male | (3) Female | (4) Chores | (5) Farming | (6) Poor | (7) Non-poor |
|---|---|---|---|---|---|---|---|
| Childhood work index[1] | | | | | | | |
| Low-intensity | 0.358 | 0.338 | 0.626 | 0.413 | -0.371 | 0.580 | 0.155 |
| | (0.220) | (0.247) | (0.566) | (0.323) | (0.350) | (0.424) | (0.287) |
| Moderate-intensity | 0.546*** | 0.443* | 0.474 | 0.800** | -0.160 | 1.013** | 0.343 |
| | (0.209) | (0.239) | (0.453) | (0.322) | (0.319) | (0.448) | (0.235) |
| High-intensity | 0.342 | 0.276 | 0.434 | 0.695** | -0.495 | 0.818* | 0.0967 |
| | (0.215) | (0.253) | (0.408) | (0.288) | (0.336) | (0.418) | (0.252) |
| Observations | 369 | 240 | 129 | 227 | 170 | 133 | 236 |
| R-squared | 0.233 | 0.215 | 0.273 | 0.260 | 0.276 | 0.346 | 0.188 |

***Notes:*** *Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;*

*[1] Reference group: No-work.*

*The models also controlled age-adjusted grade attainment and all variables presented in Table 41.*

[1] *The list of indicator variables, their description, and the construction of the index is included in Appendix 2.*

Looking at disaggregated estimates based on activity, the results show that while those mainly farm-worker children at childhood, of different intensity, do not earn significantly different income compared to their non-working peers, those who toiled for moderate and high-intensity —mainly in domestic chores—earned significantly higher income when adults. In the same way, it is also noted that children from poor households could be better off working moderate and above intensity of work instead of being inactive to boost their long-term earnings. These results show that while moderate-intensity of childhood work seems to be often tolerable level of work to improve earnings, some groups of children are even better off working at higher intensity. Perhaps, these children, as would be the case for those from poor households, may use the income from work to pay for schooling, food, and health services.

The findings, in general, suggest rethinking the child labor issue and signal the need for an alternative definition. For instance, in the UNICEF's definition, child laborers are those "(a) children 5 to 11 years of age that during the week preceding the survey did at least one hour of economic activity or at least 28 hours of domestic work, and (b) children 12 to 14 years of age that during the week preceding the survey did at least 14 hours of economic activity or at least 42 hours of economic activity and domestic work combined" (UNICEF, 2005). This study draws attention to new dimension to be taken in relation to this: Combining not only the work intensity and type of work, but also the schooling status of children in child labor definition. This makes the definition more policy-relevant and suitable for settings such as Ethiopia. The findings of this study show consistently that childhood work is likely to be detrimental to long-term earnings, in addition to working too many hours or high-intensive work participation in several jobs, if it is not accompanied by childhood schooling.

### 5.5.3 Potential mechanisms linking childhood work and earnings

One of the most important policy-relevant questions in the causality analysis is identifying how childhood working affects the outcome variable. The study also identifies the potential channels through which the effects of childhood work could link to long-term earnings. Childhood work may affect long-term earnings via several channels. It could improve adulthood earnings by increasing the likelihood of a child's progression in schooling and reduce the risk of dropout before completing key education milestones due to financial constraints, improve the probability of occupational mobility later in life, or help building better and relevant social networks. However, childhood work could also potentially result in health shocks due to on-the-job injury, interference with schooling, and the development of

chronic health problems which ultimately could reduce adulthood earnings potentials. Below, the study presents the effects of combining work and study during childhood on two possible mechanisms which may ultimately explain how full-time childhood work can be detrimental to long-term earnings, while school-only or combined with work could boost earnings.

***A. Long-term school progression***

Table 43 presents the summary of the long-term school progression based on work and study combinations. As one might expect, the average grade attainment among schoolchildren after 16 years exceeded that of work-only children by more than three years. One of the interesting insights here is that children who combined work and study are ahead of even school-only children by about one year. Moreover, school progression disparity also becomes clearer in terms of completing key education levels. While schoolchildren are more likely to complete four-year and eight-year educational programs, work-only children continue to lag behind. Furthermore, it is also noted that while about 86 percent of multitasking children have completed four years (first-cycle primary), slightly above half of such children also completed eight years (second-cycle primary) of education, which is akin to the national average levels. These values are disproportionately lower among full-time childhood working children.

Table 43. Completion of key education levels when adults by childhood work

| | | Childhood work and school combinations | | |
|---|---|---|---|---|
| Long-term schooling characteristics | Pooled sample | School-only Children | Both work & school children | Work-only children |
| Average grade attainment (years) | 5.8(4.2) | 7.5(3.6) | 8.4(3.6) | 4.3(3.9) |
| Four-year school completion (%) | 62.3 | 79.5 | 86.1 | 46.8 |
| Primary school completion (%) | 28.1 | 38.4 | 53.0 | 16.2 |

*Note: Values in the parentheses are standard deviations. The values exclude children who are neither in school not working during the baseline survey.*

The Sobel-Goodman mediation test is used to estimate the completion of primary school as one of the pathways between childhood work-school combinations and adulthood earnings, reported using Tables 44 and 45. Results for work-only children (Table 44) compared to others, as illustrated in Table 43, suggest that working full-time during childhood results in about a 37.27 percent lower probability of attaining eight years of schooling compared to other children, and to about 41.61 percent lower earnings. Regressing earnings (dependent

variable, DV) on work-only (independent variable, IV) and completion of eight-year schooling (mediator variable, MV) leads to insignificant IV effects, while the effect of the MV becomes stronger. The Sobel-Goodman mediation test shows that the completion of primary schooling mediates about 47.6 percent of the total negative effects of full-time childhood working on earnings later in life.

Table 44. The effects of full-time working on long-term earnings through human capital formation for pooled sample*: Sobel-Goodman test*

| | Earnings | | 8-year schooling | |
|---|---|---|---|---|
| | Coefficient | Std. Err. | Coefficient | Std. Err. |
| ***Path c:*** Work-only | -0.4161*** | (0.150) | | |
| ***Path a:*** Work only | | | -0.3727*** | (0.0460) |
| ***Paths b and c':*** 8-year schooling | 0.5315*** | (0.1759) | | |
| Work only | -0.2181 | (0.1702) | | |
| ***Sobel-Goodman Mediation Tests*** | | | Coefficient | Std. Err. |
| Sobel | | | -0.198*** | 0.0699 |
| Indirect effect | | | -0.198*** | 0.0699 |
| Direct effect | | | -0.218 | 0.1617 |
| Total effect | | | -0.416*** | 0.1496 |
| Proportion of total effect that is mediated | | | 0.4760 | |

***Note****: Significance levels: *P<0.10, **P<0.05, ***P<0.01; Model with mediator regressed on IV (path a), Model with DV regressed on IV (path c), Model with DV regressed on mediator and IV (paths b and c')*

In Table 45, the results also show that combining work and study compared to other children (work-only and school-only together) is associated with a 31.85 percent higher probability of attaining eight years of schooling, and about 40.68 percent higher earnings. The Sobel-Goodman mediation test suggests that completing primary school mediates about 42.98 percent of the total effects of combining work and study on adulthood earnings. The long-term progression in human capital accumulation by multitasking children supports the presence of potential synergies and complementarities between childhood works and study, which may boost earnings. This synergy is similar to what is known as "skills complementarities" (Heckman, 2007).

Table 45. The effects of combining work and study on long-term earnings through human capital formation for pooled sample

| | Earnings | | 8-year schooling | |
|---|---|---|---|---|
| | Coefficient | Std. Err. | Coefficient | Std. Err. |
| ***Path c:*** Combined work & school | 0.4068*** | (0.158) | | |
| ***Path a:*** Combined work & school | | | 0.3185*** | (0.0501) |
| ***Paths b and c':*** 8-year schooling | 0.5489*** | (0.1702) | | |
| Combined work & school | 0.2320 | (0.1650) | | |
| ***Sobel-Goodman Mediation Tests*** | | | Coefficient | Std. Err. |
| Sobel | | | 0.175*** | 0.061 |
| Indirect effect | | | 0.175*** | 0.061 |
| Direct effect | | | 0.232 | 0.165 |
| Total effect | | | 0.407** | 0.158 |
| Proportion of total effect that is mediated | | | 0.4298 | |

***Note****: Significance levels: *P<0.10, **P<0.05, ***P<0.01; Model with mediator regressed on IV (path a), Model with DV regressed on IV (path c), Model with DV regressed on mediator and IV (paths b and c')*

***B. Social networks and long-term occupational mobility***

Primary school completion cannot be the only channel that links childhood work and adulthood earnings. Childhood circumstances, i.e. work and schooling participation, could also affect children's social capital formation and their occupational trajectories. Among the tracked targets, the study finds about 51 percent mobile phone ownership, more than 70 percent of targets changed their childhood occupation, and about 26 percent non-farm jobs participation. It is also noted that while there are no significant differences in terms of the overall occupational transition from childhood to adulthood by gender, girls are less likely to own mobile phones and work in farming or non-farming jobs compared to boys later in life. In fact, most girls are housewives during adulthood. It is argued that long-term occupational trajectories could be influenced by childhood decisions regarding the type and extent of work participation and schooling, which in turn is the result of parental decisions and other factors. Parents, on the other hand, may put children to work or send them to school, taking into account both the current benefits and future expected earnings, as indicated in the theoretical framework.

