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School of Graduate Studies
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**Determinants of child Labor in Rural parts of Southern, Nations,
Nationalities and Peoples Regional State (SNNPR)**

By

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School of Graduate Studies**

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Acronym

ILO	International Labor Organization
IPEC	International Program for the Elimination of Child Labor
UNICEF	United Nations Children and Education Fund
MICS	Multiple Indicator Cluster Survey
DHS	Demographic and Health Survey
CSA	Central Statistical Agency
USDL	United States Department of Labor
FAO	Food and Agricultural Organization
SNNPR	Southern Nations Nationalities and Peoples Regional State
IRC	International Rescue Committee
EA	Enumeration Area
PSU	Primary Sampling Unit
SSU	Secondary Sampling Unit
OLS	Ordinary Least Squares
SPSS	Statistical Package for Social Science

Abstract

The main objective of this study is to identify some of the factors that determine child labor and to see how they contribute to the widespread practice of child labor in rural parts of SNNP region. The source of data used in this study is the 2001 Ethiopia Child Labor Survey conducted by Central Statistical Agency (CSA) of Ethiopia. The total number of cases in this study is 4859 of which 2042 are not working (control) group and 2817 are working children. Both descriptive and inferential techniques were employed to analyze the data. Frequency distribution was used to see the percentage share among the background variables. Moreover, to see the association of the predictor variables with the dependent variable and to find out the main determinants of child labor among different socio-economic and demographic variables, univariate and multivariate statistical techniques were employed. The analysis of the data using logistic regression method revealed that work status of children is associated with: age of child, sex of child, religion of head of the household, migration status of head of the household, household size, household income, education status of head of the household, school attendance of child and marital status of head of the household.

1. Introduction

1.1 Background and statement of the problem

There is no universally accepted definition of "child labor". Varying definitions of the term are used by international organizations, non-governmental organizations, trade unions and others. But, generally speaking, "Child labor" is work for children that harms them or exploits them in some way (physically, mentally, morally, or by blocking access to education). Today, this practice remains to be a serious problem in the world in general and in Ethiopia in particular. According to the recent estimate of the International Labor Organization (ILO), globally: 318 million children under 18 work in some form of productive activity; 218 million children are in work defined as child labor; and 126 million child laborers are engaged in hazardous activities. 70 percent of all child laborers work in agriculture (ILO, 2007).

On May 27, 1999, the Government of Ethiopia ratified ILO Convention 138, minimum age for work, and incorporated this document as part of the law of the land. Article 36 of the Constitution of Ethiopia demands that children are not to be subjected to hazardous work or exploitative practices that may be hazardous to their health. Ethiopia's Labor Proclamation sets the minimum age for employment at 14 years. Under the Proclamation, employers are forbidden to employ "young workers" when the nature of the job or the conditions under which it is carried out may endanger the life or health of the children. Some activities that are prohibited for children are transporting goods by air, land, or sea; working with electric power generation plants; and performing underground work (e.g., quarrying in mines). Young workers are prohibited from working over 7 hours per day; overtime; between the hours of 10 p.m. and 6 a.m.; during weekly rest days; and on public holidays. Ethiopia's Penal Code specifically prohibits child trafficking which is punishable by imprisonment of up to 5 years and a fine of up to USD 10,000. The law also prohibits forced or bonded labor of children (US Department of Labor, 2008).

Child labor continues although there exist laws and standards to eliminate it. Child labor is today a subject that has become worse in its purpose rather than getting the problem

solved, for due realization has not set in. In some families, due to unavoidable reasons, children are the only source of income for the entire family. Such children when they are deprived of factory or shop work have no choice but to beg and sell odd items in the streets of urban areas or become child prostitutes. Many children are made to indulge in these activities by the atmosphere prevailing in society. The ultimate objective of a child is to earn and feed the ailing mother or parents. Child workers are largely available in the world today. Many are suffering from long hours of work and some working with dangerous tools and poisonous chemicals bearing forever the physical and emotional scars of the premature labor. Poverty, limited access to education, unemployment of elders, ignorance of the parents about the adverse consequences of child labor, tradition of making children learn the family skills, and willingness to exploit children are among the currently believed causes of global child labor. In Ethiopia, child labor is one of the many problems associated with poverty. Even though poverty is more likely to be the major cause, child work in the rural areas of Ethiopia is perceived as a necessary part of children's socialization process in which children are involved in domestic activities and are supposed to assist in manual labor in agricultural sectors such as weeding, harvesting and attending domestic animals.

In some of the agricultural work they do, children operate in poor and dangerous conditions, are harshly exploited with little or no pay and deprived of their childhood, adequate education and self-development. A large number of these children are exposed to unsafe and risky working conditions. Many of the jobs they carry out are hazardous - causing physical and mental injuries and sometimes even costing them their lives. In these worst forms of children labor, children are exploited, abused and denied an education, thus compromising their future livelihood (FAO, 2007).

The problem of child labor, in recent past, was very serious in Africa where the child labor participation rate was 26.2 percent. In many parts of Africa including Ethiopia the problem has been continuing (Kaushik Basu, 1998). The issue of child labor is an issue that has to be taken into consideration not just because many children are working illegally but also because their works are mostly dependent on exploitation. Children are being employed for social, political, cultural and economic reasons. It is apparent that

child labor at a very young age, especially for long hours or in hazardous conditions, is more likely to interfere with education and also harmful to health. As children at their early age have neither the awareness of the danger nor the knowledge of the precaution to be taken at work, many are harmed and put their physical and mental development in danger.

Child trafficking is one of the serious problems of children in Africa. It leads to very dangerous forms of child labor as it pulls children away from the protection of their families and communities. An ILO study issued in 2001 found that child trafficking in West and Central Africa is on the rise. Reports from some African countries suggest that most of the children are sent to other countries for domestic service, or put to work on plantations, in petty trade, as beggars and in soliciting. The trafficking of children for commercial sexual exploitation was also reported. Trafficked children, the study found, were working between 10 and 20 hours a day, carrying heavy loads and operating dangerous tools. They often lack adequate food and drink. Nigeria reported that one out of five children trafficked in the country died of illness or accidents. Others contracted sexually transmitted diseases, including HIV/AIDS. Although parents were sometimes persuaded by recruiters to send their children away to earn some extra income, often neither the children nor the parents were paid.

According to a report by Bureau of International Labor Affairs (2008), the commercial sexual exploitation of children is increasing in Ethiopia. Girls as young as 11 years old have been reportedly recruited to work in brothels. Girls also work as hotel workers, barmaids, and prostitutes in resort towns and rural truck stops. Children are trafficked internally in Ethiopia for forced labor and displaced persons are vulnerable and sometimes must exchange sexual services for food. There are reports that networks of persons working in tourism and trade recruit young Ethiopian girls for overseas work and provide them with counterfeit work permits. There are also reports that Ethiopian girls travel to the Middle East for work as domestic servants, where they are sometimes beaten and sexually exploited. Due to the lack of birth registrations, recruitment of children into the armed forces occurred, sometimes forcibly, during the 1998-2000 border conflict with Eritrea.

Child labor is an issue many have worked to reduce, but as the poverty rose in this world, child labor problems also escalated. In recent years, more new odd fields have been opened to their employment like pornography, drug trafficking and illicit trades. As it is the case in many parts of the world, children in Ethiopia who are from low income families suffer from inadequate access to flexible, low cost and appropriate educational opportunities, putting them at risk of entering into exploitive labor practices. The results of poverty and ethnic and gender biases, social exclusion and discrimination, are other factors that keep children out of school and force them to work.

A research has shown that in most Asian and African countries, poverty and over population have been identified as the two main causes of child labor. Parents are forced to send little children into hazardous jobs for reasons of survival, even when they know it is wrong. Monetary constraints and the need for food, shelter and clothing drives their children in the trap of premature labor. Over population in some countries creates inadequacy of resources. When there are limited means and more mouths to feed, children are driven to commercial activities and not provided for their development needs (ILO, 2008).

Although there have been some studies which have tried to show the magnitude and situation of child labor, the issue of child labor is becoming of great importance to Ethiopia and hence it requires further study in order to address and solve the problem so as to enjoy the future without child labor. As southern nations nationalities and peoples regional state (SNNPR) is one of the regions of Ethiopia, this region is one of the parts of Ethiopia which share the problem of child labor. In addition, according to Ethiopia Child Labor Survey Report 2001, the percentage distribution of children aged 5 to 17 years by work status for Oromiya (46.4), Tigray (36.3), Amhara (45.3) and SNNP (51.0) regions indicates that the SNNP region is the one with the highest percentage of working children aged 5 to 17. Hence, it is worth making a thorough study concerning child labor in this region.

1.2 Objectives

General Objective

The ultimate goal of this research is to identify the possible determinants of child labor and to see how they contribute to the widespread practice of child labor in rural parts of SNNP region.

Specific Objective

To determine the socio-economic and demographic determinants of child labor in SNNP region

1.3 Significance of the Study

- ❖ The result of this study helps concerned bodies to understand the main causes of child labor and combat them.
- ❖ The result also helps in providing the required information to the concerned so as to make efficient policies regarding child labor.
- ❖ In addition, the result helps in making further study in this area.

1.4 Limitations of the study

- The 2001 Ethiopia child labor survey did not collect data on parental survivorship, that is, whether or not the parent(s) of the working children is/are surviving, as one of the variables involved in the survey. Due to this, the study could not incorporate parental survivorship although it is one of the most important influencing factors.
- Due to the lack of a recent alternative data source, this study used the data which is obtained from the 2001 Ethiopian Child Labor Survey.

1.5 Concepts and Definitions of key terms

Employee:

Is a person who works for a public or private, NGOs or for government on contract or permanent, daily or weekly basis and receives pay in wages or salary, commission or pay in kind.

Self employed:

Is a one who operates his or her own economic enterprise or engages independently in a profession or trade, and hires no employees.

Enumeration Area (EA):

Is a unit of land delineated for the purpose of enumerating population and housing units without omission and duplication. An EA in rural areas usually consists of 150-200 households, and on the other hand an EA in urban areas constitutes 150-200 housing units (CSA, 2001).

Household:

Consists of a person or groups of persons, irrespective of whether related or not, who normally live together in the same housing units or group of housing units and have common cooking and eating arrangements (CSA, 2001).

Head of household:

Is a person who economically supports or manages the household or for some reason of age or respect is considered as head by the other members of the household. It could be a male or a female (CSA, 2001).

Housekeeping Activities/Household chores:

Are personal services of a domestic nature provided by unpaid household child members in their own parents or grandparents/guardians or spouse's household, and as such, are considered non-economic. Housekeeping activities/household chores include preparing

and serving meals, making, mending, washing and pressing clothes; shopping, caring for siblings or sick and infirm persons in the household; cleaning and maintaining of the household dwelling; using, cleaning, serving and repairing household durable; transporting of household members or their good (CSA, 2001).

Economic (productive) Activity:

Is defined as a work that involves the production of goods and/or services for sale or exchange and production of certain products for own consumption.

According to the above general definition, economic activity covers production of goods and services intended for sale on the market, production of other goods and services such as government activities; production and processing of primary products (agriculture, hunting, fishing, forestry and logging; and mining and quarrying) for own consumption, processing of primary products by the producers themselves, production of other commodities where part of it is sold on the market; and own account construction and fixed asset formation (expected life use of one year or more). Such economic activities could be performed for an individual, family or private enterprise, government establishment or public organization. The remuneration may be on daily, weekly, monthly, yearly or contract basis (CSA, 2001).

Children:

In this study, the word “children” refers to persons in the age group 5 to 17 years.

Working Children:

Throughout this study, the word "working" refers to children who are engaged in either economic or housekeeping activities.

