Title
How Can Child Labor Lead to an Increase in Human Capital of Child Laborers and What Are Policy Implications?

Permalink
https://escholarship.org/uc/item/07m2v2db

Author
Luong, Quoc Viet

Publication Date
2011

Peer reviewed|Thesis/dissertation
How Can Child Labor Lead to an Increase in Human Capital of Child Laborers and What Are Policy Implications?

by

Quoc Viet Luong

A dissertation submitted in partial satisfaction of the Requirements for the degree of Doctor of Philosophy in Agricultural and Resource Economics in the Graduate Division of the University of California, Berkeley

Committee in charge:
Professor Gordon Rausser, Chair
Professor Alain de Janvry
Professor George A. Akerlof
Abstract

How Can Child Labor Lead to an Increase in Human Capital of Child Laborers and What Are Policy Implications?

by

Quoc Viet Luong

Doctor of Philosophy in Agricultural and Resource Economics

University of California, Berkeley

Professor Gordon Rausser, Chair

This dissertation attempts to answer three critical questions that have remained largely misunderstood in the literature of child labor. The first question is whether child labor can help child laborers gain more human capital, including both formal education and health status. The second question focuses on the mechanisms through which child labor impacts human capital. It asks how a positive causal impact from child labor to human capital can possibly take place. The third question discusses policy implications. Given the gain in human capital of child laborers due to child labor, what are the unintended consequences of current policies and what can we do to effectively combat child labor and at the same time help child laborers acquire more human capital? Because these three questions are intrinsically related I find it more productive to present them in form of one major study rather than in three separate papers.

To provide empirical evidence to the first question of whether child labor can help child laborers gain more human capital, I exploit a quasi-controlled experiment that took place between 2004-2009 in a poor rural area in Vietnam. Most children in this area were so poor that they dropped out of school prematurely. In order to help these children sustain their education, a non-governmental organization (NGO) decided to provide a cow to each poor household with school-aged children so that the children could spend time tending the cows, earn some income to pay for their schooling. Practically this intervention provided the children a means to convert their time into income.

Due to limited resources, the NGO could provide cows to only a subset of the poor children, effectively creating a controlled experiment in which some of the children had work (the treatment group) and the others did not (the control group). Since the children were not randomized into the treatment and control groups, the main concern was the selection bias. An examination of the bias shows that the children were selected into the treatment group on the basis of most urgent needs - which means those determined to be
more likely to drop out of school in absence of the treatment were selected to receive the
cows. The data collected verified that at baseline those in the treatment had indeed
acquired less education, had higher dropout ratio, were poorer, had less land, lived further
away from school, and their parents had lower levels of education. All of these socio-
economic indicators suggest that the selected children would have been more likely to drop
out of school if the status-quo had continued. Since the selection bias (being more likely to
drop out) works against the treatment effect (acquiring more education), estimates of the
impact are likely to be the lower bounds of the true effect and should be valid. I find that
the poor children who worked gained a significant average of 0.59 years of education over
a period of 5 years compared to those who did not have any work opportunity.

While the finding of a positive causal relationship between child labor and education is
striking, this outcome per se is not very useful in terms of proposing new policy
interventions because it does not explain how child labor results in more human capital.
Imagine even if we have the luxury of running a perfect randomized controlled trial and
the experiment shows that child labor leads to an increase in human capital, there remains
a “black box”. We still cannot explain how the positive impact takes place. Clearly unless
we can explain what happen in the black box - unless we can explain with economic
theories how child labor can positively affect human capital, we cannot construct informed
policy interventions.

This immediately leads to the second question: what are the mechanisms through
which child labor can result in more human capital? To answer this question, I construct a
theoretical model which examines how a household would choose optimal levels of human
capital under the treatment (where children can work) and under the control (where
children are not allowed to work). This framework shows that child labor affects child
laborers’ human capital through a positive income effect and a negative time cost. On one
hand, child work brings home more income to acquire more education and consumption (a
positive impact on health status). On the other hand, child labor takes away time, a
necessary input for schooling. The most important finding is that while child labor always
generates a positive income effect, its opportunity cost of time in terms of the education
forgone can be zero, leading to a positive net effect.