In Figure 20, it is shown that multitasking children are more likely to own mobile phones and change their childhood occupation to non-farming jobs compared to work-only

peers. However, it seems that school-only and multitasking children follow almost similar paths in this regard. The results suggest that childhood work and school participation could be a point of early departure for long-term occupational trajectories among the sample children with far-reaching consequences such as to earnings potential in adult labor markets.

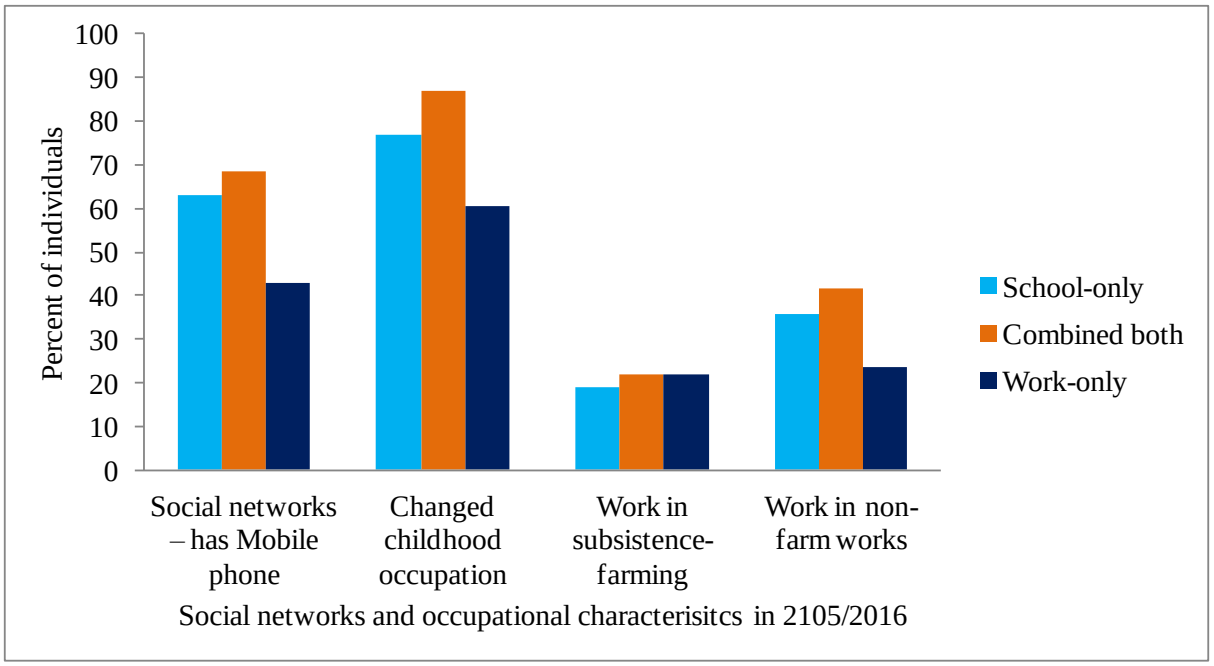


Figure 20. Social networks and long-term occupational mobility of children by childhood work and schooling participation

The associations between childhood work indicators and earnings via the long-term transition to non-farm jobs have been tested using the Sobel-Goodman mediation test (Tables 46 and 47). The results show that the probability of transiting to a non-farm occupation later in life could mediate some of the total effects of childhood full-time working and multitasking on earnings. Unlike primary school completion, examined previously, alternative combinations of work and study have significant direct effects even after we control for occupational transitions to non-farm work, meaning that this channel mediates only some proportion of the total effects of work and school combinations on adulthood earnings.

Table 46. The effects of full-time childhood work on transition to non-farm jobs and adulthood earnings

| | Earnings | | Non-farm | |
|---|---|---|---|---|
| | Coefficient | Std. Err. | Coefficient | Std. Err. |
| ***Path a:*** Work only | | | -0.1364** | (0.0540) |
| ***Path c:*** Work-only | -0.4161*** | (0.150) | | |
| ***Paths b and c'*** | | | | |
| Non-farm | 1.156*** | (0.1378) | | |
| Work only | -0.2582* | (0.1374) | | |
| ***Sobel-Goodman Mediation Tests*** | | | Coefficient | Std. Err. |
| Sobel | | | -0.158** | 0.0653 |
| Indirect effect | | | -0.158** | 0.0654 |
| Direct effect | | | -0.2582* | 0.1374 |
| Total effect | | | -0.416*** | 0.1496 |
| Proportion of total effect that is mediated | | | 0.3795 | |

***Note**: Significance levels: *P<0.10, **P<0.05, ***P<0.01.*

Table 47. The effects of combining work and study on transition to non-farm jobs and adulthood earnings

| | Earnings | | Non-farm | |
|---|---|---|---|---|
| | Coefficient | Std. Err. | Coefficient | Std. Err. |
| ***Path a:*** Combined work & school | | | 0.1361** | (0.057) |
| ***Path c:*** Combined work & school | 0.4068*** | (0.158) | | |
| ***Paths b and c'*** | | | | |
| Non-farm | 1.1624*** | (0.1379) | | |
| Combined work & school | 0.2486* | (0.1448) | | |
| ***Sobel-Goodman Mediation Tests*** | | | Coefficient | Std. Err. |
| Sobel | | | 0.158** | (0.069) |
| Indirect effect | | | 0.1586** | 0.069 |
| Direct effect | | | 0.2486* | 0.1448 |
| Total effect | | | 0.407** | 0.1580 |
| Proportion of total effect that is mediated | | | 0.3888 | |

***Note**: Significance levels: *P<0.10, **P<0.05, ***P<0.01.*

The result could be driven by the fact that school-only and multitasking children demonstrate similar trajectories in terms of social network and occupational mobility indicators. Yet, the

Sobel-Goodman mediation test suggests that about 37.95 percent of the total negative effects of full-time childhood work on earnings could be mediated by adulthood inability to transit to non-farming jobs. Furthermore, the results presented in Table 47 also indicate that about 38.88 percent of the total positive effect of combining work and study on earnings is mediated by the probability of transiting to non-farming jobs when adults. The findings generally revealed that the effects of how children used to combine work and schooling on earnings can also be established through affecting the occupational mobility of children when adults, and mainly to non-farm jobs.

### 5.5.4 Robustness of the findings

The inference on the causal effects of childhood work on adulthood earnings might be biased if children self-select or the government purposively enrolls out-of-school children for skills training and adult education, or employs them in low-skilled jobs such as in public work programs when adults. These interventions in the adult labor market, targeting adults and youths, might help remedy the skills gap, due to lower levels of schooling, or skill mismatches, as a result of poor quality of education. While this could boost their earnings, at the same time it may also obscure the causal inferences in this study.

Institutional reforms and regulations related to schooling may change work and study interactions. Moreover, external factors such as demographic changes and economic growth, as well as their interactions and the institutional environment, may also affect the transition of youths into employment (Biavaschi et al., 2012). These, in turn, may affect youths' earnings potential and wage rates in the labor markets, against which our estimations may not be robust. Regarding policy changes, for instance, in 2005, the Ethiopian government instilled changes in the school day, from 8:00 to 12:15, to a full day (mostly from 8:30 to 15:30). This change resulted in a reduction in the proportion of primary schools operating in a shift system nationally, from 38.5 percent in 1999/00 (MoE, 2000b) to about 26.5 percent in 2009/10 (MoE, 2010b). The policy almost doubled schooling time (instruction plus breaks), meaning that children had to cut down their work hours or undertake higher workloads. Therefore, in this situation, the estimation using the 1999/2000 survey as baseline may not hold robustly for working children in, say, 2009. Furthermore, the positive effects of childhood work on earnings could also be altered by future technological changes in the economy and by the demand for specific skills.