2. Literature Review

2.1 *General Literature*

On World Day Against Child Labor 2007, FAO forwarded that although great progress has been made in many countries in reducing hazardous child labor in other sectors, eliminating child labor in agriculture remains a challenge. The large numbers of child workers, the fact that they start work young, their relative invisibility due to poor statistics and informal, family-based work relationships make it difficult to know the true scale of the problem. Furthermore, low family incomes, the absence of schools, the lack of regulation, and ingrained attitudes and perceptions about the roles of children in rural areas are only some of the numerous factors which make child labor in agriculture particularly difficult to tackle and eliminate. Unless a concerted effort is made to reduce agricultural child labor, it will be impossible to achieve the goal of eliminating all the worst forms of child labor by 2016.

One of the many reasons for the importance of poverty and children's contribution to family living standards comes from examining how child labor responds to trade growth in developing countries. Greater employment opportunities for children are brought whenever the growing trade coincides with rising incomes. Although abusive labor exists and must be eliminated, data show that the typical child laborer works alongside a parent and is helping his or her family meet its most basic needs (Eric V. Edmonds, 2005). Although the current debate on child labor focuses on developing countries, it was found that in some of the relatively developed countries like Portugal, it is still a matter of concern as about 8 to 12 percent of Portuguese children may be classified as workers (Goularl Pedro and Arjum S. Bedi, 2007).

According to the study conducted by ministry of labor in Turkey (1995), many of the children in the country work under unhealthy, unsafe and insecure conditions. A large proportion of the children working in urban areas are in informal/unregistered jobs where they sell simit, gum, flowers etc. Others work in industry as apprentices or in the service

sector and run errands. The study indicated that among child apprentices, 16% of the children carry heavy loads, 13% work under unfavorable weather conditions i.e., rain and cold, 13% work standing up all day, and 12% with heavy machinery which they find difficult to operate. There are 86% working more than 7.5 hours a day and 86% work more than 45 hours per week. Less than 56% get annual paid vacation leave and half of them do not have any of the statutory holidays except for the religious ones.

A report by farm consultancy 2003/4 based on a study in Fiji tobacco industry has shown that children do work in the tobacco fields predominantly to help their families though about 17% work for cash. Although there are sufficient schools within the comfortable distance of the communities for all children to be able to attend schools, many parents keep their children at home because of financial reasons. In addition to poverty, lack of awareness within the entire community about the issues of child labor and cultural acceptance that children can and must work to help their families after school hours are among the real causes of child labor in the area. A similar report on tobacco plantations in Sumatra, Indonesia, has shown that child work on this area offered a high risk for accidents though there were few reports of actual injuries. The study confirmed that the majority of child workers were aware of the risks or possible accidents. However, the heavy work load of their father in the same field and the economic reality of their family made involvement necessary. A child's help in cultivating the tobacco helps the family's livelihood and thus has become standard practice. In the same study, most children responded that the work in the fields has never been in conflict with their learning process or studies at school. However, some of the research informants believed that the work in the plantations has negative impacts on children: They tend to feel too tired to study after helping their parents in the field.

Findings from child labor surveys in 2002 in the cocoa sector of West Africa indicated that children in rural areas have traditionally worked in agriculture as part of the family unit. According to the child labor surveys conducted in four West African countries, the overall family labor is the most used labor type. For example, in Côte d'Ivoire, 87 percent of the permanent labor used in cocoa farming came from the family. Some children

working in cocoa farms have no family ties to the farmers. In cocoa farming, children are engaged in a number of tasks/activities such as clearing fields; weeding; maintaining cocoa trees; applying pesticides, fermenting; transporting; drying; and other tasks. Boys are more likely to work in cocoa farming. About 59 percent of children working in cocoa farming are boys while girls account for 41 percent. The majority of working children (64 percent) in cocoa farming are below the age of 14.

According to the international rescue committee (IRC) in 2007, the problem of child labor in Ethiopia is significant: nearly 60 percent of children in this country work to supplement their family income, half of them at hazardous jobs. Children most often work as domestics, farm hands or miners, the latter category including bootleg prospecting for gold, a common practice in this part of the world.

The 2005 findings on the worst form of child labor in Ethiopia (US department of labor) have shown that an estimated 49.7 percent of children aged 5 to 14 years were counted as working in Ethiopia in 2001. Approximately 39.5 percent of all boys 5 to 14 were working compared to 59.5 percent of girls in the same age group. The majority of working children were found in the agricultural sector (94%), followed by services (3.6%), manufacturing (1.2%), and other sectors (1.1%). In rural areas, the largest number of working children, especially boys, is engaged in activities like cattle herding, petty trading, plowing, harvesting and weeding. Food and Agriculture Organization of the United Nations (FAO), 2007 recognized that the causes of child labor in agriculture are rooted in poverty and that generating alternative income sources for rural households is critical to reduce the need for children to work.

Using a sample of 3115 children between 7 and 17 years of age, a multinomial logit model of child schooling and labor was developed to assess the factors associated with child schooling and labor for rural and urban Ethiopia in selected regions. The model was also run for rural, urban, female-headed and male-headed households, as well as for male and female children separately. The effect of child-, family- and community-level characteristics on child “schooling and work” combined, child “work only” and “minimal

work” relative to “schooling only” were compared. It is found that a child’s sex and age, family composition, maternal education, household wealth and asset levels, access to credit, exposure to adverse shocks, and caregivers’ social capital are important in explaining children’s time use. These quantitative findings were complemented by qualitative research. In addition to providing a more nuanced understanding of the quantitative results, the qualitative findings also underscored the importance of accessibility of schools and parental attitudes towards child education and work. In this regard, the findings underscore the importance of introducing a child-sensitive perspective to national development strategies to ensure that considerations of children’s right to education are not limited to education policies only. Rather, there is an urgent need to consider the extent to which poverty reduction approaches are actually leading to an increase in child labor and/or caregivers’ labor which may in turn have a negative impact on child education and general wellbeing (Tassew et al, 2005).

In 2000, the international labor organization (ILO) estimated that 41.1 percent of children aged 10 to 14 years in Ethiopia were working. In urban areas, children work as domestic workers, street peddlers and as employees in private enterprises. According to the child labor study in rural Ethiopia, 30 percent of the workers on state-owned farms are children 7 to 14 years of age. Children work on commercial cotton, sugarcane, coffee, and tea farms. In rural areas, children also work on family farms. Household chores may require long hours and excessive physical exertion, and can interfere with school, particularly in the case of girls. The child labor study in rural Ethiopia in 1999 reported that 30 percent of the workers surveyed on state-owned farms are children in ages 7 to 14 years. These children work on coffee, tea, sugarcane and commercial cotton farms. In rural areas, children also work on family farms. According to the 2001 Ethiopia child labor survey report, approximately 85 percent of children aged 5 to 17 were engaged in different forms of productive and house keeping activities.

Family composition is one of the many factors affecting child labor. A study by Young Lives (2005), based on Ethiopia national level data, has shown that children were more likely to be attending school only when there was adequate labor in the household: more

children aged 7-17 years as well as more male adults generally decreased children's work burden. This indicates that for many rural households engaged in labor-intensive agricultural and petty trading activities, children are often needed to fill labor gaps. This has a particularly significant impact on dropout rates in male-headed households and on child enrolment in female-headed households where children (especially boys who need to compensate for the lack of adult male agricultural labor power) are less likely to attend school than in male-headed households.

2.2 Schooling and child labor

An ILO (2007) study has found that uneducated laborers are liable to be exploited by others because they may not be aware of their rights and also of how they solve their problems when they are subjected to oppression. Because of their low level of capability, the uneducated are often unable to find good jobs; and even if they find employment, their wages/ salaries as well as their productivity are low. They need education and training for skill development to raise their productivity and income. Education is also necessary if the people are to absorb and employ improved technologies and methods of organization and management to contribute towards accelerating economic growth, while enhancing their own incomes. Simply removing child laborers from work is not enough, as experience at ILO-IPEC and elsewhere has shown. Children and their guardians must also be provided with viable alternatives, if the cycle of child labor is to be broken.

Based on evidence from Multiple Indicator Cluster Surveys (MICS) and Demographic and Health Surveys (DHS) in 35 developing countries, a "Child labor, Education and Youth Employment" seminar report on "Child labor and School Attendance" highlighted the trade-off between child labor and school attendance. 78 percent of all children between 7 and 14 years of age were attending school at the time of the surveys, while 25 percent of all children in this age group were in child labor. A regression analysis identified poverty as the most important determinant of low school attendance and high child labor rates. The education of the household head was also found to be an important factor in the decision between work and school for children, underscoring the intergenerational benefits of education. Many countries are still far from the Millennium

Development Goal of universal primary education. Programmes that aim to reduce the incidence of child labor and increase school attendance rates must be tailored to the specific situation of each country and encompass legal, economic and social policies. Child labor legislation is important as a means to protect children from the worst forms of child labor by setting minimum standards and by raising awareness of the rights of children, but such legislation is not sufficient to reduce the number of working children as long as the underlying causes are not addressed. Targeted cash transfers to poor families have been tested in several countries and the evidence has shown them to be an effective tool in the struggle against poverty. Cash transfers can raise the income of poor households above the subsistence level, thus reducing the need to rely on child labor and making it possible for children to attend school (Friedrich Huebler, 2008).

Schooling and education must remain the central policy instrument for overcoming child labor in Africa. Unlike most other policy instruments, they work against both major forms of child labor. To be effective, a two-way adjustment between the children's work tasks and schooling is necessary. Otherwise, the children may quit or not join the school, either on their own or their parents' initiative. While it is important to improve the quality of the schools, such an adjustment also implies that the schools should be adjusted to the agricultural seasons and not become overly ambitious. If the schools are not adjusted to the agricultural seasons, the alternative costs of having the children attend during those seasons may become too high. Due to the cumulative nature of many learning processes, the result might be that the children drop out and have to work full time at home or in the market (Jens et al, 2001).

According to an ILO study on Tanzania, the incidence of child labor in the country has risen partly because of the deterioration of the school system, a result of economic decline. Poor infrastructure, low teacher moral and the introduction of school fees under the country's structural adjustment programme have contributed to higher drop-out rates. This has brought down Tanzania's once-high primary enrolment rate: from 90 percent in 1980 to 77.8 per cent in 1996. Thirty percent of all children between 10 and 14 are not attending school, and many end up working. In villages around mining sites, the school

drop-out rate is around 30-40 per cent. AIDS is another contributing factor in many African countries. By killing so many breadwinners, it has driven more families deeper into poverty, placing an even greater burden on the survivors, including children. A UNICEF (2001) study of six countries in Eastern and Southern Africa found that the “dissolution of families from HIV/AIDS increases the likelihood of children being forced into exploitative labor”.

The 2001 Child Labor Survey report of Ethiopia on child attendance in formal and informal schooling indicates that about 33 per cent of children aged 5 to 17 years attended formal school, whereas 5 percent attended informal schools such as religious schools. About 56 percent of children had never attended school. It is also found from the result that the dropout rate during the survey year was 5 per cent, with boys dropping out more than girls. School attendance increased with age, with 36 per cent of children aged 7 to 12 years attending school. In the report, the main reasons for not attending school are as follows:

- ❖ children are too young (31.9 per cent);
- ❖ children are needed to help with household chores (18.7 per cent);
- ❖ schools are not available in the area (10.4 per cent);
- ❖ children are needed to generate household income (9.5 per cent);
- ❖ parents cannot afford schooling (8.7 per cent); and
- ❖ Families do not permit schooling (7.5 per cent).