To see this, consider a household’s choices of child labor and human capital as in a
controlled experiment. Note that under the control when child labor is not allowed, the
optimal level of schooling can be zero. For example, a hungry family that can afford only
one meal per day would choose zero schooling, a costly expenditure in poor countries, in
order to spend all income on food. In this case, the time cost of child labor in terms of
forgone schooling is zero because in the absence of work children stay home anyway.
When these hungry children can work, there are only two possibilities. First, they might
choose to work full-time and spend all additional income on food. This case would lead to
an increase in health status of the child laborers with no change in their education. Second,
they might choose to work part-time and go to school part-time, using their additional
income to pay for more food and more schooling. This case would lead to an increase in
both their health status and education. The model shows that the income effect of child
labor can dominate the time cost (because it can be zero), resulting in a positive net effect on human capital. The critical point that separates this research from the literature is that I use the amount of school time that would be chosen in the absence of work as the benchmark, not school time endowment, to measure the time cost of child labor.

New answers to question 1 and 2 immediately bring up question 3: what are the unintended consequences of current policies and what can we do to effectively combat child labor and promote human capital? I find that current interventions such as trade sanctions, consumer boycotts, legal penalties or an outright ban against child labor, which would diminish or eliminate child work opportunity, would unambiguously reduce the human capital of the poorest child laborers. Note that child labor restricting policies are grounded on the belief that a loss in household welfare due to the loss of child labor income can be offset by an increase in child schooling due to reduced child labor. However, this study shows that by restricting child labor, these policies would reduce not only household welfare but also the schooling and physiological capital of the poorest children. Such instruments will have unintended consequences on children’s human capital, the very point that they advocate for.

Instead I find policies that make schooling more affordable such as such as reducing school fees, providing free meals and textbooks, providing cash transfer conditional on schooling, improving teacher/student ratios, improving curriculum, would simultaneously increase education and reduce child labor. In addition, I suggest new market-based policies that can enhance child laborers’ education and health status without consuming additional public resources more than the status-quo. For example, encouraging the private sector to provide work to children with unemployed non-school time conditional on their school attendance would maximize education gain by capturing the income effect while excluding the substitution effect.

My research adds to the literature in a number of ways. This is the first study to provide empirical evidence that child labor can lead to an increase in the human capital of child laborers. Moreover, this research is also the first to provide a theoretical framework that explains the mechanism at work – that is child laborers can gain more human capital from working because child labor always generates a positive income effect while its opportunity cost of time in terms of forgone education can be zero. Most importantly, my work suggests a need for a major overhaul of current policies that are adversely affecting hundreds of million poor children around the globe. Reducing child labor by enforcing interventions that restrict child work opportunities will have the exact unintended consequences of reducing the human capital of the poorest child laborers. The best way to get the more than 100 million hungry children worldwide out of work is to subsidize schooling (i.e. even pay them to go to school). Such a subsidized education in poorest countries, however, more often than not is practically out of the question. In this situation, the hungry children need, not less, but more work opportunities to buy more food, and at times also buy more education.
ACKNOWLEDGEMENT

I especially thank my chair, Professor Gordon Rausser for his guidance, patience, and continued support given to me on this research.

I am truly indebted to Professor George Akerlof for his comments, support, and encouragement.

I would like to thank Professor Alain de Janvry for his understanding and support.

I owe a lot to Professors Peter Berck, Sofia B. Villas Boas, and my fellow friends Shanthi Nataraj and Anin Aroonruengsawat for their invaluable comments.

All remaining errors are my own.
Dedication

I would like to dedicate this work first to my grandmother and father who taught me the values of education and not to give up schooling under any circumstances. Their love and lesson gave me the strength and guided me through the extreme hardship of being a hungry child laborer.

I devote this work to Phuong Mai who has always inspired me to be a better person. I have gone intellectually this far and become who I am today thanks a large part to Mai. I just cannot thank her enough.

I very much love to give this work to my little daughter, Vivian Luong, hoping she will find it an encouragement in her own journey of exploring and enjoying the beauty of education. I would like to thank Khanh for bringing Vivian into this world and for sharing her time with me during my study.