## 5.6 Conclusions

This chapter has examined the long-term effects of childhood work on earnings, in a first attempt to unravel the inter-temporal penalties of child labor on labor market outcomes in rural Ethiopia. The results show that childhood work non-linearly affects adulthood earnings. It is found that an hour's increase in childhood hours worked per week could boost earnings by about 13.8 percent later in life, but children may face diminishing returns for excessive levels of work, i.e. more than five hours of work per day. The study has also identified and described how childhood work could affect earnings through completion of primary education and transiting to non-farming occupations when adults. There seem also potential synergies between working and schooling, and hence multitasking children are able to boost their adulthood earnings much better compared to their peers. The study argues that multitasking children may have developed entrepreneurial spirits and gained occupation-specific skills, thereby increasing their ability to shift easily to productive non-farming jobs later in life.

The findings challenge the common assertion that child labor is bad for children's development. Instead, the results suggest that in this research setting, childhood work may have provided alternative avenues for rural children to learn relevant skills to be used later in their lives. Thus, beyond appropriate regulations to eliminate full-time childhood work, any coercive policies such as a blanket ban on child labor or generally preventing children from participating in lower intensity works, without investing in schooling, could be self-defeating or counterproductive.

The findings imply alternative policy mixes that target early human capital formation, and compensating and remedial policies for adults. In this regard, in order to control full-time child work, compulsory education could be combined with conditional cash transfer to poor households and school feeding programs, as well as other incentives such as parents being rewarded for their child's achievements. These early interventions, however, have to be accompanied and sustained by compensating and remedial policies for youths and adults, including access to skills training and employment expansion for low-skilled adults in the adult labor markets.

## 6. General conclusions and policy implications

### 6.1 General conclusions

In Ethiopia, children participate widely in different kinds of work, with or without attending school. Recent national representative studies have shown that a quarter of Ethiopian children are child laborers of which one in every three works full-time. Currently more children than ever before also combine schooling with work. Various studies argue that child labor may jeopardize children's physical development, health, and human capital formation, which in turn may lead to a cycle of poverty and precarious employment later in life. Other studies, on the contrary, claim that child labor might bring more resources into a family and improve child nutrition and schooling. In this regard, evidence show that although net primary school enrollment in Ethiopia increased three-fold—to almost 90 percent over the last decade—more than half of the children drop out of school to join the labor markets before completing their primary education. As a result, lower educational attainment, high illiteracy rates, and low technical skills continue to characterize the Ethiopian labor force. Employing about three-quarters of the country's labor force, for example, inadequate human capital development has severely hindered the agricultural sector and rural developments in the country. Notwithstanding, previous empirical studies focus on the short-term implications of childhood work on children's educational outcomes, and limited evidence is available with regard to the effects on adulthood outcomes. Therefore, this study examines the consequences of childhood work participation in rural Ethiopia on children's long-term human capital formation, migration decisions, and adulthood earnings. The data come from a tracking survey of a sample of 4-14-year-old rural children re-surveyed 16 years later, in 2015/2016, after the baseline survey, in 1999/2000.

In addition to presenting in-depth community level accounts of the changes in key variables of interest, the study also devotes a background chapter to discussing the short-term associations between childhood work and schooling outcomes. Although in one way or another related studies have been conducted in Brazil (Emerson & Souza, 2011; Ilahi et al., 2005), Tanzania (Beegle et al., 2008), Vietnam (Beegle et al., 2009), and Senegal (Dumas, 2012), this study is the first empirical attempt to link childhood work and schooling conditions with long-term human capital formation, migration decisions, and labor market outcomes in the Ethiopian context. With regard to the measurement strategies, childhood work was measured in three different ways: The number of hours worked in the previous seven days, the age at which the child started working, and mutually exclusive combinations of work and study. Additionally, the thesis has also introduced a novel approach to measure child labor that has not been used before, namely the childhood work index, constructed using

principal component analysis. Its primary aim is to complement the main analyses, partly addressing the limitations associated with most of the childhood work indicators. Depending on the time horizon, education outcomes included childhood enrollment and age-(un)adjusted completed years of schooling, on the one hand, and enrollment, adulthood grade attainment, and the completion of key education milestones when adults, on the other.

With the twin objectives of understanding the short-term associations between childhood work and schooling outcomes, on the one hand, and of setting the background for the subsequent chapters, on the other, the thesis started with a descriptive discussion on the associations between childhood work and schooling outcomes. Among a number of useful insights, the study finds that the hours worked increase in line with the age of the child, boys and girls tend to allocate their time differently in productive activities and domestic chores, and full-time childhood work has an inverted-U association with household wealth. It is also found that poverty may play a key role in the decision leading up to childhood work and schooling, mainly in relation to the nature of work and study combinations. The chapter also presents some useful inquires related to the long-term effects of childhood work on human capital formation and labor market outcomes, and points to some contending views in this regard. However, despite the differences in relation to the potential effects of childhood work, key theoretical works (Becker, 1964; Ben-Porath, 1967; Cunha & Heckman, 2007; Mincer, 1995) and policy evaluations have asserted that childhood is a critical life stage, whereby investment in human capital and any other interventions have persistent and profound impacts on long-term human capital and labor market outcomes such as earnings (Carneiro & Heckman, 2003; Heckman, 2000; Schultz, 1972).

Taking the theoretical arguments into account, the study then identifies the long-term causal effects of childhood work on children's schooling progression, measured after 16 years. The random-effects Poisson regression model has been estimated in order to analyze the education progression, measured by completed years of education, while the random-effects ordered logit model is employed to examine long-term transitions over school-cycles, namely between first-cycle primary, second-cycle primary, high schools, and preparatory. The results show that full-time childhood work may lead to significantly lower long-term human capital formation. Underlining the condition that work and study might not be mutually exclusive, the study finds that children who combined work and study accumulate a higher level of human capital compared even to school-only peers. These findings challenge the widely accepted and long-held wisdom that child labor hinders long-term school progression.

Moreover, in contravention of the child labor definition of 14 years as a cut-off age, the study presents evidence that while the age at which the child started working indeed plays a crucial role in long-term child development, children who did not participate in either domestic chores or farming-related activities after the age of seven, while have enrolled in school, are found at lower school-cycles when adults. The effects, however, are heterogeneous according to child gender and work type. A similar effect has been found by Dumas (2012) in Senegal, though it is contrary to the findings by Beegle et al. (2009) in Vietnam and Beegle et al. (2008) in Tanzania. Dumas (2012) has found a positive effect of child labor (economic activities) on cognitive achievement, measured by test scores eight years later in Senegal. Nonetheless, in related socioeconomic settings, Beegle et al. (2008) and Beegle et al. (2009) have found a number of detrimental effects of child labor on school enrollment and attainment after ten and five years, respectively.

Taking the human capital discussion further in a somewhat different direction, and within the framework of child work and education as forms of human capital investment for future or prospect long-term migration (Schultz, 1972; Stark, 1991), the study identifies the effects of childhood work and schooling on village out-migration decisions made later in life. It was found that village out-migration decisions is dominated by females and, relatively, by schoolchildren. Using a doubly robust estimation technique and attaining balance on observables, the results show that full-time childhood work may hold back children in villages later in life compared to schoolchildren. The findings also imply that while full-time childhood laborers are more likely to continue farming when adults, schoolchildren are relatively more likely to out-migrate from the villages. Using childhood work index, the study also finds that high-intensity working children—about 90 percent of full-time workers do belong to—, tend to stay in the villages, working in subsistence farming and earning lower income compared to non-working peers. On the other hand, those who combined work with study are more likely to out-migrate from villages to seek employment. It is, thus, argued that childhood work, when combined with study, in consonance with the human capital theory of migration (Sjaastad, 1962), may have provided them with the opportunity to gain transferable and marketable skills and build their entrepreneurial spirit, thereby encouraging them to out-migrate and work in non-farming economic activities. In addition to non-farm-relevant human capital, other factors such as expected migration income and relative deprivation (Stark & Taylor, 1991b) may also explain the higher likelihood of village out-migration by multitasking children later in life.

However, contrary to the imperfect credit and risk markets argument (Stark & Bloom, 1985; Stark & Taylor, 1991a), in which poorer families are disproportionately affected, the study does not find an increasing proportion of children from the poorest households compared to those from other parental wealth groups in the aggregated migrant population. Accordingly, in addition to commonly known drivers of labor migration, the study presents new evidence that childhood work and schooling participation may also affect children's long-term migration decisions. Consequently, the homogeneity assumption in childhood conditions while studying adulthood migration may oversimplify the labor migration decisions. The findings imply that investment in schooling might be as relevant as enabling youths to out-migrate from rural areas and is likely to cross-fertilize with childhood work.