A research by Young Lives, a joint research and policy initiative co-ordinated by an academic consortium and Save the Children UK, in Ethiopia (2005) indicated that maternal education levels significantly decreased the likelihood that children would combine work and school compared to schooling only. Similarly, children with better educated fathers were less likely to be involved in work only when compared to those children with less educated fathers. These results imply that children of educated parents are more likely to attend school, which may have an interesting policy implication for adult education. In a separate regression for female-headed households, more maternal

education was found to be associated with a greater probability of combining work and school and participating in work only relative to school only. In the case of male-headed households, however, maternal education reduced the probability that children combined work with school; fathers' education reduced the likelihood of children being involved in either work or minimal work.

2.3 Income, wealth, ownership of assets and child labor

There are a lot of reasons that can urge a child to labor market, but generally the most common is the presence of low household incomes, which forces children to work to sustain themselves or, in less serious cases, to increase the life quality of their families. In other words, a household will not push children to labor market if their income is sufficiently high (Basu and Van, 1998).

Various studies have examined the dynamics surrounding the balance between school and work for children in families with few economic resources. In Latin America, according to a report by Association of School of Public Health (2005), children living in households of lower socioeconomic status, measured by total income of the head of household, tended to enter the workforce at an earlier age to compensate for lack of family earnings. This resulted in diminished academic performance (i.e., greater failure and grade repetition rates), resulting in an approximate 1.5 year reduction in the amount of schooling attained. Also, children who worked were more likely to have failed at least one grade in school.

A study by Tassew et al (2005) found that when the participation rate of children in economic activity by wealth category is analyzed, participation in economic activity increased with increasing expenditure, reached a maximum at the 100-300 Birr expenditure level and declined thereafter. For those children not attending school, there was a positive relationship between wealth and child labor participation. The results showed a remarkable trend when this relationship was disaggregated by rural and urban areas. For urban children attending school, participation rates in economic activity declined as the level of household wealth increased. For those who did not attend school,

participation rates declined up to a certain level of wealth (600-1000 Birr per month) and then started to rise. This result for urban areas indicates that child labor was more closely related to income poverty. However, in rural areas, there was a positive relationship between the level of expenditure (wealth) and children's participation rates in economic activity (child labor) up to a certain level of wealth. It is also indicated that both for those who were attending school and those who were not, the participation rate in work increased as the level of household expenditure or wealth increased. This may be a consequence of the "wealth paradox effect" which explains that participation of children in economic activity can increase with wealth in rural areas when it is related to land ownership, since failures in credit and labor markets mean that land owners cannot employ external laborers and thus use their children to work the land instead.

Owners of land and livestock who are not able to hire productive labor may have an incentive to use their children's labor instead of sending them to school. Similarly, if households do not have access to credit, or if they cannot use their assets to gain access to credit to employ labor, they will use their children's labor. The findings of the study by Young Lives (2005) in Ethiopia indicated that the size of a household's land holdings had a positive and significant impact on children working or combining work and school relative to schooling only. That is, children of households with greater land size (because of opportunity cost effects) were more likely to spend their time working or combining school and work than attending school only. The impact on children's engagement in minimal work, however, was insignificant. These findings are supported by qualitative research which highlighted the problems of growing land fragmentation and landlessness due to a combination of population pressures and poor quality of land. That is, while land ownership often necessitates some child involvement in labor activities, it also provides greater economic security than that enjoyed by families who have been compelled to rent or sell their land due to natural disasters and financial strains. Such families are often forced to migrate in search of low-paying off-farm work or to send their children to work on construction sites, sell food in the vicinity of places selling alcohol (simultaneously increasing the risk of sexual harassment, abuse and exploitation) or allow their children, particularly, daughters, to be trafficked to Arab countries. It is also found that the number

of livestock that a household owns influences child schooling and labor. The results for this variable indicated that the number of livestock a household owns had a positive and significant impact on children engaged in work only or combining work and school. In the absence of perfect labor and credit markets, ownership of larger numbers of livestock led to greater child labor (Tassew et al, 2005).

2.4 Poverty and child labor

Child labor is closely associated with poverty. Many poor families are unable to afford school fees or other school costs. The family may depend on the contribution that a working child makes to the household's income, and place more importance on that than on education. And when a family has to make a choice between sending either a boy or girl to school, it is often the girl who loses out (ILO, 2008). The results from the full sample as well as the various sub samples from the study "Revisiting the Link between Poverty and Child Labor" in Ghana indicated that children from poor households are more likely to engage in child labor as they grow older. Poverty affects the likelihood of engaging in harmful child labor positively and is a very robust finding since it is found to be statistically significant for the full sample as well as all the sub-samples (except for urban girls) (Niels-Hugo Blunch and Dorte Verner, 2001).

Metin Turan (2005) in his study, "Determining nature of poverty on child labor" found that the basic reason of child employment is poverty for the family. Children with families deprived of economic and social security are obliged to work to contribute to their families. In some cases, it is only the child who brings income to the family.

2.5 Child labor and informal sectors

In many developing countries, working children are highly concentrated in the informal sectors of the economy. In such sectors, their activities are not "official" and they work for people that are not normally registered as employers (ILO/IPEC, 2004).

Sherry L. Baron made a study titled "Injuries in Child Laborers in the Informal Sector in Mexico City, Mexico, 1997" on a total of 584 injured children from 5 to 17 years of age,

of whom 72% were male. Of the children involved, 18% were ages of 5–9, 30% were 10–13, and 52% were 14–17. Among both males and females, a large percentage of work-related injuries occurred while they were commuting to work: 28% for males and 25% for females. Injuries occurring while commuting to work are considered work-related injuries in Mexico. To analyze the remainder of the work related injuries, the occupations of the injured children were classified into five groups: (1) streets workers, (2) domestic workers, (3) workers delivering services to homes such as distributors of bottled water and garbage collectors, (4) retail employees including workers in stores, markets, and food establishments, and (5) construction and construction helpers. The results revealed that males had the most work-related injuries occurring in construction workers and construction helpers (38%), followed by workers in stores, markets, and restaurants (23%); for females, most injuries occurred in workers in stores, markets, and restaurants (50%). The most common causes of injuries were contact with equipment or objects (41%) and falls (19%). Although the numbers were small, violence was an important cause of injury among those working in the streets (two out of three injuries) and among those injuries that occurred while commuting to work (four out of 21 injuries).

According to a study in the informal sectors in Gulele Subcity, Addis Ababa, child workers are largely available in many different sectors of the area. A number of underage children are engaged in diversified productive activities. Children of either sex are taking part in the child labor market of the study areas for various reasons. In the context of the study, the participation of children is gender stratified. As a result, most of the working children in the sectors are male children. It is safe to say that they are male dominated economic sectors. However, there are very few girls who are working in the informal sectors particularly in businesses like baking *injera* for sale, in commercial sex working, serving clients in cafes, street peddling and collecting firewood for sale. The domination of boys may be due to the traditional outlook of parents towards sending their female children outside their home for work and the harassments female children may face in the outside world. Working children in the sectors are child laborers with disadvantaged background involving lack of or minimal access to education due to household poverty,

being orphans and are migrated from rural areas or other urban centers. The parents of the working children are engaging in 'marginal' economic activities largely due to lack of appropriate skills and education. As a result of their illiteracy, mostly they develop very little concern for their children's education and thus send them to the labor market to supplement the meager household income (Addisu Gedlu, 2008).

3. Data and Methodology

3.1 Source of Data, Study Area and Sampling Procedure

3.1.1 The source of data

The data source for this study is the Ethiopia Child Labor Survey conducted by Central Statistical Agency (CSA) of Ethiopia in 2001. This survey is the first of its kind carried out by CSA. The survey was designed to provide statistical data on children's activities focusing on the status of schooling, non-economic and economic activities.

3.1.2 Study Area

Southern Nations, Nationalities, and People's Region is one of the nine regions of Ethiopia. Its capital is Hawassa. The SNNPR borders Kenya to the south, Sudan to the west, the Ethiopian region of Gambela to the north, and the Ethiopian region of Oromia to the north and east. Besides Hawassa, the region's major cities and towns include Arba Minch, Wolaita Sodo, Dilla and Hosaena.

Based on the 2001 Ethiopia Child Labor Survey conducted by the Central Statistical Agency of Ethiopia, the SNNPR has an estimated total population of 12,431,218 of whom 895,958 (7.2%) are urban dwellers and 11,535,260 (92.8%) are rural inhabitants; this makes the SNNPR most rural region. Out of the total population, 31.2% are children aged 5 to 17 years.

3.1.3 Sample Design

The 2001 Stand-alone National Child Labor Survey of Ethiopia covered both rural and urban parts of the country. For the purpose of the survey the population of the country was divided into three major categories namely, rural (category 1), major urban centers (category 2) and other urban centers (category 3).

3.1.4 Sampling Frame

The Enumeration Area (EA) delineated for the 1994 Population and Housing Census of Ethiopia was used as a sampling frame for the selection of Primary Sampling Units (psu). The sampling frame used for the selection of ultimate sampling units (households) was a fresh list of households, which was prepared by the enumerator in the sampled EA at the time of the survey.

3.1.5 Sample Size and Selection Scheme

A sample size of 1,257 EAs was fixed based upon the required precision level and available resource for the survey. The 1999 National Labor Force Survey result was used to determine the required number of sample households per PSU/EA. For the survey, it was found that about 35 households per EA would give fair and reasonable estimates at a required reporting level for the variables under study.

In category I and II stratified two-stage cluster sampling was used for the selection of ultimate sampling units. The Primary Sampling Units (PSUs) are EAs and secondary sampling units are households. In category III stratified three stage cluster sampling was used for the selection of ultimate sampling units. In this category the PSUs are towns, the Secondary Sampling Units (SSUs) are EAs and the tertiary sampling units are households. The probability proportional to size (PPS) systematic sampling, size being total number of households obtained from the 1994 population and housing census was used for selection of towns and EAs.

From category I, a total of 723 EAs, from category II a total of 305 EAs and from category III a total of 229 EAs were selected. After generating a fresh listing of households within each sample EA at the beginning of the field work the survey questionnaire was administered to 35 systematically selected households, for rural and both categories of the urban domains.

3.2 Variables used in this study

Dependent variable: work status of children:

- Working = 1
- Not working= 0

Independent variables:

The following are variables that are assumed to influence the prediction of the work status of children.

No.	Description and Name	Categories
1	Sex of child (SEXCH)	(1) Female (2) Male
2	Age of child (AGECH)	(1) 5-9 (2) 10-17
3	School attendance of child (SCHCH)	(1) Attending (2) Not attending
4	Relationship to the head of the household (RELATHEAD)	(1) Son/daughter of head and/or spouse (2) Other relative (3) Non relative
5	Household size (HHDSIZE)	(1) 1-4 (2) 5-7 (3) 8-9 (4) 10 and above
6	Household income (HHDINCOME)	(1) Less than or equal to 2000 Br (2) Greater than 2001 Br and less than or equal to 4000 Br (3) Greater than 4001 Br

7	Religion of the head of the household (RELG)	(1) Orthodox (2) Muslim (3) Protestant (4) Others
8	Marital status of head of household (MARITST)	(1) Married (2) Divorced/Widowed/Separated (3) Never married
9	Employment status of head of household (EMPST)	(1) Employee (2) Self employed (3) Others
10	Migration status of head of household (MIGRE)	(1) Migrant (2) Non migrant
11	Education status of head of household (EDUCHEAD)	(1) Illiterate (2) Primary (3) Junior (4) High school and above

Among the predictor variables given above, some of them are hypothesized as follows:

1. The vulnerability to child labor is higher among male children as compared to female children.
2. Child labor is positively related with age of children.
3. Child labor is inversely related with education status of the head of the household.
4. The likelihood that a child will work increases as the size of the household increases.
5. School attendance of child reduces the likelihood that a child will participate in work.
6. Increase in household income decreases child labor.