This humble accomplishment also belongs to all in my family: my mother, my brother-in-law Hong Pham, my sisters: Phuong Quynh Luong, Hoa Quynh Luong, Trang Quynh Luong, Tien Luong, Dung Thuy Luong, Dien Thao Luong, my brothers: Viet Luong, and Doan Luong. I have been truly blessed to have their love, trust, and support.

Special thanks go to chi Bich, a life-time friend, who has always pushed me toward my full potential. I would like to give this work to my close friends: Co Van, Co Thao, chi Mai, and anh Ky.
# Table of Contents

CHAPTER 1 - INTRODUCTION ..................................................................................................... 1
CHAPTER 2 - MODEL ..................................................................................................................... 8
CHAPTER 3 - IMPERFECT CHILD LABOR MARKET .............................................................. 23
CHAPTER 4 - EMPIRICAL STUDY ............................................................................................. 29
CHAPTER 5 - ANALYSIS OF ALTERNATIVE POLICIES ........................................................ 40
CHAPTER 6 - CONCLUSION ....................................................................................................... 52
APPENDIX 1: A STORY OF KYRGYZSTAN - CHILDREN LABOR TO PAY SCHOOL FEES .......................................................................................................................................................... 58
APPENDIX 2: A STORY OF NIGERIA – 15 MILLION CHILDREN WORK, MAINLY TO PAY FOR SCHOOL ................................................................................................................................. 60
APPENDIX 3: A STORY OF AFGHANISTAN – CHILDREN WORK FULL-TIME WITHOUT GOING TO SCHOOL ..................................................................................................................... 62
APPENDIX 4: THE NECESSARY AND SUFFICIENT CONDITIONS FOR CHILD LABOR TO INCREASE HUMAN CAPITAL .................................................................................................... 64
APPENDIX 5: PHOTOS OF COW TENDING .............................................................................. 66
APPENDIX 6: AGE DISTRIBUTIONS OF CHILDREN UNDER 7 IN 2004 .............................. 68
APPENDIX 7: SURVEY FORMS OF THE COW PROJECT IN VIETNAM............................... 69
CHAPTER 1 - INTRODUCTION

This dissertation is the first in the literature to provide new answers to perhaps the three most significant questions regarding child labor: (i) Can child labor help child laborers gain more human capital? (ii) If the first answer is yes, what are the mechanisms through which child labor can result in more human capital? and (iii) What are appropriate policies for controlling child labor without hurting the laboring children?

A consensus has emerged among the public, policy makers, and even academics that child labor causes losses in human capital. For example, Baland and Robinson (2000) in their seminal paper modeled the relationship between child labor and human capital as one-to-one trade-off. An hour spent at work is an hour lost in the time investment to accumulate human capital. Similarly, Udry (2006) argues that because of poverty children must work and therefore remain out of school; consequently, (p. 2) “the primary cost of child labor is the associated reduction in investment in the child’s human capital”.

Empirical investigations also support the accepted wisdom that child labor is detrimental to human capital accumulation. Ray (2000c) found that in both rural and urban areas in India, (p. 3) “the sample of children involved in economic activities recorded a lower mean level of educational experience than non working children”. Examining multi-country data sets, Ray and Lancaster (2005) found that children’s work does adversely affect the child’s learning as reflected in a lower attendance rate and shorter length of schooling received by the child1.

The popularity of the view that child labor is harmful to human capital is not surprising because child laborers have been viewed as synonymous with emaciated, malnourished children toiling in workshops as opposed to those who are well nourished and enjoying their time in schools and playgrounds. Most real-life images and stories of working children versus non-working children are so strikingly contrast that it becomes obvious and natural to our mind that child labor is undoubtedly harmful to children (see Pictures 1 and 2 as examples).

However, when we compare working children to non-working children as in Picture 1 and 2, if we look across countries, we are essentially comparing children in a poor country like Bangladesh to children in a rich country like the United States. If we look across households from within a country, we are basically comparing children from poor families to those from a middle-income or wealthy class. Of course, non-working children attain better education and nutritional status than working children because they are wealthier and they do not need to work. The public’s negative emotional reaction and our conventional wisdom toward child labor have been largely driven by a comparison of apples and oranges. Note that in making the conclusion that a laboring child is losing her days at school, we implicitly assume that if she had not worked, she would otherwise have spent her time of school, which is obviously not necessarily true.