After identifying the long-term human capital and migration effects of childhood work, the study finally examines its prime objective—the long-term effects of childhood work on earnings. In order to address the endogeneity problem, primarily due to unobserved factors and simultaneity between childhood work and schooling, a three-stage least squares (3SLS) method is used as the main analytical approach. The method accounts for cross-equation interdependences and the fact that endogenous variables (childhood work, schooling, and earnings) are treated as correlated with disturbance terms. Unlike the instrumental variables approach, the method also allows specifying the control variables for each equation. Recalling the earlier conclusion that excessive and exclusive childhood work could be detrimental to long-term human capital formation and mobility away from the villages, it is found herein that an extra hour of childhood work per week could boost adulthood earnings by as much as 13.8 percent. However, the effect may have diminishing returns when work is excessive, i.e. working more than five hours a day. This means that when childhood work is excessive or exclusive, it might result in lower adulthood human capital, impede mobility, and ultimately could also reduce earnings.

Moreover, the study also shows that there seems to be potential synergies between work and study as observed from multitasking children who have earned much higher income, mainly in non-farm low-skilled jobs compared to work-only and school-only peers. It is argued that the former children may have acquired non-farm job-relevant skills that enhanced their ability to shift easily to productive non-farming jobs when adults. In this regard, the study finds that having childhood work experience in the current main occupation was negatively associated with earnings for girls, possibly due to the nature of their current job, most of whom were housewives, and partly due to lack of relevant skills gained from

their childhood work to participate in productive sectors. Furthermore, the findings in the successive analytical chapters using childhood work-entry age show invariably that entry into childhood work before the age of seven could be detrimental to long-term human capital formation, and may deter the ability to out-migrate from the village later in life. The study also presents suggestive evidence that childhood work could affect long-term earnings by affecting the odds of completing primary education and shaping occupational trajectories, mainly in relation to non-farming jobs.

Adding reflections further on those who combined work and study, while children who studied either exclusively or combined with work realize higher income than work-only children, their performance varied according to adulthood occupations. School-only children have fared better in skilled-based jobs, and those who combined work and study are better off working in self-employed non-farming jobs. This suggests that with proper monitoring, to avoid full-time and highly intensive child work, children may be allowed to participate in family farming and non-farming jobs to prepare them for a better transition to non-farming employment when adults. Yet, more effort should be put into providing quality education. As long as children are enrolled in school, the long-term detrimental effects of childhood work on long-term school progression could be minimal. However, excessive childhood work (full-time or exclusive, high-intensity or intensive, or long work hours or excessive) may result in long-term school non-enrolment, early dropouts, lower grade attainment, and, perhaps, premature role transitions in the family. For instance, children may dropout to take up adult duties or early marriage. In this regard, the study finds that work-only girls tend to get married and remain in their rural villages than multitasking peers. On the contrary, the results suggest that working while schooling might provide children with the opportunity to socialize with the world of work, and build social capital, they are less likely to suffer from social disability unlike others, mainly work-only peers, and more likely to succeed in their schooling.

Previous studies conducted in some countries under similar settings have reported mixed evidence. In Brazil, Ilahi et al. (2005) have found that early entry into the labor market may reduce lifetime earnings, and likely to increase the chances of being poor when adults. However, Ilahi et al. (2005) also identify evidence that child labor has potential positive effects on occupation-specific human capital formation and leads to higher hourly wages. Their work was extended by Emerson and Souza (2011), who have reported non-linear effects of child labor on adulthood earnings, whereby early entry into work (before the age of 12) may reduce earnings. In an African rural setting, a study by Beegle et al. (2008) in Tanzania

shows that while child labor tends to increase the probability of working in farming 10 years later, male laborers are found largely in farming activities and girls got married. A similar analysis conducted in Vietnam by Beegle et al. (2009) also concludes that children who worked and attended school are more likely to be wage earners after five years. They argue that due to the higher living standards associated with wage work, child laborers are more likely to compensate for any loss in schooling through accumulated experiences. Their results support our finding that multitasking children are more likely to join non-farming works (mainly low-skilled) compared to full-time childhood workers and school-only children

### 6.2 Policy implications

Given the evidence in the respective long-term analytical chapters, the study highlights a set of policy implications, mainly in light of national growth and development objectives and relevant international development agreements and declarations. More specifically, it frames the implications in relation to attaining education for all (EFA) program and the sustainable development goals (SDGs) on universal primary education declarations from international development pledges, and poverty reduction, youth development (education, skills building, and employment), and structural transformation, as part of national development agendas.

#### *(i) Child labor, national education objectives, and future human capital policies*

Education is both a goal and a means to end other goals in several international development declarations. In 2015, the SDGs reaffirm the 1990 EFA declaration to create universal access to basic education for all children, youths, and adults, as well as the MDG's goal of universal primary education launched in 2000. The SDGs also pledge to eliminate child labor in all its forms. Being one of the countries that are on track to achieve the MDG goal on education, Ethiopia made extraordinary progress in ensuring access to education amid wider childhood work practices in various sectors. Its achievement, and the evidence presented in this study, signal that it is indeed possible to increase enrollment in the presence of extensive child labor. In this regard, while full-time work could run counter to school enrollment and long-term grade attainment, it is noted that childhood working and schooling could also be effectively combined. The implicit assumption that work and study are mutually exclusive does not conform to the reality. However, children who work long hours tend to dropout before completing primary school—against the goal of universal primary education. The study, therefore, suggests compulsory school enrollment for all school-aged children and the

provision of continued support and incentives (free education and education subsidies for poorer households) to realize children's full potential. It also implies that while the prevention and elimination of full-time child labor should be a policy priority integrated into and with other development works and national education policy, getting children to school and continuing on to a higher level should also be part and parcel of the effort. If not, as indicated in the Education Sector Development Program IV (EDSP IV), attaining universal primary education could be difficult with the current high rate of dropout in early grades (MoE, 2010a).

***(ii) From compulsory basic to compulsory full primary education***

Free primary education was introduced with the adoption of the new Education and Training Policy in 1994 as a major strategy towards achieving the EFA goals. This led to a rapid increase in the net enrollment rate, which currently stands at 83 percent of primary school-aged children. To attain the remaining 17 percent, the ESDP IV was designed as a milestone to make free primary education compulsory. Most of these education-excluded children could be most vulnerable in society, and ensuring universal primary education will be a pre-requisite for universalization of secondary education (MoE, 2010a). Given the socioeconomic conditions of households and the institutional capacity to implement policies, the move from compulsory basic to compulsory full primary education will require concerted efforts for effective enforcement, which could make it costly. For reasons of cost and social structure, stringent child labor laws that call for the total elimination of child labor to achieve full primary education may be impractical, at least at this stage, and can be counterproductive. Moreover, there is no such guarantee that child labor prohibition in its totality increases enrollment or long-term grade attainment. Thus, compulsory primary education could be combined with conditional cash transfers to keep children in school, and school feeding programs, along with other incentives such as parental rewards for their child's achievements. Transfers and subsidies may also target children. For instance, gender-targeted interventions, such as providing sanitary products to girls in second-cycle schools, who otherwise are likely to work in paid jobs to pay for it or quit their schooling, may also play a greater role in regulating childhood work, while keeping children in schools. In relation to this suggestion, evidence from Ghana shows that provision of sanitary pads alongside education was helpful to young women to increase their school attendance and the life chances (Montgomery et al., 2012).

***(iii) Child labor and potentials of structural transformation in rural areas***

It is well-understood that education is instrumental in long-term and inclusive economic growth and development, in that it helps to supply the economy with skilled labor through which it enhances the success of all other national development goals. In this regard, while eliminating exclusive child labor could be a pre-condition, the study finds that a balanced workload and study may also boost long-term school progression, provided that children also enrolled at the right school age. Active childhood participation in work and schooling may facilitate long-term shift of labor from the agricultural sector to non-farming economic sectors. In this regard, investment in rural education infrastructure and ensuring enrollment and attainment could facilitate the transfer of labor from farming to non-farming sectors, for some, which may also mean leaving the rural areas. The findings also suggest that in order to ensure labor migration as an engine for structural transformation, and to improve labor market outcomes, policymakers need to link early human capital policies such as schooling with youth-targeted labor market policies. Anti-poverty policies alone may not regulate rural out-migration. Thus, labor market policies intended to keep educated youths in rural areas should also focus on expanding rural non-farming employment opportunities, parallel with expansion of quality child education. This means that investment in rural education should also be accompanied by supportive and expansionary labor market policies in the rural areas, to whet the appetites of youths or avoid unproductive rural-urban youth migration.