3.3 Method of Data Analysis

3.3.1 The logistic regression

To analyze the data, both univariate and multiple logistic regression techniques are employed. Logistic regression can be binary or multinomial. The binary or binomial logistic regression is the type of regression which is used when the dependent variable is a dichotomous and the independent variables are of any type while multinomial logistic regression is used when the dependent variable has more than two categories. In this study, the binary logistic regression is used since the dependent variable, the work status of children, is dichotomous, that is, it assumes only two values: working (1) and not working (0). The logistic regression is used because of two main reasons: the first is its extreme flexibility and ease, and the second is because it leads itself to a meaningful interpretation.

Logistic regression can be used

- to predict a dependent variable on the basis of continuous and/or categorical independent variables and to determine the percent of variance in the dependent variable explained by the independent variables;
- to rank the relative importance of independent variables.

Logistic regression calculates changes in the log odds of the dependent variable, not changes in the dependent variable itself as OLS regression does. Unlike OLS regression, logistic regression does not assume linearity of relationship between the independent variables and the dependent variable, does not require normality assumption, does not assume homoscedasticity, and in general has less strict requirements. The logistic regression applies maximum likelihood estimation after transforming the dependent into a logit variable (the natural log of the odds of the dependent variable occurring or not). In this way, logistic regression estimates the probability of occurrence of a certain event.

3.3.2 The Logistic Regression Model

As mentioned previously, the independent or predictor variables in logistic regression can take any form. That is, logistic regression makes no assumption about the distribution of the independent variables. They do not have to be normally distributed, linearly related or of equal variance within each group. The relationship between the predictor and response variables is not a linear function in logistic regression; instead, the logistic regression function is used, which is the logit transformation of success probability, P_i of the i^{th} individual. In logistic regression, a single outcome variable Y_i ($i=1--- n$) follows a Bernoulli probability function that takes on the value 1 with probability P_i and 0 with probability $1- P_i$. Then P_i varies over the observations as an inverse logistic function of a vector X_i of predictors for the i^{th} individual which includes a constant and k explanatory variables, that is,

$$\begin{aligned}
 P_i &= \frac{e^{\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki}}}{1 + e^{\beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_k x_{ki}}} \\
 &= \frac{e^{X_i' \beta}}{1 + e^{X_i' \beta}} \quad , \quad i = 1, \dots, n \quad \dots \dots \dots (1)
 \end{aligned}$$

Where: $\beta = (\beta_0, \beta_1, \dots, \beta_k)'$ and $X_i = (x_{0i}, x_{1i}, \dots, x_{ki})'$ with $x_{0i} = 1$.

In logistic regression, the dependent variable is a logit, which is the natural log of the odds, that is,

$$\begin{aligned} \log(\text{odds}) = \text{logit}(p_i) &= \ln\left(\frac{p_i}{1-p_i}\right) \\ &= \beta_0 + \beta_1 x_{1i} + \dots + \beta_k x_{ki} \\ &= X_i' \beta \dots\dots\dots (2) \end{aligned}$$

where:

$p_i = p(Y_i = 1 | X_i)$ is the probability of success or chance of being in the working category.

So, a logit is a log of odds and the odds are a function of p_i , the success probability.

And a model parameter β_i is interpreted as the change in the log odds for a one unit increase in X_i , holding all the other predictors constant, or after adjusting for the other predictors. If β_i is positive and greater than one, the odds are increasing; if β_i is negative, the factor will be less than one, indicating the odds are decreasing. When β_i is zero, the factor equals one, which leaves the odds unchanged (Hosmer Jr. and Lemeshow, 1989).

In logistic regression, $\text{Exp}(\hat{\beta})$ is the estimated multiplicative change in the odds for a unit increase in the predictor, controlling for the effect of others. The value of the relative odds ratio can be further expressed as a percentage change of the odds, (i.e. $\text{Exp}(\beta) - 1$). The significant level of the regression coefficients will be determined by p-value and the

analysis of the result will be presented in the form of odds ratios, (i.e. the ratio of the probability that the event will occur to the probability that it will not).

The logistic regression is interpreted using odds ratio. The odds ratio sometimes refers to the risk or chance of occurrence. The odds ratio is, therefore, obtained by the probability of event occurring to that of probability of event not occurring. The odds ratio of the reference category is one by definition.

The parameters in logistic regression model represent the increment or the decrement in the log odds for the categories as opposed to the reference category holding all factors constant.

3.3.3 Assumptions of the logistic regression model

In addition to the advantages stated above, logistic regression has some useful assumptions that have to be considered for efficient use of the method.

- **Meaningful coding:** If the independent variables are not coded meaningfully, logistic coefficients will be difficult to interpret. The convention for binary logistic regression is to code the dependent class of greatest interest as 1 and the other class as 0. For multinomial logistic regression, the class of greatest interest should be the last class. Logistic regression is predicting the log odds of being in the class of greatest interest.
- **Inclusion of all relevant variables in the regression model:** If relevant variables are omitted, the common variance they share with included variables may be wrongly attributed to those variables, or the error term may be inflated
- **Exclusion of all irrelevant variables:** If causally irrelevant variables are included in the model, the common variance they share with included variables may be wrongly attributed to the irrelevant variables. The stronger the correlation of the irrelevant variable(s) with other independent variables, the greater the standard errors of the regression coefficients for these independent variable.

3.4 Estimation of parameters

In fitting logistic regression model, the maximum likelihood and non-iterative weighted least squares are the two commonly used estimation methods (Green, 1993 and Hosmer-Lemeshow, 1989). When the assumption of normality of the predictors does not hold, the maximum likelihood method is more efficient than the non-iterative weighted least squares method (Maddala, 1992). Therefore, in this study the maximum likelihood estimation technique is employed to estimate the parameters of the model. Such estimators are unbiased and efficient and therefore technically superior to those of ordinary least squares (OLS). Ordinary least squares estimation with a binary dependent variable yields unbiased but inefficient estimators because of the heteroscedasticity disturbance term (House, 1985).

Let P_i be the probability of success, which is equivalent to the probability that the response variable Y_i assumes the value one. Then:

$$p_i = P(Y_i = 1 | X_i) = \frac{1}{1 + e^{-X_i' \beta}} \quad i = 1, 2, \dots, n \quad \dots \dots \dots (3)$$

where $X_i = (x_{1i}, x_{2i}, \dots, x_{ki})$ is vector of predictors for the i^{th} individual

Each observation (response) can be considered as an outcome of a Bernoulli trial. Thus, for the i^{th} observation Y_i , the Bernoulli distribution is:

$$P(Y_i = y_i | X_i) = p^{y_i} (1 - p)^{1 - y_i} \quad i = 1, 2, \dots, n \quad \dots \dots \dots (4)$$

Then the likelihood function is the joint probability distribution of all n observations and is given by:

$$L = \prod_{i=1}^n p_i^{y_i} (1 - p_i)^{1 - y_i} = \prod_{i=1}^n \left(\frac{1}{1 + e^{-X_i' \beta}} \right)^{y_i} \left(\frac{e^{-X_i' \beta}}{1 + e^{-X_i' \beta}} \right)^{1 - y_i} \quad i = 1, 2, \dots, n \quad \dots \dots (5)$$

Taking the natural logarithm of both sides gives:

$$\ln L = \sum_{i=1}^n y_i \ln\left(\frac{1}{1+e^{-X_i'\beta}}\right) + \sum_{i=1}^n (1-y_i) \ln\left(\frac{e^{-X_i'\beta}}{1+e^{-X_i'\beta}}\right) \dots\dots\dots (6)$$

Thus, by maximizing the log-likelihood function in equation (6) we can estimate the parameter vector β . But the equation is nonlinear in β , and as a result the estimates do not have a closed form expression. Therefore, we can obtain $\hat{\beta}$, the estimator of β , using a numerical iterative method (Agresti, 1996).

3.5 Model development and model assessment

3.5.1 Model development or variable selection

The goal of logistic regression is to correctly predict the category of outcome for individual cases using the most appropriate model. To accomplish this goal, a model is created that includes all predictor variables that are useful in predicting the response variable. Several different options are available during model creation. Variables can be entered into the model in the order specified by the researcher or logistic regression can test the fit of the model after each coefficient is added or deleted, called stepwise regression. The basic procedures involve (1) identifying an initial model, (2) iteratively "stepping," that is, repeatedly altering the model at the previous step by adding or removing a predictor variable in accordance with the "stepping criteria," and (3) terminating the search when stepping is no longer possible given the stepping criteria, or when a specified maximum number of steps has been reached. The two major categories of stepwise regression techniques are: (1) the forward stepwise and forward entry and (2) the backward stepwise and backward removal. In this study, the forward stepwise and forward entry method is used to select variables.

3.5.2 Assessing goodness of fit

After developing the model for our data, it is better to investigate how effective the model is in describing the outcome variable. The Pearson's Chi-square, the likelihood ratio test (LRT)(Deviance), Hosmer- Lemeshow test and the Wald test are the most commonly used measures of goodness of fit for categorical data. Among them, some are briefly discussed in the following section. See detail discussion in Agresti (1996).

3.5.2.1 The Hosmer-Lemsho Test:

The Hosmer-Lemsho test is one of the methods used in testing the hypothesis that the model fits the data. In this approach, data are divided into 10 groups. From each group, the observed and expected number of events will be computed and the test statistics is given by

$$\hat{C} = \frac{\sum_{k=1}^g (O_k - E_k)^2}{V_k},$$

where g is the number of group, O_k is observed number of events in the k^{th} group, E_k is the expected number of events in k^{th} group, and V_k is a variance correction factor for the k^{th} group. If the difference between the observed number of events and what is expected by the model is large, then the statistic \hat{C} becomes large and there will be evidence against the null hypothesis that the model is adequate to fit the data. This statistics has an approximate chi-square distribution with $g-1$ degrees of freedom.

3.5.2.2 The Likelihood Ratio Test:

The likelihood ratio statistic, G^2 , is the other commonly used approach which is based on the comparison of the fitted and the observed counts. Large value of G^2 indicates lack of fit of the model. If the fit of the model is not good, residuals and other diagnostic measures describe the influence of individual observations on the model fit.

The likelihood ratio statistic, G^2 , is given by

$$G^2 = -2LL_R - (-2LL_F) = -2\ln\left(\frac{\text{likelihood}_R}{\text{likelihood}_F}\right)$$

where the likelihood ratio is $-2(\log \text{likelihood R})$ for a restricted (smaller) model minus $(-2 \log \text{likelihood F})$ for a full (larger) model which is the same as the log of the ratio of the two likelihoods, that is distributed as chi-square. The full or larger model has all the parameters of interest in it whereas the restricted is nested in the larger model. The restricted model has one or more of parameters in the full model restricted to some value (usually zero). The parameters in the nested model should be a proper subset of the parameters in the full model. Here the chi-square test is employed to see whether including a variable improves goodness-of-fit measure. If chi-square is significant, the variable is considered to be a significant predictor in the equation.

3.5.2.3 The Wald Test:

The other measure of goodness of fit is what we call the Wald statistic which is commonly used to test the significance of individual logistic regression coefficients for each independent variable. For a dichotomous independent variable, the Wald statistic is given by

$$W = \frac{\hat{\beta}_i^2}{\text{Var}\left(\hat{\beta}_i\right)}$$

When the sample size is large, the statistic has an approximate chi-square distribution with one degree of freedom.

3.6 Model Diagnostics

The fitted model may be inadequate because of particular observations, outliers or influential values. These observations may affect the conclusion to be drawn from the analysis, thus, detection and treatment of such observations should be part of the model adequacy check. Detection and treatment of outliers and influence diagnostics are some of the statistical techniques that are used to examine the adequacy of a fitted model.