---

Perhaps the best way to shed light on the long-lived myth that child labor is *always harmful* to children’s human capital is to examine this relationship as in a controlled
experiment. Suppose we can first assign a poor family into a control situation where the children are not allowed to work. Further suppose that this family is so poor that they are starving. Clearly, the best choice for the family is to spend all income on food and nothing on education. The same family is then assigned to a treatment setting where the children can work as much as they wish. Now the hungry children will choose to work to turn all their idle time into income with which they can either (i) spend all on food or (ii) spend some on food and some on schooling. Obviously, choice (i) will lead to a better physiological status without causing any harm to schooling. Choice (ii) will lead to an increase in both physiological status and better schooling. This simple example demonstrates that the level of human capital optimally chosen with child labor can be higher than that without child labor.

As seen in Pictures 1 and 2, while it is true that most of the child laborers dropped out of school prematurely and suffered malnourishment and stunted growth, it is not necessarily correct to conclude that child labor harms their education and their health, or more succinctly their human capital. For if this were true, children would acquire more education and a better physical well-being in the absence of work, ceteris paribus. However, there is empirical evidence that suggests this is unlikely to be the case.

In 1993, Senator Thomas Harkin proposed a bill to ban imports to the U.S. of products tainted with child labor. Fearing of losing the U.S. market, the Bangladesh Garment Manufacturers and Exporters Association (BGMEA) took the preemptive action of firing virtually all of their child laborers, about 60,000, literally overnight. UNICEF and the International Labour Organization (ILO) welcomed this move and expected these freed children return to special schools opened for them. To the complete surprise of these agencies, a year after the layoff the total number of dismissed child workers enrolled in the schools was a mere 2,000 or 3% (ILO Midterm Review 1997). This outcome suggests that banning child labor does not necessarily increase education.

While a positive effect of child labor on human capital seems to provoke skepticism or denial among many people in first world countries, it seems natural to the poor that income from child work can help pay for more education and more food. For example, the Oxfam Education Report, through field surveys in Vietnam, shows how the poor resort to child labor to cope with the burden of schooling costs: “Children from approximately one-third of poor households included in the survey had been sent home from school at some stage for non-payment.... Most poor households had developed income-raising strategies to finance education. For example, after school many children would spend the afternoon tending buffalo or working on the farms of their neighbors, in order to generate income to cover education costs” (Watkins, 2000, p.180).

There are countless other similar real-life stories of poor children using income from child work to pay for their schooling, which basically demonstrate the income effect (see

---

2 Basic education in poor countries is not free. Poor families in developing countries have to pay for textbooks, uniforms, various school fees, and transportation, etc. which can take up to 30%-45% income of the poorest households.
3 Unless the starving children prefer staying hungry to enjoy leisure.
Appendix 1 and Appendix 2). On the other hand, many other stories show that because children have to work they do not have enough time to attend school, which essentially demonstrate the time cost of child labor (see Appendix 3). Since the impact of child labor on schooling can go either way, identifying the causality from child labor to human capital is challenging.

As noted by Edmonds and Pavnick (2005) and Udry (2006), it is inherently difficult to identify the causality between child labor and human capital because child labor, education, and consumption are determined simultaneously. To sort out the issue of endogeneity, I employ a controlled experiment approach in both the theoretical model and empirical investigation. The goal of this approach is to compare the levels of education and consumption currently attained by a working child against the levels she would otherwise have achieved if she had not had any opportunity to work.