***(iv) Skills backlogs and lower (fewer than four years of schooling) educational attainment***

A minimum of five years of primary schooling is normally required for one to achieve permanent literacy and numeracy skills, and it is also expected to boost individual's life chances (World Bank, 2005). With about 38 and 14 percent of children attaining fewer than four years of schooling and illiterate when adults, respectively, we need to devise mechanisms to build their skills to enable them participate effectively in adult labor markets. One key strategy, as currently going on in Ethiopia, is to enroll them in structured basic literacy and numeracy skills training programs. Although the current adult functional literacy programs are not rigorously evaluated, they might help youths with skills backlogs to improve their labor market participation. The programs might also be relevant in other respects, such as improving technology uptake, health, and reducing youth unemployment. Ultimately, it may improve their income and hence reduce poverty and inequality, which could have been perpetuated by a lack of earlier education opportunities. Nonetheless, it has to be well noted that from the effectiveness and cost-efficiency perspectives, early human capital investment is

more effective and cost-efficient than later life investments such as adult education or training, or the introduction of remedial policies to address skills backlogs (Carneiro & Heckman, 2003; Heckman, 2000; Mincer, 1995).

### 6.3 General caveats of the study

***Applicability of the research setting:*** The results are applicable only in rural areas where children participate in family farming, either working independently or helping others, herding cattle with other fellow children, in domestic chores and low-intensity non-farming work. Most of these works are light in nature and not categorized under the worst forms of child labor. Therefore, the results do not apply to children who engage in the worst forms of child labor, such as in industry, mining, drug-trafficking, military service, or prostitution.

***The implicit assumption about the decision-making household:*** Analytical strategies assume that an altruistic head of the household makes childhood work and schooling decisions under the unitary household framework (Becker, 1981). Of course, it could be one of the limitations of the study, since in reality, rural households are composed of individuals with conflicting interests regarding resource allocation, and some human capital decisions could favor more 'talented' children or other siblings by age or gender. The study, thus, assumes that taking into account the abilities of each child as a well-informed parent, as well as future expected income, the unitary household makes the decision as a single decision-making unit to put each child into work, school or combine both within household's utility optimization framework. The study also assumed that the altruistic parents' behavior corrects the selfish behavior of some children towards their siblings. This assumption is informed by the well-known rotten kid theorem, i.e. "[u]nder some conditions, even selfish persons […] are induced to act as if they are altruistic toward their benefactors because that raises their own selfish welfare. They act this way because otherwise gifts from their benefactors would be reduced enough to make them worse off" (Becker, 1974, 1993, p. 13; Bergstrom, 1989). Therefore, the study assumes that children's work and school decisions are unaffected by the behavior of any other siblings.

***Innate abilities:*** The most common causal identification problem, endogeneity, has not been addressed in some of the empirical chapters. Except in Chapter Five, on earnings, in the rest of the analyses the study does not address the endogeneity problem due to the changes in the childhood work and schooling and respective outcome variables due to unobserved effects such as innate abilities. The estimates in these chapters are made on observables, and so all their results should be interpreted with caution.

***Human capital from health and on-the-job skills training:*** The concept of human capital is often identified by its components, i.e. education, training, and health. In addition to the inherent benefits of health and education in their own right, both are also considered as investments in human capital with promises of higher future standards of living (Schultz, 1999). While the study has explicitly dealt with the education dimension, future research may explore the effects of childhood work on long-term health and the role of on-the-job training, such as adult education, farmer's skills training, and technology-specific training, in rectifying the skills backlogs and in building new and productive human capital. Also, the research extension to the health dimension will contribute to a comprehensive understanding of the long-term effects of childhood work on human capital formation. The available literature in this aspect provides mixed evidence. Several studies show that early life health conditions have substantial effects on adulthood human capital—mainly health capital (Currie et al., 2008; Delaney & Smith, 2012; Haas et al., 2011) and labor market outcomes such as earnings (Delaney & Smith, 2012; Fletcher, 2014; Haas et al., 2011; Smith, 2009). Past studies also show that diminished long-term educational attainment explains part of the consequences of early childhood health conditions on earnings (Currie & Stabile, 2006; Haas et al., 2011). But studies find mixed effects (negative and insignificant) of child labor on health status when adults (Beegle et al., 2009; Lee & Orazem, 2010), which means that childhood work—health human capital—labor market outcomes nexus study may also provide more useful insights regarding the trajectories of rural child development in farming households.

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## 8. Appendices

### Appendix 1: Construction of household Wealth Index

The asset-based Wealth Index is constructed using Principal component analysis (PCA) technique for households to measure economic well-being in a continuous scale. Often, the first component represents the linear combination of the asset related variables with the most information. The wealth index is constructed using indicators related to the housing quality (construction materials for walls, floor, and roof), ownership of selected household and durable assets, and farming tools. However, during the baseline survey, it was found that all survey villages did not have access to electricity, all household used to get drinking water from Springs, rivers and Wells/Boreholes (unprotected sources), and that garden/Field/Bush defecation was the most practiced in all villages. Therefore, these variables were excluded from the wealth index construction. Therefore, the index was composed of three equally weighted indices: (1) Housing quality and investment during 1994a-1999/2000, (2) Farm tools and other productive assets owned, and (3) Household assets, furniture, & durables assets owned.

**Selection of indicator variables**

A total of 47 indicator variables were used to construct the wealth index. The variables were selected in such way that altogether they explain the economic status of households in a farming community in a rural setting. It was also tried to include as many indicator variables as possible to have a better household distribution but also keeping in mind about possible multicollinearity between variables. Moreover, many of the variables were included in quantitative forms—to introduce enough variability—instead of categorization into dummies with zero and one to represent asset ownership. In addition, whenever a variable is binary, '1' is used to denote that the household owns the asset and '0' to its absence.

**Missing data Imputation strategy**

Generally, by many standards, relatively very few variables have missing values. However, even though, and instead of mean substitution, which may introduce other biases, few steps were followed to impute the missing indicator variables through a propensity score method. The households' current poverty status in1999 was used to group households into quintiles and estimate their possible asset holdings (1994-1997) to which we missed values.

The following steps were followed:

1. Estimate the logistic regression model for poverty status controlling for relevant variables. A number of variables were controlled for: Household off-farm participation, changes in soil fertility, whether household grew a new crop in the seven years prior to 1999, household size, and the number of re-surveying targets in the household. Moreover, head-specific variables including physical functionality, main occupation, age, gender, satisfaction with the quality of education at schools, and literacy status were controlled.
2. Predict Propensity Scores to get the probability of the household to be poor.

3. Sort the households based on their 'Propensity Scores of being poor'.
4. Categorize the households into five groups (quintiles): each quintile will have 65 households except the last quintile of 66 households. Surprisingly, the households with missing observations were distributed across different quintiles which would have been imputed equal values, if mean substitutions were used.
5. Finally, for continuous variables, the missing values were imputed with the average value of the quintile to which the household with the missing observation belongs to. However, for binary indicator variables, first, we calculate the overall sample average then we impute 1 if the quintile average is above the 'overall average' and 0 otherwise. Details regarding the variables before and after imputations are available in Table a.

**A. Housing quality and investment during 1994a-1999**

One of the three indices is constructed using housing quality indicator variables (materials used for wall and roof construction) and household's investment on constructing new houses and improving existing ones during 1994 to 1999. The study used a total of 16 variables in the index. In addition to the number of bedrooms as of 1994a, dummy variables were used to denote the materials used to construct the walls and roof in 1994a and cost of housing investment in the subsequent years (1994b, 1995 and 1997) to construct new houses, expand the existing one, or for re-innovation.

**B. Farm tools and other productive assets**

Farm tools such as hoes, ploughs, shovels, and other productive assets including weaving equipment are critical assets for the farming households in rural Ethiopian setting. While the 1997 survey round recorded farm tools and other productive assets by item, the 1999/2000 survey question is built on the 1997 survey round. Moreover, the 1999/2000 survey collected earnings and expenditure data on selling and buying of these assets. Therefore, ownership of farm tools and other productive assets as of 1997 and the amount of investment made on these assets during 1997-1999 were included in the estimation. The index was constructed using a total of 12 variables.

**C. Household assets, furniture, and durables assets**

The 1999/2000 asset ownership questions are follow ups to the previous survey, 1997. In 1999/2000, the records are made only if the household bought or sold any assets since the 1997. They are also aggregated by the types of assets. Therefore, the study uses individual household assets, furniture, and durables as recorded in the 1997 survey and also the amount of expenditures households made on purchasing furniture and household goods (bed, chairs, bench, shelf, mat, sofa, fanoos, pots, utensils) and other durables (guns, jewelry, radio, …). A total of 19 continuous, count, and binary variables were included to construct this index.

The overall household wealth index was computed as the simple average of the three sub-indices. These scores are then used to create the breakpoints that define wealth quintiles as lowest, second, middle, fourth, and highest.