3.6.1 Outliers

Outliers are observations that are unexpectedly far-away from the remaining observations in the sample. Such values may occur as a result of measurement errors or employing a faulty experimental procedure. Some of the statistical techniques that are used to detect the presence and extent of influence of outliers are: unstandardized residuals, $y_i - \hat{u}_i$; the

Pearson or standardized residuals, $\chi^2 = \sum_{i=1}^n \frac{(y_i - \hat{u}_i)^2}{\hat{u}_i(1 - \hat{u}_i)}$ and deviance (D) which is

given by $\pm 2 \sqrt{\ln \left[\frac{y_i}{\hat{u}_i} \right]^{y_i} \left[\frac{1 - y_i}{1 - \hat{u}_i} \right]^{1 - y_i}}$ where u is the number of parameters in the

model. In this study, the standardized residuals method is employed. Using the significance level 0.01, the presence of outliers is signaled if the standardized residuals lie outside the range of the interval (-3, 3). If the presence of outliers affects the inference, the decision whether or not to include them or revise the model must also require a close subjective examination of the data in addition to statistical grounds.

3.6.2 Influence Diagnostics

If exclusion of an observation from the data set results in substantial changes to a certain aspects of the fit of the model, then the observation is said to be influential. Leverage statistic; (\hat{h}_{ii} , which is the diagonal element of the matrix $H = X(X'X)^{-1}X'$), DFBETA (the change in the logistic regression parameter estimates when the observation is

deleted) and *Cook's* distance ($C_i = \frac{r_i \hat{h}_{ii}}{u(1 - \hat{h}_{ii})}$ where r_i is the Pearson residual, \hat{h}_{ii} is the leverage of case i and u is the number of parameters in the model) are some of the statistical techniques used in influence diagnostics. Of these techniques, the *Cook's* distance is employed for this study to assess the overall impact of an observation on the estimated parameter vector $\hat{\beta}$. Thus, points for which *Cook's* distance greater than one is considered as an influential. In addition, using DFBETA statistic, the specific impact of an observation on the regression coefficients is checked. DFBETA greater than one is considered as outlier for critical variables in the model.

3.6.3 Multicollinearity

Multicollinearity in logistic regression models is a result of strong correlations between independent variables. The existence of multicollinearity inflates the variances of the parameter estimates. That may result, particularly for small and moderate sample sizes, in lack of statistical significance of individual independent variables while the overall model may be strongly significant. Multicollinearity may also result in wrong signs and magnitudes of regression coefficient estimates, and consequently in incorrect conclusions about relationships between independent and dependent variables. Some of the statistical techniques that have been proposed for detecting multicollinearity among categorical predictor variables are: inspecting off-diagonal elements of the Kendall's tau bivariate correlation matrix of the explanatory variables; variance inflation factors (VIFs), tolerance and condition number or indices. Among them, this study used variance inflation factors (VIFs) and tolerance.

Tolerances or variance inflation factors (VIFs) are probably superior to the analysis based on bivariate correlations and defined as $VIF(\hat{\beta}_j) = \frac{1}{1 - R_j^2}$ where R_j^2 is the coefficient of determination obtained when x_j is regressed on the remaining $p - 1$ predictors. The VIF for each term in the model measures the combined effect of the dependencies among the predictors on the variance of that term. A commonly given rule of thumb is that if any

of the VIFs exceeds 5 or 10, it is an indication that the associated regression coefficients are poorly estimated because of multicollinearity. Another approach is taking the inverse of VIF termed as tolerance associated with a predictor. When the tolerance is small, say less than 0.01 then, it would be expedient to discard the variable with smallest tolerance. A tolerance close to 1 means there is little multicollinearity; whereas a value close to zero suggests that multicollinearity may be a threat (Marquardt, 1970).

4. Statistical Data Analysis and Discussion

4.1 Summary Statistics

I. Introduction

In this study the response variable, work status of children, is binary; that is, it assumes only two values 0 and 1. To assess the relationship between the response variable and the suggested independent variables, the logistic regression analysis is employed. Before going to the analyses of univariate and multivariate statistics, it is better to start by briefly summarizing the cases of the data. The total number of cases in this study is 4859 of which 2042 are not working (control) group and 2817 are working children. The following two sections describe the percentage distribution of selected demographic and socio-economic variables by work status of children.

II. Demographic factors and working children

In this section, we give a brief analysis of the cases of the working children out of the total number of cases for each variable. Among the children in the working category, 57.9 % are female workers whereas the remaining 42.1 % are males. The majority (61.9%) of the working children are in the age group 5 to 9 years and the remaining are in age group 10 to 17 years. Out of the children categorized in the working group, about 82.7 % are sons or daughters of head and/or spouse and the remaining are other relatives (14.4%) and non relatives (2.9%). About 93.9 % of the families of the children are non migrants and the rest are found to be migrants. The household size of the largest group (49.0%) of the working children is 5 to 7 persons per household followed by 1 to 4 persons per household (30.4%) and 10 and above persons per household (12.1%). Table 4.1 below gives details of the above discussion.

Table 4.1 **Demographic factors by working children**

Demographic factors		Working	percent
Sex of child	F	1632	57.9
	M	1185	42.1
	Total	2817	100.0
Age of child	5 to 9	1744	61.9
	10 to 17	1073	38.1
	Total	2817	100.0
Relationship to head of the household	Son or daughter of head and/or spouse	2329	82.7
	Other relative	407	14.4
	Non relative	81	2.9
	Total	2817	100.0
Migration status of head of household	Migrant	172	6.1
	Non migrant	2645	93.9
	Total	2817	100.0
Household size	1 to 4	870	30.9
	5 to 7	1381	49.0
	8 to 9	224	8.0
	10 and above	342	12.1
	Total	2817	100.0

III. Socioeconomic factors and working children

Nearly 64.3 % of the household heads of the families of the children in the working category are married and 20.9 % and 14.8 % are divorced/widowed/separated and never married, respectively. The majority of the household heads of the working children are illiterates (66.5%) followed by about 16.7 % and 11.4 % primary and junior school completes, respectively. About 58.0 % of the households earn a yearly income less than or equal to 2000 Br and 33.5 % earn greater than 2001 Br and less than or equal to 4000

Br. The major category of religion of the heads of the household is Protestant (47.1%), and Orthodox and others categories constitute 12.6 % and 36.0 %, respectively. About 69.3 % of the working children attend formal education and 30.7 % of the children are not attending school. Majority (70.9%) of the household heads of the working children are self employed and about 25.9 % are employees. Table 4.2 below gives the details of the above.

Table 4.2 Socioeconomic factors by working children

<i>Socioeconomic factors</i>		<i>Working</i>	<i>percent</i>
Marital status of the head of the household	<i>Married</i>	1811	64.3
	<i>Divorced/widowed/separated</i>	589	20.9
	<i>Never married</i>	417	14.8
	Total	2817	100
Household income	Less than or equal to 2000 Br	1634	58
	Greater than 2001 and less than or equal to 4000 Br	944	33.5
	Greater than 4001 Br	239	8.5
	Total	2817	100
Education status of the head of the household	Illiterate	1873	66.5
	Primary	470	16.7
	Junior	322	11.4
	High school and above	152	5.4
	Total	2817	100
Employment status of the head of the household	Employee	731	25.9
	Self employed	1998	70.9
	Others	88	3.1
	Total	2817	100
Religion of the head of the household	Orthodox	354	12.6
	Muslim	122	4.3
	Protestant	1328	47.1
	Others	1013	36
	Total	2817	100
School attendance of child	Attending	1951	69.3
	Not attending	866	30.7
	Total	2817	100

4.2 Univariate Analysis

Before proceeding to the multivariate analysis, we need to test whether there is a significant association between the dependent variable and each of the independent variables. As the variables used are categorical, the chi-square statistic is used. Since the Pearson chi-square test is asymptotically equivalent to the likelihood ratio chi-square test, it can also be used to test the significance of each predictor variable.

The variables that are found to be significant in the univariate analysis, using Pearson chi-square test are sex of child (SEXCHILD), age of child (AGECH), migration status of head of the household (MIGRE), household size (HHDSIZE), household income (HHDINCOME), marital status of head of the household (MARIT), education status of head of the household (EDUCHEAD), religion of the head of the household (RELIGION) and school attendance of child (SCHOOLCH). The variables that are not significant in the univariate analysis are relationship to the head of the household (RELATHEAD) and employment status of the head of the household (EMPSTATUS). Note that high values of Pearson chi-square value for a given independent variable indicates that there is strong association between each of the given independent variables and the dependant variable keeping the effect of other factors constant. Table 4.3 below gives the summary of the above findings.

Table 4.3 Variables in the univariate analysis

Variable	Pearson chi-square value	DF	p-value (asymptotic)
Sex of child	156.327	1	0.000
Age of child	561.420	1	0.000
Relationship to the head of the household	4.146	2	0.126
Migration status of the head of the household	29.945	1	0.000
Household size	50.499	3	0.000
Marital status of head of household	41.048	2	0.014
Education status of the head of the household	26.891	3	0.000
Employment status of head of household	2.521	2	0.284
Religion of head of the household	110.370	3	0.000
Income of the household	9.2	2	0.010
School attendance of child	9.625	1	0.002

4.3 Multiple Logistic Regression Analysis

In the univariate analysis, we can only examine the presence of statistical association, that is, the degree to which an independent variable is associated with the dependent variable without controlling the effect of others. In other words, the univariate approach ignores the possibility that a collection of variables, each of which is weakly associated with the outcome, can become an important predictor of the outcome when taken together. This is the main problem with any univariate approach (Hosmer and Lemeshow, 1989).

In order to examine the effect of more than one variable simultaneously, multiple logistic regression analysis is done using those variables that are significant in univariate analysis. Among the stepwise regression techniques, forward stepwise likelihood ratio method is used to select variables. Using stepwise selection, the variables entered are: age of child, sex of child, religion of head of the household, migration status of head of the household, household size, household income, education status of head of the household, school attendance of child and marital status of head of the household.

All the variables that are significant in univariate analysis are also found to be significant in multiple logistic regression analysis. The values of wald statistic for individual β coefficients also support the above results, that is, the estimated values ($\hat{\beta}_i$'s) are significantly different from zero at $\alpha=0.05$ level of significance for all nine variables that are selected above.

In the following table, the estimated coefficients ($\hat{\beta}_i$'s) for those covariates in the final model, their standard error and the odds ratio for each estimated coefficient $\hat{\beta}_i$ are given as follows:

Table 4.4 Variables in the final model

Covariates	Sub-groups	$\hat{\beta}$	S.E.($\hat{\beta}$)	Wald	DF	Sig.	Exp(β)
Migration status of head	Migrant(Ref)	-	-	-	-	-	-
	Non migrant	.927	.172	28.885	1	.000	2.527
Household size				27881	3	.000	
	1-4(Ref)	-	-	-	-	-	-
	5-7	.132	.109	1.482	1	.224	1.142
	8-9	.013	.102	.017	1	.896	1.013
	10 and above	.838	.179	21.856	1	.000	2.313
Education status of head				20.600	3	.000	
	Illiterate(Ref)	-	-	-	-	-	-
	Primary	-.806	.181	19.951	1	.000	.446
	Junior	-.757	.193	15.362	1	.000	.469
	High school and above	-.672	.201	11.137	1	.001	.511
Marital status of head				12.444	2	.005	
	Married(Ref)	-	-	-	-	-	-
	Divorced/widowed/separated	.321	.089	13.011	1	.000	1.379
	Never married	.685	.113	36.998	1	.002	1.984
Household income				37.128	2	.000	
	Less than or equal to 2000 Br.(Ref)	-	-	-	-	-	-
	Greater than 2001 and less than or equal to 4000 Br.	-.458	.130	12.439	1	.020	.633
	Greater than 4001 Br.	-.414	.135	9.405	1	.000	.661

Religion of head	Orthodox(Ref)	-	-	118.025	3	.000	-
	Muslim	-.923	.098	89.337	1	.000	.397
	protestant	.229	.183	1.564	1	.211	1.258
	Others	.017	.078	.050	1	.823	1.010
School attendance of child	Attending(Ref)	-	-	-	-	-	-
	Not attending	.246	.070	12.401	1	.000	1.279
Age of child	5-9(Ref)	-	-	-	-	-	-
	10-17	1.659	.068	588.181	1	.000	5.252
Sex of child	Female(Ref)	-	-	-	-	-	-
	Male	.887	.066	178.976	1	.000	2.428

*Ref indicates reference category

4.4 Assessing goodness of fit of the model

After fitting a model to our data, we have to investigate how effective the model is in describing the response variable. The model is said to be a good fit if the agreement between the observations and the corresponding fitted values is good.