Specifically, I first consider a control setting in which no opportunity for child work exists, for example, in the presence of a strictly enforced ban on child labor. In this situation, the household will choose optimal levels of education and consumption given the constraint of non-child labor income. More formally let $T$ be school time endowment which a student must invest in learning if she wants to fully acquire the knowledge taught by her school. If time flow is measured daily, we can think of $T$ as 8 hours, which includes approximately 5 hours attending in-class sessions plus about 3 hours studying at home$^4$. Let the household be constrained by the school time endowment $T^5$. Since education is costly$^6$, the poor, in the absence of work, may invest only a fraction $x$ of $T$ so as to increase survival consumption, leaving $T-x$ as non-school time. For example, if a household in the absence of work can afford only one meal per day, they may spend nothing on education and all on food for survival, thus turning all the child’s school time endowment into non-school time. Formally defined,

$$\text{non-school time} = \text{school time endowment} - \text{school time chosen in the absence of work}.$$

$^4$ If time flow is measured yearly, $T$ would represent about 190 school days each of which contains 8 study hours.

$^5$ In A Theory of Allocation of Time, Becker (1965) considers allocating 24 hours per day over all activities such as sleeping, eating, work, non-work, etc. In this research, I focus solely on the time trade-off between child work and child education. In particular, I consider how a family would allocate the school time endowment $T$ needed by formal education over child work and schooling. Put another way, I do not consider light works that do not interfere with schooling as child labor. Some examples of non-interfering works would include doing household chores or working 1 or 2 hours per day for wages after fully completing all school requirements. These light non-interfering works are often meant to be part of the upbringing of children and they are popular even among rich families who do not need to resort to child labor income. Because they do not interfere with formal schooling, they cause no harm to education and therefore are of trivial interest.

$^6$ Contrary to popular perception in high-income countries that basic education is free, poor families in developing countries have to pay for textbooks, uniform, various school fees, school meals, and transportation. These costs impose a heavy financial burden and generally can take up to 30%-45% of the income of the poorest households (Watkins, 2000).
Given the choice of non-school time in the absence of work, having an opportunity to work allows children to work up to the amount of non-school time without harming their education. In summary, not investing all school time endowment in education in the absence of work is a necessary condition for child labor to increase human capital because it gives rise to an amount of non-school time up to which a child can work to bring home additional income without harming her education.

The existence of non-school time, however, is not a sufficient condition for an increase in human capital because when children have the option to work, they may choose to work for more or less than the non-school time otherwise chosen in the absence of work. The allocation of time among work and school, when child labor is possible, is driven by both an income effect and a substitution effect. On one hand, child labor brings home more income so as to acquire more education and consumption. On the other hand, because children can work, going to school incurs an opportunity cost, the forgone child labor income. Consequently, child labor drives up total education costs and thus induces the household to substitute away from education towards more current consumption.

The household will re-optimize their decisions, choosing an optimal amount of child work, new optimal levels of child education and household consumption given an increased income (child labor plus non-child labor incomes), and a higher price of schooling (original costs plus opportunity cost). If the income effect dominates the substitution effect, the household, in the presence of work, would choose a higher level of education, allocate part of the previously chosen non-school time to education and part of it to child work, and use additional child labor income to pay for the increases in schooling and consumption. In brief, the sufficient condition for child labor to increase education and consumption is that the income effect must dominate the substitution effect.

The necessary and sufficient conditions show a striking result: even under a strict time trade-off constraint that any amount of time devoted to work takes away school time endowment, child labor can still increase the education and physical well-being of working children because the poor, in the absence of work, may not invest all school time endowment in education. Appendix 4 presents a more detailed illustration of how the existence of the necessary and sufficient conditions determines the positive net impact of child labor on human capital.

Using the amount of school time that would be chosen in the absence of work as the benchmark, instead of the school time endowment, to measure the time cost of child labor is the critical point that separates this research from the literature. Typically, the time cost of child labor has been modeled in the literature as:

\[
\text{time spent working} = \text{school time loss}.
\]

This formula states that each hour child labor takes away from school time endowment is each hour child labor harms education. This is not correct because how much time child labor takes away from education depends on how much time the child would have invested in schooling in the absence of work, independent of school time endowment. Moreover, by using school time endowment as benchmark, this formula implicitly assumes that in the
absence of work (child labor = 0), children always spend all their school time endowment on education. This assumption barely relates to the reality of the poor. A family living below subsistence in the absence of child labor may optimally choose to let their children stay at home (zero schooling) in order to spend all income on survival consumption. As James T. Morris (2003), Executive Director of the World Food Program observes: “Why don’t children go to school? Because when a family is hungry, finding food is all that matters. In the most desperate places, that can be a full time job even for young children.”