*Table a.* Household economic assets (indicator variables) used to construct the Wealth Index

| Variables used to construct the Wealth Index | Complete cases | Ratio of missings | Before Imputation | | After Imputation | | Mean change |
|---|---|---|---|---|---|---|---|
| | N | Percent | mean | sd | mean | sd | |
| A. Housing quality and investment during 1994a-1999 (pca_housing) | | | | | | | |
| Number of bedroom in 1994a (first round of ERHS survey) | 317 | 2.76% | 1.280 | 0.581 | 1.281 | 0.574 | 0.001 |
| External wall material is Mud/Dung in 1994a* | 314 | 3.68% | 0.500 | 0.501 | 0.500 | 0.501 | 0.000 |
| External wall material is Wood in 1994a* | 314 | 3.68% | 0.392 | 0.489 | 0.396 | 0.490 | 0.004 |
| Roof material is Galvanized Iron sheet in 1994a* | 314 | 3.68% | 0.217 | 0.413 | 0.236 | 0.425 | 0.019 |
| Roof material is Thatch and other in 1994a* | 314 | 3.68% | 0.666 | 0.473 | 0.660 | 0.475 | -0.006 |
| Cost (Birr) of wall construction material in 1994a | 311 | 4.60% | 425.0 | 664.9 | 426.0 | 649.6 | 1.000 |
| Cost (Birr) of roof construction material in 1994a | 310 | 4.91% | 525.5 | 797.2 | 526.0 | 777.4 | 0.500 |
| Cost (Birr) of wall construction material in 1994b | 304 | 6.75% | 43.24 | 257.0 | 43.14 | 248.3 | -0.100 |
| Cost (Birr) of roof construction material in 1994b | 301 | 7.67% | 114.7 | 1,059 | 113.5 | 1,019 | -1.200 |
| Cost (Birr) of wall construction material in 1995 | 296 | 9.20% | 23.99 | 101.9 | 23.78 | 97.09 | -0.210 |
| Cost (Birr) of roof construction material in 1995 | 290 | 11.04% | 30.76 | 128.3 | 30.78 | 121.2 | 0.020 |
| Cost (Birr) of wall construction material in 1997 | 277 | 15.03% | 113.2 | 334.9 | 112.7 | 308.9 | -0.500 |
| Cost (Birr) of roof construction material in 1997 | 299 | 8.28% | 133.6 | 428.1 | 134.6 | 410.1 | 1.000 |
| Cost (Birr) of wall construction material in 1999 | 298 | 8.59% | 130.8 | 561.3 | 131.2 | 536.8 | 0.400 |
| Cost (Birr) of roof construction material in 1999 | 314 | 3.68% | 157.6 | 434.1 | 157.5 | 426.1 | -0.100 |
| HH invested in housing (constructed or improved) during 1994a to 1999* | 326 | 0.00% | 0.779 | 0.415 | 0.779 | 0.415 | 0.000 |
| B. Farm tools and other productive assets (pca_farmtools) | | | | | | | |
| Farm land size (hectare) owned by the household in 1999 | 326 | 0% | 1.346 | 0.946 | 1.346 | 0.946 | 0.000 |
| Livestock (Tropical Livestock Unit) size owned by the household in 1999 | 326 | 0% | 3.364 | 3.412 | 3.364 | 3.412 | 0.000 |
| Total number of oxen owned by the household in 1999 | 326 | 0% | 1.071 | 1.144 | 1.071 | 1.144 | 0.000 |
| Number of Hoes | 320 | 1.84% | 1.178 | 1.118 | 1.179 | 1.108 | 0.001 |
| Number of Ploughs | 320 | 1.84% | 1.038 | 1.076 | 1.035 | 1.067 | -0.003 |
| Number of Hammer | 320 | 1.84% | 0.359 | 0.783 | 0.360 | 0.776 | 0.001 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Number of Saddle | 320 | 1.84% | 0.237 | 0.513 | 0.236 | 0.508 | -0.001 |
| Number of Mills | 320 | 1.84% | 0.178 | 0.650 | 0.179 | 0.644 | 0.001 |
| Number of Sickles | 320 | 1.84% | 1 | 1.683 | 0.999 | 1.669 | -0.001 |
| Number of Choppers | 320 | 1.84% | 1.250 | 2.307 | 1.260 | 2.291 | 0.010 |
| Number of Shovels | 320 | 1.84% | 1.531 | 1.231 | 1.530 | 1.220 | -0.001 |
| Other productive assets (e.g. weaving equipments and beehives) | 320 | 1.84% | 0.056 | 0.231 | 0.067 | 0.251 | 0.011 |
| C. Household assets, furniture, and durables assets (pca_hh.assets) | | | | | | | |
| Number of Beds | 320 | 1.84% | 0.741 | 0.844 | 0.740 | 0.837 | -0.001 |
| Number of Fanoos (gas Lantern) | 320 | 1.84% | 0.784 | 0.960 | 0.787 | 0.953 | 0.003 |
| Number of Radios | 320 | 1.84% | 0.141 | 0.406 | 0.140 | 0.403 | -0.001 |
| Number of Mesob (Large hand-woven basket looking eating plate) | 320 | 1.84% | 1.384 | 3.478 | 1.389 | 3.446 | 0.005 |
| Number of Cupboards | 320 | 1.84% | 0.247 | 0.505 | 0.247 | 0.501 | 0.000 |
| Number of Leather Pouches | 320 | 1.84% | 0.0656 | 0.361 | 0.0664 | 0.358 | 0.001 |
| Number of Jewelry | 320 | 1.84% | 0.537 | 1.477 | 0.539 | 1.463 | 0.002 |
| Number of Guns | 320 | 1.84% | 0.478 | 0.930 | 0.479 | 0.922 | 0.001 |
| Number of Kitchen Utensils | 320 | 1.84% | 3.941 | 6.711 | 3.965 | 6.661 | 0.024 |
| Number of Barrels | 320 | 1.84% | 0.287 | 1.079 | 0.290 | 1.070 | 0.003 |
| Number of Tables | 320 | 1.84% | 0.412 | 1.056 | 0.414 | 1.047 | 0.002 |
| Number of Chairs | 320 | 1.84% | 0.569 | 1.326 | 0.571 | 1.315 | 0.002 |
| Number of Mattress/Blanket | 320 | 1.84% | 0.153 | 0.602 | 0.153 | 0.596 | 0.000 |
| Has storage materials (Sacks/Dawla or Gotera)* | 320 | 1.84% | 0.109 | .313 | 0.126 | 0.332 | 0.017 |
| Number of other assets (e.g. Umbrella) | 320 | 1.84% | 0.272 | 1.510 | 0.275 | 1.496 | 0.003 |
| *Household Investments in assets during 1997-1999* | | | | | | | |
| HH invested in household, farm, durable or other productive assets* | 326 | 0.00% | 0.736 | 0.441 | 0.736 | 0.441 | 0.000 |
| Expenditure (Birr) on durable assets | 326 | 0.00% | 12.28 | 54.94 | 12.28 | 54.94 | 0.000 |
| Expenditure (Birr) on farming or other productive assets | 326 | 0.00% | 15.81 | 23.11 | 15.81 | 23.11 | 0.000 |
| Expenditure (Birr) on household assets and furniture | 326 | 0.00% | 25.71 | 72.53 | 25.71 | 72.53 | 0.000 |

*Yes=1 and No=0

**Appendix 2: Childhood Work Index (CWI)**

**Selection of indicator variables**

Seventeen direct and indirect childhood work indicator variables are used to construct the childhood work index. Almost all common child labor variables and other proxy variables which signal potential child labor use in the typical farming communities are included. While it is the first attempt to use an index variable to measure the extents of children's work in rural areas, where the usual proxy variables are prone to measurement error and recall bias, this approach can be improved with further inputs. In the dichotomization of indicator variables, 'Yes' or the 'existence of the case' is denoted by '1' and 'No' for 0.