The likelihood ratio test

As we have discussed in chapter 3, the likelihood ratio statistic is given by

$-2LL_R - (-2LL_F) = -2 \ln \left(\frac{\text{likelihood}_R}{\text{likelihood}_F} \right)$. The $-2LL_R$ for the restricted (smaller) model

is 6611.864 and $-2LL_F$ for full (larger) model is 5543.527 Thus, the model chi-square value 1068.334 with P-value 0.000 shows a large decrease in deviance and implies that the model is a good fit. Table 4.5 below gives the summary of the above finding.

Table 4.5 **model fitting information**

	Model fit criteria	Likelihood Ratio Tests		
	-2 log likelihood	Chi-square	DF	Sig.
Intercept only	6611.864			
Final	5543.527	1068.334	8	0.000

Hosmer-Lemeshow Test

Similar to the previous test, the hypothesis to be tested here is

H_0 : Model fits the data

H_A : Model does not fit the data

The value of Hosmer-Lemeshow statistic for the final step (computed using SPSS) was 12.359 with a p-value of 0.136. Thus, the final stage result of the Hosmer-Lemeshow test statistic leads to non-rejection of the above null hypothesis and it can be concluded that the model fits the data which agrees the likelihood ratio test result.

Classification table

Classification table is another way of summarizing the results of a fitted logistic regression model. This table gives us the result of the outcome variable Y which is cross classified with a dichotomous variable whose values are derived from the estimated logistic probabilities (Hosmer and Lemeshow, 1989). Here also, we can assess the goodness of fit of a model. As can be seen from the following table, the fitted model has an overall predictive accuracy of 70.4 % which may be considered sufficient.

Table 4.6: **Classification Table**

Observed		Predicted		
		work status of child		Percentage Correct
		not working	working	
work status of child	not working	1185	857	58.0
	working	579	2238	79.4
Overall Percentage				70.4

The cut value is .500

4.5 Model diagnostics

Besides global examination of the model, it is also useful to investigate the characteristics of individual cases in our data. That is, the adequacy of the fitted model is checked for possible presence and treatment of outliers and influential values. The diagnostic test results for detection of outliers and influential values are given in the following table.

Table 4.7: Results of diagnostic tests for outliers and influential values

	minimum	maximum
Normalized residuals	-2.96584	2.84509
Cook's influence statistics	0.00002	0.05419
DFBATA for constant	-0.03112	0.02454
DFBETA for sex of child	-0.00273	0.00174
DFBETA for age of child	-0.00344	0.00114
DFBETA for migration status of head of the household	-0.02528	0.01952
DFBETA for household income	-0.01047	0.01407
DFBETA for household size	-0.00718	0.00783
DFBETA for marital status of head of the household	-0.00670	0.00582
DFBETA for education status of head of the household	-0.02349	0.02749
DFBETA for religion of the head of the household	-0.02695	0.02167
DFBETA for school attendance of child	-0.00305	0.00305

The above table shows that the normalized residuals are within the interval of -3 and 3 which implies that no outlier is detected at significance level of 0.01. The cook's influence statistics and the DFBETAS for model parameters including the constant term are both less than one. The cook's distance less than one shows that there is no

observation that has an overall impact on the estimated vector of regression coefficients and $DFBETAS$ less than one shows no specific impact of an observation on the coefficient of a particular predictor variable. In addition, in multicollinearity test of the model adequacy, both the VIF and tolerance values (see in the appendix) indicated that there is no indication of multicollinearity in the model. Thus, in general, we can say that the model fits the data.

4.6 Discussion and Interpretation of results

Most of the results obtained from the summary statistics and univariate analysis agree with those results of multivariate analysis. However, there exist some deviations with respect to certain variables. In the summary statistics, for example, we can observe that the risk of working for those children that are sons or daughters of husband and/or spouse with self employed household head is higher. But these two variables, relationship to the head of the household and employment status of the head, are not significant in both univariate and multivariate analyses. The possible interpretation of this is that all children regardless of their relation to the head of the household and employment status of the head are at risk of working. This result might be considered factual since almost all of the household heads in the rural areas, regardless of their employment status, are involved in similar work (which is agriculture) in most cases, the children with self employed household heads also have equal chance of participation in work whether or not they are related to the household head.

When we proceed from the univariate analysis to multivariate analysis we found that those variables that are significant in the univariate analysis are also found to be significant in the multivariate analysis. Thus, in the following section detailed discussion and interpretation of those variables that are significant in the multivariate analysis are given based on the results of table 4.4.

Sex of child and child labor

Sex of child is categorized into Female (F) and Male (M) and the category F is taken as a reference. Here, the interest is to see whether males are at higher risk of working than females. The logistic regression output found that sex of child is one of the determining factors for child labor.

As was expected, the result supports the hypothesis that was stated in the previous chapter for the variable sex of child. That is, the odds ratio (2.428) for the variable in table 4.4 implies that the risk of working for males is about 2.428 times the risk of working for females. This result is expected in a country like Ethiopia where male children are expected to contribute their labor in a household agricultural activities such as weeding, harvesting and attending domestic animals, and non- agricultural activities like handicrafts. In addition, this result agrees with many findings of child labor studies. One of them is the finding from the child labor surveys in 2002 in the cocoa sector of West Africa which indicated that about 59% of the children working in Cocoa farming are boys while girls account for 41%.

Age of child and child labor

Many rural children begin work at their earlier age but most labor force surveys cover people aged 10 years and above. Similar to many different literatures and also for convenience, age is divided into two groups, namely 5 to 9 and 10 to 17 years. Here, the first group is used as a reference. The interest here is to see how the chance of working varies for children in these two age groups.

The odds ratio (5.252) for the variable age of child in table 4.4 implies that children in the age group 10 to 17 are more than 5 times likely to be child laborer than those in the age group 5 to 9. This result and the value for regression coefficient ($\beta = 1.659$) support our hypothesis which states that child labor is positively related with age of children.

The above finding is supported by the study in Mexico (Baron, 1997) on a total of 584 injured children from 5 to 17 years. The results of the study found that of the children involved in work, 18% were ages of 5-9 years and 82% were 10-17 years.

Household income and child labor

For convenience and also by looking into the frequency distribution, household income is categorized into three: less than or equal to 2000 Br, greater than 2001 and less than or equal to 4000 Br and greater than 4001 Br. As usual, the first category is used as a reference. We are interested to see whether or not an increase in household income will decrease child labor.

The values of odds ratio (0.633 and 0.661) for the last two categories indicate that the odds of being at risk of working for children in a household with household income greater than 2001 and less than or equal to 4000 Br and greater than 4001 Br is about 36.6 % and 34.0 %, respectively, less than for those in the reference category. That is, the result indicates that the higher the household income, the lesser the chance of working for children. This result is consistent with many findings of child labor surveys. According to Basu and Van (1998), there are a lot of reasons that can urge a child to labor market, but generally the most common is the presence of low household income, which forces children to work to sustain themselves or, in less serious cases, to increase the life quality of their families. In other words, a household will not push children to labor market if their income is sufficiently high.

Marital status of head of household and child labor

Marital status here is divided in three categories: Married, Widowed/Divorced/separated and Never married. The first category is the reference group. Here also, the interest is to observe how the chance of working for children varies among the three categories.

As can be seen from the table 4.4, odds ratios (1.379 and 1.984 for categories divorced/widowed/separated and never married) imply that the chance of working for those children living with divorced/widowed/separated and never married household

heads is about 1.379 and 1.984 times, respectively, the chance for those with married household heads. This might be due to the reason that children living with a single parent are required to contribute in a household expenditure and as a result they are more likely to work.

Migration Status of household head and child Labor

Here, migration status is categorized into two: Migrant and non migrant. Migrant is taken as a reference. Odds ratio (2.527) in table 4.4 tells us that the likelihood that a child will work for children with non migrant household head is about 2.527 times the likelihood for children with migrant household head.

The possible explanation for this result may be that in Ethiopia in general and in SNNP region in particular, it is a common practice that people migrate from over populated and scarce resource areas to those areas where there are relatively better resources. As a result, these people (the migrant) can cover the expense of the household and may be in a better position not to send their children to work as compared to those in the other category.

Household Size and Child Labor

In order to closely observe its effect in different levels, the household size here is categorized into four: 1-4, 5-7, 8-9 and 10 and above persons per household. The first category is used as a reference. Here, the interest is to see whether an increase in household size will increase the likelihood of a child to be child laborer.

As can be seen from table 4.4, the positive sign of the regression coefficients (β) supports our hypothesis showing that there is a direct relationship between household size and child labor. The categories for household sizes 5-7 and 8-9 persons per household both are insignificant implies that the optimal household size does not affect child labor whereas when it is beyond the economic status of the household, it has a significant effect. That is, the odds ratio for the last category, 10 and above persons per household,

(2.313) implies that the odds of being at risk of working for children living in households with household size 10 persons and above is about 2.313 times the risk for those in the reference category. One of the study results that agree with this finding is an ILO (2008) study which indicated that when there are limited means and more mouths to feed, children are driven to commercial activities and not provided for their development needs (ILO, 2008).

Education Status of Head and Child Labor

The level of education here is divided into four categories as illiterate, primary, junior and high school and above. The first group is used as a reference category. What we are interested to see here is whether or not educational level of the household head has inverse relationship to the chance of child to work.

As was expected, the result in table 4.4 for the variable supports the hypothesis. That is, the negative sign of the regression coefficients ($\beta' s$) indicates that as education level of the household head increases, the chance of being child laborer for the children decreases. And the values of odds ratio (0.446, 0.469 and 0.511 for categories primary, junior and high school and above, respectively) indicate that the chance of working for children with household heads having primary, junior and high school and above educational levels is about 55.4 %, 53.1 % and 48.9 %, respectively, less than for the children with illiterate household heads.

There are a lot of researches that support our result. Taking data from 35 household surveys that cover one quarter of the world population, a UNICEF (2008) study on child labor and school attendance indicated that children from poor households and from households with out a formally educated household head are more likely to be engaged in child labor and less likely to attend school than members of rich households and children living with an educated household head.

School attendance of child and child labor

School attendance of child is grouped into two: Attending and not attending. The first group is used as a reference and the interest here is to see whether or not the children that are not attending school are at higher risk of working than the reference group.

The value of the odds ratio (1.279) in table 4.4 supports our hypothesis which states that school attendance reduces the likelihood that a child participates in work. That is, $\text{Exp}(\beta) = 1.279$ implies that children not attending school are about 1.279 times more likely to be child laborer than those attending school.

The possible explanation for this might be that those children who are attending school spent most of their time in the school so that they have a lesser chance to be involved in work or to be a child laborer. Moreover, among many findings that support our result is an ILO (2005) study on child labor in Mines and Quarries on children around the world. According to the study, children are driven into work and exploitation by poverty and inadequate education. It has been identified also that uneducated laborers are liable to be exploited by others because they may not be aware of their right and also of how they solve their problems when they are subjected to oppression (ILO, 2007).