The theoretical model proposes three hypotheses that can be tested empirically. First, if the household is so poor that in the absence of work it invests none of the school time endowment in education, then child labor always enhance human capital by increasing either consumption or both consumption and education of the working children. Second, if the household in the absence of work invests only part of the school time endowment in education, then child labor will lead to an increase in human capital if the income effect dominates the substitution effect. Third, when the child labor market is imperfect and as a result children have involuntarily unemployed non-school time, a marginal increase in child labor results in more human capital as there is an income effect but no substitution effect.

Due to availability of empirical data, the empirical test focuses only on the third hypothesis when the child labor market is imperfect. Specifically, I make use of a quasi-controlled experiment to measure the impacts of child work on education when children had work but did not have as much as they wished. The quasi-experiment took place in 2004 in a poor rural area in the central highland in Vietnam. Poor children in this area typically dropped out before completing high school. A non-governmental organization (NGO), Compassion Foundation, initiated a project that aimed to help the poor children acquire more education. The project provided a female cow to each selected poor student. The students would spend time tending the cow and was allowed to retain all income generated. Income comes from sale of the cow’s offspring and its dung as manure. When the original cow gives birth to its first offspring, the students must return that offspring to the project as payment for the original cow. In effect, this project gave the selected children a job. Each child spent on average 1.9 hours tending the cows and earned an additional income of about 16 U.S. cents per day.

The NGO was not able to fund all poor students in the area. Instead, they selected the most needy children who were determined by the organization as being more likely to drop out if they did not receive any assistance. As later verified by data, the treatment group was more disadvantaged than the control group along every socio-economic dimension. At baseline, they acquired less education compared to those of the same age in the control group; their parents had lower levels of education; they had less land per capita. All indicators at baseline suggest that those in the treatment group would have been more likely to attain less education in absence of the treatment than those in the control group. The selection bias, therefore, works against the treatment effect and the reported estimates of the impact are likely to be the lower bounds of the true effect. The empirical results reveal that over a period of five years, the group with work gained a significant average of
0.59 years of education compared to the control group that did not have any work opportunity.

This research adds to the literature by providing new answers to perhaps the three most significant questions regarding child labor. First, there is empirical evidence that child labor can lead to an increase in the human capital of child laborers. Second, this study provides a theoretical framework to show the mechanism at work. That is child labor can benefit human capital through the interaction of an income effect and a substitution effect. Third, this model suggests two important policy lessons. The first lesson is that because child labor can enhance human capital, direct control policies such as child labor ban, trade sanction, consumer boycotts, or legal penalties against products made with child labor will have unintended consequences by diminishing or eliminating demand in the child labor market. These interventions would harm rather than improve the accumulation of children’s human capital for a subset of working children\(^7\). The second lesson is that it is possible to construct a policy that would allow the household to capture the income effect while excluding the substitution effect of child labor, thereby maximizing gain in education. For example, providing work conditional on school attendance to children who have unemployed non-school time would be sufficient to induce them to attain more education solely through the income effect.

Regarding empirical estimation methodology, most previous studies relied on weak instrumental variables such as weather shocks, commodity prices, and child labor wages to estimate the causal impacts of child labor on education to address endogeneity problem (Beegle et al. 2005, Assaad et al. 2001). However, meeting the exclusion restriction has largely remained a concern because the instrumental variables used are for the most part strongly correlated with macro economic conditions, which in turn affect human capital through non-child labor incomes of the household. Making use of a unique quasi-controlled experimental setting, this research allows for a direct and more plausible estimation of the causal impacts of child labor on education without relying on weak instrumental variables.

The dissertation is organized as follows. The next chapter describes the basic theoretical model. In Chapter 3, I extend the model to cover the case of imperfect child labor market where children can find work but cannot work as much as they wish. Chapter 4 describes the setting of the empirical quasi-controlled experiment, the data, the method of estimation and results. Chapter 5 discusses policy implications and proposes new interventions.