*Table b.* Summary statistics for childhood work indicator variables

| **Childhood work indicator variables** | **N** | **Mean** | **SD** |
|---|---|---|---|
| Farming and allied activities were child's main occupation (V1) | 652 | 0.307 | (0.461) |
| Domestic chores were child's main occupation (V2) | 652 | 0.242 | (0.429) |
| The number of years child worked before turning 14 years old (V3) | 652 | 7.591 | (1.818) |
| Child combined work with schooling in the last 12 months (V4) | 652 | 0.190 | (0.393) |
| Child was working exclusively in the previous 12 months (V5) | 652 | 0.541 | (0.499) |
| Child participated in domestic chores (fetching water, collecting firewood, cooking etc. ) in the previous 7 days (V6) | 652 | 0.534 | (0.499) |
| Child participated in caring siblings in the previous 7 days (V7) | 652 | 0.180 | (0.383) |
| Child participated in cattle herding in the previous 7 days (V8) | 652 | 0.360 | (0.480) |
| Child participated in any other work in the previous 7 days (V9) | 652 | 0.098 | (0.298) |
| Household had labor shortage during preparation for *meher* season (V10) | 614* | 0.191 | (0.393) |
| Household had labor shortage during cultivation *meher* crop (V11) | 612* | 0.278 | (0.448) |
| Household had labor shortage during harvesting *meher* crop (V12) | 616* | 0.391 | (0.488) |
| Household hired outside labor in the previous cropping season (V13) | 587* | 0.276 | (0.447) |
| Child worked both in farming and chores in the previous 7 days (V14) | 652 | 0.210 | (0.408) |
| Child worked only in farm activities in the previous 7 days (V15) | 652 | 0.183 | (0.387) |
| Child worked only in domestic chores in the previous 7 days (V16) | 652 | 0.325 | (0.469) |
| Total number of hours worked in the previous 7 days (V17) | 652 | 20.389 | (20.462) |
| ***Observations*** | 652 | | |

*Variables with missing values

*Table c.* Correlation matrix between childhood work indicator variables (observation=585)

| | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 | V10 | V11 | V12 | V13 | V14 | V15 | V16 | V17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V1 | 1 | | | | | | | | | | | | | | | | |
| V2 | -0.380 | 1 | | | | | | | | | | | | | | | |
| V3 | 0.006 | 0.089 | 1.000 | | | | | | | | | | | | | | |
| V4 | -0.266 | -0.269 | -0.080 | 1.000 | | | | | | | | | | | | | |
| V5 | 0.569 | 0.529 | 0.080 | -0.509 | 1.000 | | | | | | | | | | | | |
| V6 | 0.028 | 0.538 | 0.055 | 0.133 | 0.488 | 1.000 | | | | | | | | | | | |
| V7 | -0.017 | 0.330 | -0.028 | -0.016 | 0.278 | 0.451 | 1.000 | | | | | | | | | | |
| V8 | 0.572 | -0.299 | 0.044 | 0.196 | 0.262 | 0.006 | -0.034 | 1.000 | | | | | | | | | |
| V9 | -0.001 | 0.142 | 0.003 | 0.079 | 0.128 | 0.318 | 0.157 | 0.102 | 1.000 | | | | | | | | |
| V10 | 0.012 | -0.102 | 0.020 | 0.058 | -0.070 | 0.032 | 0.068 | 0.056 | 0.108 | 1.000 | | | | | | | |
| V11 | 0.089 | -0.160 | -0.016 | 0.168 | -0.057 | 0.069 | -0.035 | 0.133 | 0.165 | 0.393 | 1.000 | | | | | | |
| V12 | 0.156 | -0.186 | 0.013 | 0.146 | -0.014 | 0.060 | 0.036 | 0.196 | 0.142 | 0.478 | 0.640 | 1.000 | | | | | |
| V13 | 0.055 | -0.039 | 0.205 | 0.014 | 0.002 | -0.056 | 0.039 | 0.062 | -0.070 | 0.021 | -0.052 | 0.223 | 1.000 | | | | |
| V14 | 0.293 | -0.125 | 0.048 | 0.177 | 0.151 | 0.478 | 0.152 | 0.598 | 0.282 | 0.122 | 0.154 | 0.167 | -0.017 | 1.000 | | | |
| V15 | 0.460 | -0.258 | -0.030 | 0.079 | 0.197 | -0.491 | -0.221 | 0.557 | -0.156 | -0.065 | -0.009 | 0.058 | 0.107 | -0.239 | 1.000 | | |
| V16 | -0.220 | 0.682 | 0.022 | -0.014 | 0.393 | 0.648 | 0.348 | -0.511 | 0.093 | -0.074 | -0.055 | -0.077 | -0.039 | -0.355 | -0.318 | 1.000 | |
| V17 | 0.464 | 0.022 | -0.028 | 0.144 | 0.435 | 0.334 | 0.284 | 0.620 | 0.156 | -0.001 | 0.105 | 0.160 | 0.034 | 0.466 | 0.313 | -0.048 | 1 |

**Missing data imputation strategy**

The above variables are used to generate the index, however few variables had missing values. As a result, about 67 children (about 10.3%) have missing childhood work index. The missing indices are imputed using propensity scores approach, the probability to work.

In order to logically estimate the childhood work index, the binary variable 'whether the child participated in any kinds of works as a main or additional occupation in the previous 12 months' was used as left-hand side variable, and the right-hand side controls are also selected using stepwise regression. The final regressor variables include age of the child, distance of the village from nearest main town, whether the child worked in a different occupation when adult, age of the head, average real wage rate in the villages during the baseline survey, whether the household used fertilizer during the baseline survey, and household wealth status in quintiles.

Steps for imputation:

1. Estimate the logistic regression model for childhood work participation controlling for the above variables.
2. Predict propensity scores to get the probability of the child to participate in works. This gives scores of the 'propensity to work / participate in work' for all tracked children.
3. Sort the children based on the propensity scores to work.
4. Categorize the children into five groups (quintiles) based on their propensity scores.
5. Calculate the mean values of the childhood work index for each quintile.
6. Now, replace the missing work indices in each quintile by the quintile average value.

**Appendix 3:** Village-level effects as a regressor

*Table d*. Effects of childhood work on human capital formation with village-fixed effects

| | *Model 2 (REOL)* | | *Model 4 (REOL)* | | *Model 5 (Poisson)* | | *Model 6 (REOL)* | |
|---|---|---|---|---|---|---|---|---|
| | School transition | | School transition | | Grade attain | | School transition | |
| | *OR* | *Std. Err.* | *OR* | *Std. Err.* | *IRR* | *Std. Err.* | *OR* | *Std. Err.* |
| Work-starting age | 1.541* | 0.3691 | | | | | | |
| Age squared | 0.969* | 0.0171 | | | | | | |
| Hours worked | | | 0.985* | 0.008 | | | | |
| Hours squared | | | 1.000 | 0.0001 | | | | |
| Work-school comb.[1] | | | | | | | | |
| Combining both | | | | | 0.984 | 0.315 | 0.995 | 0.156 |
| Work-only | | | | | 0.458*** | 0.133 | 0.185*** | 0.0285 |
| LR test, α=0, F-test | | | | | 340.03*** | | | |
| Observations | 456 | | 632 | | 493 | | 493 | |
| RESET test | 0.2045 | | 0.3634 | | 0.2457 | | 0.2612 | |

[1]Reference group: School-only children

***Appendix 4***. Covariate balancing

*Table e.* Covariate balancing for childhood work and school combinations; Comparison group: *School-only children and* Participation variable: *Childhood work and school combinations*