Religion of head of the household and child labor

The last variable, religion of the household head, is categorized into four: Orthodox, Muslim, Protestant and others. The first category, Orthodox, is used as a reference. The logistic regression output indicated that religion of household head determines child labor. Out of the remaining categories, only Muslim is found to be significant. The odds ratio (0.397) for the category Muslim indicates that the chance of working for children with a household head who is a follower of Muslim religion is about 60.3 % lower than those in the reference category. A study titled "Child Labor and Religion" found that religion of household head affects child labor indirectly by contrasting the idea of limiting the number of children in a family ([www. Secularsites.freeuk.com](http://www.Secularsites.freeuk.com)).

5. Conclusions and Recommendations

5.1 Conclusions

As is the case in many developing countries, the economy of Ethiopia in general and the SNNP region in particular depends mainly on agriculture. As mentioned earlier, the majority of people of SNNP region reside in rural areas where agriculture is the major source of livelihood and as a result the agricultural activities need intensive labor in these areas. Therefore, people in rural areas involve their children in different agricultural activities.

This study has tried to identify the main determinants of child labor in rural areas of SNNP region. The analysis of determinants was carried out using both univariate and multivariate analysis methods. The multivariate logistic regression analysis based on this study showed that the factors that affect work status of children in rural parts of SNNP region include age of child, sex of child, household size, household income, education status of the head of the household, migration status of the head of household, religion of the head of the household, marital status of the head of the household and school attendance of child.

This study shows that work status of children does not show any difference whether or not the child is related to the household head. In addition, it has been found that difference in employment status of household head has no significant impact on work status of children. Thus, these two variables, namely relationship to the head of the household and employment status of the head of the household have no significant effect in determining child labor. By employing the forward stepwise (likelihood ratio) method, nine out of eleven predictor variables were selected as the major factors affecting child labor in SNNP region. Reviewing the results of the study in terms of the hypothesis forwarded at the beginning, all the hypotheses are supported by the results and found to be true.

In general, according to the findings of this study, those variables that are significant in both univariate and multivariate analysis can be taken as the major determining factors of child labor in rural parts of SNNP region. In order to have a future without child labor, strategies should be designed in a way that would focus on and address the identified determinants as well as other factors that are useful to achieve the goal.

5.2 Recommendations

The following recommendations are given on the basis of the findings of this study:

- To the extent possible, access to education should be enlarged for all members of the household.
- Improved income will reduce the pressure on all family members (including children) to be involved in low return, harmful, and time-consuming activities to meet household needs. Therefore, strategies should be designed in a way that can help the households improve their income.
- A very high share of children's work in rural areas is rooted in agricultural activities such as weeding, harvesting and attending domestic animals. Thus, many simple improvements in agriculture could be adapted to reduce the demand for such child labor. That is, to the extent possible, domestic and farm technologies have to be modernized to reduce child labor.
- This study has found that household size beyond the means of livelihood of a family aggravates the problem of child labor. Thus, awareness raising programs on family planning, like limiting the number of children in a family, have to be given to the community at all levels.
- Finally, this study was done only based on some of those variables that are found in the 2001 Ethiopia Child Labor Survey. Therefore, we further recommend similar studies with additional exogenous variables (such as parental survivorship) so as to address and hence overcome the problem in Ethiopia in general and in SNNP region in particular.

References

- Addisu Gedlu, (2008). Child Labor in the Informal Sector: The case of Gulele Subcity, Addis Ababa. M.A. Thesis. Addis Ababa University. Addis Ababa.
- Agresti, A. (1996). An Introduction to Categorical Data Analysis. John Wiley and Sons. Inc., New York.
- Andrea leinbercer-Jabari, David L. Parker and Charles Oberc, (2005). Child Labor, Gender and Health. Division of Epidemiology, University of Minnesota School of Public Health, Minneapolis, MN.
- Anita Amorim, Sandhya Bandrinath and Una Murrey, (2004). Gender Equality and Child Labor: A participatory tool for Facilitators. International Labor Office. International Programme on the Elimination of Child Labor (IPEC).
- Baron, Shery L., (2005). Injuries in Child Laborers in the Informal Sector in Mexico City, Mexico, 1997. Public Health Report, 120(6): 598-600.
- Basu, K. and Van, P.H. (1998), 'The Economics of Child Labor', American Economic Review, vol. 88.
- Beegle, K, R. Dehejia and R. Gatti, (2002). "Do Households Resort to Child labor to cope with Income Shocks?" Journal of Economic Literature, 37, 1083-1119.
- Child Labor and Society. [http:// www.sadashivan.com/](http://www.sadashivan.com/)
- Child Labor in Turkey: An Embarrassing Fact. bilnews@bilkent.edu.tr.
- CSA, (2001). The 2001 Ethiopia Child Labor Survey Report. Addis Ababa, Ethiopia.
- Eric Edmonds, (2005). Understanding child labor patterns, types, and causes: Journal of Economic Perspectives, Volume 10, No. 1 May 2005.

- Ernest Harsch, (2001). Child Labor Rooted in Africa's Poverty. Campaigns Launched Against Traffickers and Abusive Work. *African Recovery*, Vol. 15. No. 3, October 2001, Page 14.
- Farm Consultancy, (2003/4). Child Labor in the Fiji Tobacco Industry.
- Food and Agricultural Organization (FAO), (2007). Harvest for the Future: Agriculture without Child labor. World Day Against Child Labor Agenda for 12th June events at FAO Headquarters, Rome, Italy.
- Friedrich Huebler, (2008). Child Labor and School Attendance: Evidence from Multiple Indicator Cluster Surveys (MICS) and Demographic and Health Surveys (DHS). Seminar on child labor, education and youth employment. Understanding Children's Work Project. Madrid, 11-12 September 2008.
- Goularl Pedro and Arjum S. Bedi, (2007). A History of Child Labor in Portugal. Working Papers – General Series 448, Institute of Social Studies.
-
- Greene, W. H. (1993): *Econometric Analysis*. 2nd Edition. New York, Macmillan.
- Hosmer D. and Lemeshow S., (1989). *Applied Logistic Regression*. John Wiley and Sons. Inc., New York.
- ILO, (2000). *Action against Child Labor*, Geneva.
- ILO, (2002). *A Future without Child Labor: Global Report under the Follow-up to the ILO Declaration on Fundamental Principles and Rights at Work*. 99th International Labor Conference Report I (B), Geneva.
- ILO, (2002). *Combating Child Labor: A Hand Book for Labor Inspectors*, Geneva.
- ILO, (2007). *The Elimination of the Worst Form of Child Labor and Poverty Alleviation through distance Education*, Geneva.

ILO/IPEC, (2004). Child Labor in tobacco Cultivation in Santiago Province in the Dominican Republic.

International Institute of Tropical Agriculture (IITA), (2002). Summary of Findings from the Child Labor Surveys in the Cocoa Sector of West Africa: Cameroon, Côte d'Ivoire, Ghana, and Nigeria. July 2002.

International Risk Committee (IRC), (2007). Combating Child Labor in Ethiopia. Addis Ababa.

Jens Chr. Andvig, Sudharshan Canagarajah and Anne Kielland, (2001). Issues in Child Labor in Africa. Africa Region Human Development Working Paper Series. September 2001. The World Bank.

John Cochrane, (2001). Child Labor versus Education: Poverty Constraints or Income Opportunities? Centre for the Study of African Economies and Nuffield College (Oxford University) and CREFA, jcoc@ecn.ulaval.ca

Kathleen Beegle, Rajeev H. Dehejia and Roberta Gatti, (2003). Child Labor, Income Shocks and Access to Credit. World Bank Policy Research Working Paper No. 3075, June 2003.

Kaushik Basu and Zafiris Tzannatis, (2003). The Global Child Labor Problem: What Do We Know and What Can We Do? CAE Working Paper No. 03-06.

Kaushik Basu, (1998). Child Labor: Cause, Consequence and Cure, With Remarks on International Labor Standards. kbasu@worldbank.org.

Maddala, G.S. (1992): Introduction to Econometrics. Second Edition. Prentice-Hall, Inc., USA.

Marquardt, D. W. (1970): Generalized Inverses, Ridge Regression, Biased Linear Estimation, and Non-linear Estimation. *Technometrics*, **12**: 591-612.

Metin Turan, (2006). Determining Nature of Poverty on Child Labor. Izmir, 2006 (Dokuz Eylul University Institute of Social Sciences Department of Labor Economics and Industrial Relations).

Niels-Hugo Blunch and Dorte Verner, (2000). Revising the Link between Poverty and Child Labor: The Ghanaian Experience. The George Washington University and World Bank. Draft, October 4, 2000.

SCD, (2003). Child Labor in Ethiopia with Special Focus on Child Prostitution. Save the Children, Denmark. December 2003, Addis Ababa, Ethiopia.

Sonia Bhalotra, (2003). Child Labor in Africa. OECD Social, Employment and Migration Working Paper No. 4. University of Bristol, Bristol, United Kingdom.

StatNotes (2006). Logistic Regression.
www2.chass.ncsu.edu/garson/PA765/logistic.

Tassew Woldehanna, Bekele Tefera, Nicola Jones and Alebel Bayrau, (2005). Child Labor, Gender Inequality and Rural/Urban Disparities: How Can Ethiopia's National Development Strategies be revised to Address Negative Spill-Over Impacts on Child Education and Wellbeing? Young Lives Project Working Paper No. 20.

Tuncer Bulutay and Enver Tasu, (2004). Informal Sector in Turkish Labor Market. Turkish Economic Association Discussion Paper 2004/22.

USDL, (2003). 2002 Findings on the Worst Form of Child Labor-Ethiopia, 18 April 2003.

USDL, (2006). The 2005 Findings on the Worst Forms of Child Labor-Ethiopia, 29 August 2006.

USDL, (2007). The 2006 Findings on the Worst Form of Child Labor-Ethiopia, 31, August 2006.

Appendix

Results of Collinearity statistics

variables	Collinearity Statistics	
	Tolerance	VIF
migration status of head	.978	1.023
education of head	.968	1.033
religion of head	.985	1.016
school attendance of child	.998	1.002
age of child	.998	1.002
sex of child	.995	1.005
marital status	.996	1.004
household income	.995	1.005
the size of household	.996	1.004

Dependent Variable: work status of child

Logistic Regression output:

Case Processing Summary

Unweighted Cases(a)		N	Percent
Selected Cases	Included in Analysis	4859	100.0
	Missing Cases	0	.0
	Total	4859	100.0
Unselected Cases		0	.0
Total		4859	100.0

a If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
not working	0
Working	1

Categorical Variables Coding

		Frequency	Parameter coding		
			(1)	(2)	(3)
the size of household	1 to 4	1504	1.000	.000	.000
	5 to 7	2453	.000	1.000	.000
	8 to 9	288	.000	.000	1.000
	10 and above	614	.000	.000	.000
education of head	Illiterate	3329	1.000	.000	.000
	Primary	797	.000	1.000	.000
	Junior high school and above	526	.000	.000	1.000
		207	.000	.000	.000
religion of head	Orthodox	844	1.000	.000	.000
	Muslim	182	.000	1.000	.000
	Protestant	2167	.000	.000	1.000
	Others	1666	.000	.000	.000
household income	less than or equal to 2000 Br.	2867	1.000	.000	
	greater than 2001 and less than or equal to 4000 Br.	1626	.000	1.000	
	greater than 4001 Br.	366	.000	.000	
marital status	Married	3131	1.000	.000	
	divorced/widowed/separated	899	.000	1.000	
	never married	829	.000	.000	
school attendance of child	Attending	3279	1.000		
	not attending	1580	.000		
age of child	5 to 9	2306	1.000		
	10 to 17	2553	.000		
sex of child	Female	2444	1.000		
	Male	2415	.000		
migration status of head	Migrant	228	1.000		
	non migrant	4631	.000		

Block 0: Beginning Block

Iteration History (a,b,c)

Iteration	-2 Log likelihood	Coefficients
	Constant	Constant
Step 1	6611.873	.319
0 2	6611.864	.322
3	6611.864	.322

a Constant is included in the model.

b Initial -2 Log Likelihood: 6611.864

c Estimation terminated at iteration number 3 because parameter estimates changed by less than .001.