\(^7\) This subset includes (i) those who in the absence of work would invest none of school time endowment in education and (ii) those who in the absence of work would invest part of school time endowment and to whom the income effect dominates the substitution effect.
CHAPTER 2 - MODEL

Since child labor and human capital are the two essential elements of the model, it is necessary to articulate clear definitions employed in this research of these two concepts.

What is child labor?

This study excludes the worst forms of child labor such as bondage or forced labor, prostitution, child soldiers, pornography, or other illicit activities which shall be banned per se. Child labor, in this paper, is defined as any amount of time spent by children ages 6-15 on any activities that shifts out the budget constraint and takes away school time required by formal education.

First, the definition of shifting out the budget constraint includes works that generate income directly or indirectly. Working for wages directly generates income. Some of the indirect income generating activities would include work to increase production on the family farm or business, fetching water, collecting firewood, or taking up parental domestic duties so that parents can extent outside work hours for wages.

Second, this definition does not consider small amounts of work that do not interfere with schooling as child labor. Doing household chores or working 1 or 2 hours per day for wages after fully completing all schooling works are some typical examples of non-interfering works. Because these non-interfering works incur no time cost to children’s education, they are not relevant in terms of considering the trade-off between child labor and education.

What is human capital?

Human capital is defined as consisting of two components: the intellectual development and physical well-being of children.

Intellectual development, in the context of this research, is defined as formal education acquired at school. Empirically, it is measured by years of schooling completed. Note that acquiring formal education requires two necessary inputs: time and money. Contrary to popular perception in high-income countries that basic education is free, poor families in developing countries have to pay for textbooks, uniforms, various school fees, and transportation etc. These costs impose a heavy financial burden on the poor. For example, in Vietnam, at the lower secondary level, it costs the poorest households the equivalent of 45 per cent of household income to keep a single child in school. In Nepal, the poorest quintile spends more than 40 per cent of household income to send one child to primary school. Direct primary-school costs in Indonesia absorb 38 per cent of per capita incomes for the poorest quintile (Watkins, 2000). Surveys from various developing countries consistently show that education is a luxury poor parents struggle to afford although they want to send their children to school.

Physical well-being refers to the health status of children. Since the vast majority of poor children who have to resort to child labor are unable to afford sufficient calorie intake to maintain a modest health status, the income effect of child labor on the physical well-being of the children must be too significant to be ignored. A dollar brought home from
child work may help a hungry child laborer afford two meals per day instead of one. I believe one cannot fully account for the impact of child labor on the human capital if one fails to examine that impact on the child laborer’s physiological status, which for some strange reason has been largely ignored in the literature.

Given the fact that most of child laborers are in poor health, higher consumption of necessity goods such as foods and basic health care should unambiguously improve their physical well-being. For this reason, I shall treat higher consumption of necessity goods as synonymous with improved physical well-being of the children. This treatment helps avoid making the model unnecessarily complicated with little or no gain in marginal insights.

**The links between child labor and human capital.**

The relationship between child labor and human capital is depicted in Figure 1. The ovals present constraints that are exogenous to the household: income endowment (given level of poverty), schooling supply, and child labor demand. The rectangular boxes present endogenous decisions chosen by the family: how much to consume, how much children should work, and how much education children should acquire. The dashed arrows show the channels through which an exogenous constraint would impact an endogenous decision. The solid arrows show the channels through which one endogenous variable affects another. Figure 1 shows that given poverty constraints and taking the child labor market and school supply as given, the household simultaneously has to choose how much the child has to work as well as to allocate total income over consumption and education. The interactions between child labor, education, and consumption are discussed in detail below.
Child labor and human capital are simultaneously determined by poverty

There is overwhelming historical and empirical evidence that child labor and education are simultaneously driven by poverty. Whether one is looking across countries, cultures, or individual families within one country, rarely does one find that children of the non-poor such as doctors, lawyers, or professionals drop out of school and work for a living. In fact, the richer the household, the more likely the children are to finish high school and the less likely they are to work as a child.