| | *Standardized diff.* | | *Variance ratio* | | *Standardized diff.* | | *Variance ratio* | |
|---|---|---|---|---|---|---|---|---|
| | *Raw* | *Weighted* | *Raw* | *Weighted* | *Raw* | *Weighted* | *Raw* | *Weighted* |
| | Combining both | | | | Working only | | | |
| Age of the child | 0.4429 | 0.1553 | 0.6123 | 0.6910 | -0.1398 | 0.0873 | 1.1746 | 1.2058 |
| Child is male | -0.1173 | 0.0694 | 1.0212 | 1.0020 | -0.1882 | 0.0843 | 1.0217 | 1.0010 |
| Birth order[1] | | | | | | | | |
| 2nd eldest | 0.0403 | -0.2775 | 1.0244 | 0.8271 | 0.0000 | -0.2049 | 0.9906 | 0.8837 |
| 3rd eldest | -0.2121 | 0.0694 | 0.6654 | 1.0950 | 0.1123 | -0.0228 | 1.1511 | 0.9681 |
| Age of the head | 0.2088 | 0.0502 | 0.7858 | 0.9586 | 0.2247 | 0.0527 | 0.9639 | 1.1024 |
| Head is male | -0.1534 | 0.1418 | 1.3418 | 0.7695 | -0.0982 | 0.0953 | 1.2134 | 0.8458 |
| Head is literate | -0.0400 | 0.0370 | 0.9977 | 1.0091 | -0.2577 | 0.0390 | 0.9635 | 1.0094 |
| Education quality | 0.0971 | 0.2931 | 0.8260 | 0.7308 | -0.2890 | 0.2080 | 1.4322 | 0.8190 |
| Household size | -0.1392 | 0.0629 | 1.7142 | 1.5606 | -0.0042 | 0.0617 | 1.6939 | 1.4318 |
| Prop. Of children | -0.2075 | -0.0508 | 0.8979 | 0.9736 | -0.2211 | -0.1131 | 1.0490 | 1.0959 |
| Off-farm participation | 0.3496 | -0.0567 | 1.2841 | 0.9745 | 0.1388 | -0.1286 | 1.1351 | 0.9332 |
| Adult left or died | 0.4154 | -0.4242 | 1.8725 | 0.6588 | 0.2191 | -0.3635 | 1.4827 | 0.7191 |
| Farm size declines | 0.3559 | -0.0476 | 1.6250 | 0.9566 | 0.2940 | -0.0759 | 1.5269 | 0.9288 |
| Soil fertility declines | 0.2119 | -0.2977 | 0.9595 | 1.1603 | 0.1311 | -0.2803 | 0.9800 | 1.1560 |
| Grew new crop variety | 0.3262 | -0.1398 | 1.4818 | 0.8709 | 0.0163 | -0.1843 | 1.0182 | 0.8243 |
| Wealth quintiles | | | | | | | | |
| Poorer[2] | -0.1270 | 0.0546 | 0.8090 | 1.1031 | -0.1363 | 0.0519 | 0.7931 | 1.0979 |
| Middle | -0.1750 | 0.1030 | 0.7373 | 1.2090 | 0.0226 | 0.1476 | 1.0220 | 1.2970 |
| Richer | -0.0352 | -0.1762 | 0.9401 | 0.8213 | 0.0905 | -0.1867 | 1.1212 | 0.8094 |
| Richest | -0.0740 | -0.0541 | 0.9336 | 0.9400 | -0.2780 | -0.0377 | 0.7309 | 0.9586 |
| Village distance | 0.0846 | 0.0839 | 0.8314 | 1.2180 | 0.0435 | 0.0539 | 1.2272 | 1.1697 |
| Real farm wage rate | 0.4758 | -0.1152 | 1.2695 | 0.8903 | 0.0766 | -0.1329 | 0.7681 | 0.7979 |
| No PSNP | -0.1801 | -0.0335 | 1.0440 | 1.0033 | -0.0761 | 0.0348 | 1.0199 | 0.9950 |

Reference groups: [1,2]Firstborn and Children from the poorest households, respectively

*Table f*. Covariate balancing for childhood work index: Participation variable: *Childhood work index;* Comparison group: *No-work (Non positive work index)*

| | *Standardized diff.* | | *Variance ratio* | | *Standardized diff.* | | *Variance ratio* | | *Standardized diff.* | | *Variance ratio* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Raw* | *Weighted* | *Raw* | *Weighted* | *Raw* | *Weighted* | *Raw* | *Weighted* | *Raw* | *Weighted* | *Raw* | *Weighted* |
| | *Low intensity* | | | | *Middle intensity* | | | | *High intensity* | | | |
| Age of the child | 0.4947 | -0.2465 | 0.9063 | 0.9139 | 0.5966 | 0.0547 | 0.8771 | 0.8909 | 0.4822 | -0.0314 | 0.7658 | 0.6615 |
| Child is male | 0.1832 | 0.0382 | 1.0109 | 1.0023 | 0.2605 | 0.1287 | 0.9873 | 0.9967 | 0.2525 | -0.3029 | 0.9900 | 0.8834 |
| Birth order (ref.:1st born) | | | | | | | | | | | | |
| 2nd eldest | 0.1592 | 0.0074 | 1.1499 | 1.0067 | 0.1032 | 0.2375 | 1.1021 | 1.1673 | 0.1688 | -0.2447 | 1.1523 | 0.7369 |
| 3rd eldest | -0.5769 | 0.1672 | 0.5210 | 1.1305 | -0.3887 | -0.1781 | 0.7105 | 0.8137 | -0.6130 | 0.0083 | 0.4821 | 1.0074 |
| Child education (ref: no grade) | | | | | | | | | | | | |
| Grade 1 | -0.0172 | -0.1838 | 0.9672 | 0.5880 | 0.1161 | 0.1274 | 1.3061 | 1.3032 | -0.0848 | 0.0312 | 0.7973 | 1.0733 |
| Grade 2 | 0.0971 | -0.0262 | 1.3083 | 0.9257 | 0.2870 | -0.0215 | 1.9053 | 0.9394 | -0.2560 | -0.0657 | 0.3441 | 0.8171 |
| Grade 3 and above | 0.2097 | -0.1060 | 1.6674 | 0.6914 | 0.0182 | -0.0009 | 1.0609 | 0.9978 | -0.2560 | -0.0798 | 0.3441 | 0.7645 |
| Age of the head | -0.0588 | -0.0735 | 1.0001 | 1.1089 | 0.0928 | -0.0751 | 0.9570 | 1.2667 | 0.0979 | 0.0085 | 0.8549 | 0.6943 |
| Head is male | -0.5321 | 0.0745 | 2.6534 | 0.8475 | -0.1443 | 0.0656 | 1.4614 | 0.8662 | -0.3232 | -0.4905 | 2.0434 | 1.8594 |
| Head is literate | -0.0420 | -0.1173 | 1.0114 | 0.9716 | -0.1216 | -0.1332 | 0.9991 | 0.9662 | -0.2657 | -0.1250 | 0.9528 | 0.9686 |
| Education quality | 0.0765 | -0.3067 | 0.9250 | 1.2497 | 0.1960 | -0.0645 | 0.7763 | 1.0680 | -0.0506 | 0.0043 | 1.0588 | 0.9949 |
| Household size | -0.3273 | -0.0401 | 0.9219 | 0.7984 | -0.3220 | -0.0704 | 0.6529 | 0.7491 | -0.4175 | 0.2480 | 0.7961 | 1.1198 |
| Prop. Of children | 0.1325 | 0.0679 | 0.9235 | 0.9350 | 0.0555 | 0.0525 | 1.0178 | 1.1337 | -0.0543 | 0.0382 | 1.0269 | 0.8314 |
| Off-farm participation | -0.0492 | 0.1414 | 0.9673 | 1.1188 | -0.0875 | 0.2294 | 0.9275 | 1.1734 | 0.0602 | 0.0943 | 1.0543 | 1.0831 |
| Adult left or died | 0.3437 | -0.0576 | 1.5200 | 0.9075 | 0.1345 | 0.1051 | 1.2286 | 1.1617 | 0.0010 | -0.0969 | 1.0087 | 0.8436 |
| Farm size declines | 0.1811 | -0.1920 | 1.1759 | 0.7845 | -0.0387 | -0.0024 | 0.9647 | 0.9980 | -0.1445 | 0.2924 | 0.8404 | 1.2137 |
| Soil fertility declines | 0.6091 | 0.0015 | 0.9373 | 0.9999 | 0.5269 | 0.0759 | 0.9825 | 0.9914 | 0.9441 | -0.1190 | 0.6719 | 0.9907 |
| Grew new crop variety | 0.0774 | -0.1878 | 1.1412 | 0.7469 | 0.3024 | 0.0089 | 1.4655 | 1.0117 | 0.2046 | 0.0854 | 1.3345 | 1.1028 |
| Wealth status (ref: poorest) | | | | | | | | | | | | |
| Poorer | -0.2519 | 0.1125 | 0.6535 | 1.1966 | -0.4681 | 0.1572 | 0.3492 | 1.2718 | -0.1956 | -0.2904 | 0.7327 | 0.4888 |
| Middle | -0.0006 | 0.0862 | 1.0097 | 1.1116 | 0.0316 | -0.0347 | 1.0592 | 0.9530 | 0.2755 | -0.1523 | 1.4177 | 0.7847 |
| Richer | 0.1980 | -0.0490 | 1.3062 | 0.9304 | 0.1465 | 0.0204 | 1.2301 | 1.0286 | 0.2975 | -0.0076 | 1.4224 | 0.9890 |
| Richest | 0.1716 | -0.0172 | 1.2207 | 0.9789 | 0.2663 | -0.0415 | 1.3075 | 0.9489 | -0.1898 | 0.3918 | 0.7384 | 1.3347 |
| Village distance | 0.0975 | 0.2299 | 1.3124 | 1.3566 | 0.0414 | 0.1542 | 1.5505 | 1.1687 | 0.3588 | -0.3590 | 1.2603 | 1.5459 |
| Real farm wage rate | 0.4298 | 0.0423 | 0.9404 | 0.6254 | 0.4566 | 0.0922 | 0.9667 | 0.8618 | 0.6087 | 0.1790 | 1.0058 | 0.5078 |
| No PSNP | -0.2352 | -0.1715 | 1.1170 | 1.0245 | -0.3660 | -0.1093 | 1.1205 | 1.0230 | -0.3375 | -0.3291 | 1.1221 | 0.9949 |