Classification Table

Observed			Predicted		
			work status of child		Percentage Correct
			not working	working	not working
Step 0	work status of child	not working	0	2042	.0
		working	0	2817	100.0
	Overall Percentage				58.0

a Constant is included in the model.

b The cut value is .500

Variables in the Equation

	B	S.E.		Wald		Sig.	Exp(B)	
		Lower	Upper	Lower	Upper		Lower	Upper
Step 0	Constant	.322	.029	122.550	1	.000	1.380	

Variables not in the Equation

Step	Variables	Score	df	Sig.
0	migre(1)	29.945	1	.000
	eduhead	26.891	3	.000
	eduhead(1)	12.715	1	.000
	eduhead(2)	.388	1	.533
	eduhead(3)	2.544	1	.111
	relgion	110.370	3	.000
	relgion(1)	107.750	1	.000
	relgion(2)	6.368	1	.012
	relgion(3)	17.567	1	.000
	schch(1)	9.625	1	.002
	agech(1)	561.420	1	.000
	sex(1)	156.327	1	.000
	marstatus	41.048	2	.000
	marstatus(1)	.065	1	.799
	marstatus(2)	25.756	1	.000
	hhdincome	9.200	2	.010
	hhdincome(1)	2.765	1	.096
	hhdincome(2)	.007	1	.935
	hhsiz	50.499	3	.000
	hhsiz(1)	.015	1	.903
	hhsiz(2)	5.715	1	.017
	hhsiz(3)	49.276	1	.000
	Overall Statistics	975.467	17	.000

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

Step	Step	Chi-square	df	Sig.
1	Step	1068.337	17	.000
	Block	1068.337	17	.000
	Model	1068.337	17	.000

Contingency Table for Hosmer and Lemeshow Test

		work status of child = not working		work status of child = working		Total
		Observed	Expected	Observed	Expected	Observed
Step	1	378	386.620	109	100.380	487
	2	337	338.891	150	148.109	487
	3	303	298.194	186	190.806	489
	4	257	249.291	227	234.709	484
	5	213	217.443	274	269.557	487
	6	165	174.019	320	310.981	485
	7	161	143.268	325	342.732	486
	8	99	110.087	390	378.913	489
	9	90	75.710	397	411.290	487
	10	39	48.478	439	429.522	478

Block 1: Method = Forward Stepwise

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	.000	0	.
2	2.054	2	.358
3	2.950	8	.937
4	4.430	7	.729
5	4.736	8	.785
6	6.650	8	.575
7	11.967	8	.153
8	5.956	8	.652
9	12.359	8	.136

Classification Table(a)

Observed			Predicted		
			work status of child		Percentage Correct
			not working	working	
Step 1	work status of child	not working working	1480 1073	562 1744	72.5 61.9
	Overall Percentage				66.4
Step 2	work status of child	not working working	844 401	1198 2416	41.3 85.8
	Overall Percentage				67.1
Step 3	work status of child	not working working	1102 577	940 2240	54.0 79.5
	Overall Percentage				68.8
Step 4	work status of child	not working working	1072 537	970 2280	52.5 80.9
	Overall Percentage				69.0
Step 5	work status of child	not working working	1138 568	904 2249	55.7 79.8
	Overall Percentage				69.7
Step 6	work status of child	not working working	1088 531	954 2286	53.3 81.2
	Overall Percentage				69.4
Step 7	work status of child	not working working	1122 542	920 2275	54.9 80.8
	Overall Percentage				69.9
Step 8	work status of child	not working working	1186 592	856 2225	58.1 79.0
	Overall Percentage				70.2
Step 9	work status of child	not working working	1185 579	857 2238	58.0 79.4
	Overall Percentage				70.4

The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step	agech(1)	1.454	.063	533.828	1	.000	4.280
1(a)	Constant	-.322	.040	64.328	1	.000	.725
Step	agech(1)	1.536	.065	557.318	1	.000	4.646
2(b)	sex(1)	.873	.064	186.078	1	.000	2.395
	Constant	-.785	.054	210.953	1	.000	.456
Step	relgion			133.609	3	.000	
3(c)	relgion(1)	-.922	.094	95.328	1	.000	.398
	relgion(2)	.328	.179	3.383	1	.066	1.389
	relgion(3)	.061	.073	.694	1	.405	1.062
	agech(1)	1.605	.067	576.740	1	.000	4.979
	sex(1)	.884	.065	184.731	1	.000	2.420
	Constant	-.694	.070	97.707	1	.000	.500
Step	migre(1)	1.037	.169	37.796	1	.000	2.821
4(d)	relgion			137.539	3	.000	
	relgion(1)	-.960	.095	101.527	1	.000	.383
	relgion(2)	.296	.179	2.729	1	.099	1.345
	relgion(3)	.041	.073	.314	1	.575	1.042
	agech(1)	1.623	.067	582.849	1	.000	5.067
	sex(1)	.881	.065	181.854	1	.000	2.412
	Constant	-.728	.071	106.203	1	.000	.483
Step	migre(1)	1.060	.169	39.333	1	.000	2.888
5(e)	relgion			134.922	3	.000	
	relgion(1)	-.903	.096	88.579	1	.000	.405
	relgion(2)	.296	.181	2.684	1	.101	1.344
	relgion(3)	.125	.075	2.795	1	.095	1.133
	agech(1)	1.635	.068	584.831	1	.000	5.128
	sex(1)	.874	.066	177.299	1	.000	2.396
	marstatus			38.425	2	.000	
	marstatus(1)	.321	.088	13.204	1	.000	1.378
	marstatus(2)	.690	.112	38.250	1	.000	1.993
	Constant	-1.111	.106	109.147	1	.000	.329
Step	migre(1)	1.027	.170	36.735	1	.000	2.794
6(f)	relgion			118.976	3	.000	
	relgion(1)	-.878	.096	83.186	1	.000	.416
	relgion(2)	.233	.183	1.618	1	.203	1.262
	relgion(3)	.087	.076	1.333	1	.248	1.091
	agech(1)	1.633	.068	580.433	1	.000	5.119
	sex(1)	.876	.066	176.777	1	.000	2.401
	marstatus			38.214	2	.000	
	marstatus(1)	.328	.089	13.718	1	.000	1.388
	marstatus(2)	.692	.112	38.115	1	.000	1.998

	hhsize			29.399	3	.000	
	hhsize(1)	.109	.108	1.019	1	.313	1.115
	hhsize(2)	.013	.101	.016	1	.898	1.013
	hhsize(3)	.864	.178	23.470	1	.000	2.373
	Constant	-1.186	.135	77.603	1	.000	.305
Step	migre(1)	.914	.172	28.162	1	.000	2.494
7(g)	educhead			22.401	3	.000	
	educhead(1)	-.839	.179	21.860	1	.000	.432
	educhead(2)	-.786	.192	16.711	1	.000	.456
	educhead(3)	-.710	.200	12.573	1	.000	.492
	relgion			122.195	3	.000	
	relgion(1)	-.924	.097	90.217	1	.000	.397
	relgion(2)	.232	.183	1.600	1	.206	1.261
	relgion(3)	.040	.077	.270	1	.603	1.041
	agech(1)	1.642	.068	582.696	1	.000	5.164
	sex(1)	.875	.066	175.674	1	.000	2.400
	marstatus			37.356	2	.000	
	marstatus(1)	.324	.089	13.339	1	.000	1.383
	marstatus(2)	.686	.112	37.252	1	.000	1.985
	hhsize			28.319	3	.000	
	hhsize(1)	.134	.108	1.536	1	.215	1.144
	hhsize(2)	.028	.101	.076	1	.783	1.028
	hhsize(3)	.859	.179	22.998	1	.000	2.360
	Constant	-.384	.219	3.084	1	.079	.681
Step	migre(1)	.913	.172	28.192	1	.000	2.493
8(h)	educhead			22.158	3	.000	
	educhead(1)	-.834	.180	21.483	1	.000	.434
	educhead(2)	-.782	.193	16.502	1	.000	.457
	educhead(3)	-.696	.201	12.030	1	.001	.499
	relgion			119.945	3	.000	
	relgion(1)	-.932	.097	91.396	1	.000	.394
	relgion(2)	.230	.184	1.562	1	.211	1.258
	relgion(3)	.012	.078	.026	1	.873	1.013
	schch(1)	.238	.070	11.650	1	.001	1.269
	agech(1)	1.647	.068	584.142	1	.000	5.191
	sex(1)	.883	.066	177.848	1	.000	2.417
	marstatus			36.605	2	.000	
	marstatus(1)	.322	.089	13.107	1	.000	1.380
	marstatus(2)	.679	.112	36.508	1	.000	1.973
	hhsize			28.557	3	.000	
	hhsize(1)	.133	.109	1.492	1	.222	1.142
	hhsize(2)	.021	.102	.043	1	.835	1.021
	hhsize(3)	.857	.179	22.862	1	.000	2.357
	Constant	-.535	.224	5.721	1	.017	.586
Step	migre(1)	.927	.172	28.885	1	.000	2.527
9(i)	educhead			20.600	3	.000	

educhead(1)	-.806	.181	19.951	1	.000	.446
educhead(2)	-.757	.193	15.362	1	.000	.469
educhead(3)	-.672	.201	11.137	1	.001	.511
relgion			118.025	3	.000	
relgion(1)	-.923	.098	89.337	1	.000	.397
relgion(2)	.229	.183	1.564	1	.211	1.258
relgion(3)	.017	.078	.050	1	.823	1.018
schch(1)	.246	.070	12.401	1	.000	1.279
agech(1)	1.659	.068	588.181	1	.000	5.252
sex(1)	.887	.066	178.976	1	.000	2.428
marstatus			37.128	2	.000	
marstatus(1)	.321	.089	13.011	1	.000	1.379
marstatus(2)	.685	.113	36.998	1	.000	1.984
hhdincome			12.444	2	.002	
hhdincome(1)	-.458	.130	12.439	1	.000	.633
hhdincome(2)	-.414	.135	9.405	1	.002	.661
hhsiz			27.881	3	.000	
hhsiz(1)	.132	.109	1.482	1	.224	1.142
hhsiz(2)	.013	.102	.017	1	.896	1.013
hhsiz(3)	.838	.179	21.856	1	.000	2.313
Constant	-.163	.249	.428	1	.513	.850

a Variable(s) entered on step 1: agech.

b Variable(s) entered on step 2: sexch.

c Variable(s) entered on step 3: relgion.

d Variable(s) entered on step 4: migre.

e Variable(s) entered on step 5: marstatus.

f Variable(s) entered on step 6: hhsiz.

g Variable(s) entered on step 7: educhead.

h Variable(s) entered on step 8: schch.

i Variable(s) entered on step 9: hhdincome.

DECLARATION

I, the undersigned, declare that the thesis is my original work, has not been presented for degrees in any other University and all sources of material used for the thesis have been duly acknowledged.

Name: Netsanet Asfaw

Signature: 

Place: Faculty of Science, Addis Ababa University

Date: June, 2009

~~This thesis has been submitted for examination with my approval as a University advisor.~~



.....
Emmanuel G / Yohannes (Dr.)