Edmonds (2002) shows that an increase in income from South African government-funded cash pension leads to both a dramatic decline in child labor and an increase in school attendance. Three fourths of the cross-country differences in economic activity rates
of children can be explained by the variation in living standards (Edmonds and Pavcnik 2005). Eighty percent of the decline in child participation in market work in families living near the poverty line in Vietnam in the 1990s can be explained by improving living standards (Edmonds 2005).

**Causality can go from child labor to education or vice versa**

First, causality can go from education opportunities to child labor. Lower schooling costs obviously can attract more children to school and increase attendance, hence reducing time available for work. Free meals, closer schools, lower tuition and school fees would all have a positive impact on school attendance and negative impacts on child labor supply (Ravallion and Wodon 2000). Higher quality education such as better textbooks, better curricula, better teachers, and improved teacher-student ratios would also enhance the benefits of schooling perceived by parents, making future returns from schooling more attractive relative to current income from child labor (Handa 2002). As a result, families would choose more education thereby reducing the time available for child labor.

Second, child labor can directly affect education. In one channel, income from child labor would improve the ability to invest more in schooling. In another, child labor competes with schooling for time. Because children can work, going to school incurs an opportunity cost, the forgone child labor income. Consequently, child labor drives up education costs and thus induces the household to substitute away from education towards more consumption. These two effects occur sequentially and the net effect depends on which one dominates.

**How to address endogeneity of child labor and education?**

As depicted in Figure 1, constructing a model that can identify the causal impact from child labor to human capital is inherently challenging because of the problem of simultaneity and reverse causality between child labor and education. An effective approach to identify the causal impact of child labor on human capital is to construct the model as a controlled experiment. This is because the impact of child labor on the human capital of the child depends on the counterfactual of what level of human capital the child would acquire in the absence of work. Following this principle, the model focuses on the following question:

*What levels of education and consumption would a currently working child have acquired if she had not had the opportunity to work?*

To answer this question, I compare the optimal choices of education and consumption a household would make under a control setting where child labor is strictly banned versus a treatment setting where parents can let their children work as much as they wish. Any difference in the levels of education and consumption chosen between the two settings then can be attributed to the choice of positive amounts of child labor.

**Assumptions**

I begin by assuming that parents are altruistic in the sense that parents derive utility from the level of education acquired by their children. Allowing parents to derive utility from
their child’s educational level is plausible because the education attained by the child reflects all her future welfare, which includes not only future financial well-being but also life-time non-monetary benefits from having a good education. By deriving utility from the child’s educational attainment, parents implicitly take into account the future benefits of education against working and consumption now.\footnote{Note that this is different from the argument that one enjoys learning simply from going to school per se.}

The second assumption is that education is a normal good. There is overwhelming anecdotal and empirical evidence that education is a normal good (see Appendixes 4 and 5). The evidence is even stronger for basic education up to completion of high school. Rarely do children from middle-class families such doctors, lawyers, and professionals terminate their education before completing at least high school. Various studies (Behrman and Knowles 1999, Edmonds 2002) have found strong evidence that an increase in household income leads to more schooling.

**Construction of the model**

Parents are a single agent making decisions for the household. Assuming parents are altruistic and following Basu (2007) and Cockburn (2001), I adopt a unitary utility maximization approach and ignore intra-household bargaining issues. The parents have only one child and maximize the utility of the household over two goods: joint consumption and the educational attainment of the child.

Educational attainment is produced by a production function $E = f(s)$ which maps schooling time $s$ to educational attainment $E$. I let this function be a one-to-one mapping meaning one unit of schooling time produces one unit of education. This simplification is solely for expository purpose and the model’s results do not rely on it in any way. The assumption closely reflects the reality that one schooling year generally produces one grade attained. Hence, in this model $s$ can be interpreted both as schooling time and as educational attainment. Schooling costs are denoted by $d$ which includes school fees, textbooks, transportation, etc.

Let $T$ be school time endowment which a student must spend on studying if she wants to fully acquire the knowledge taught by her school\footnote{If time flow is measured daily, $T$ would be 8 hours which includes about 5 hours attending in-class sessions plus about 3 hours studying at home. If time flow is measured yearly, $T$ would represent about 190 school days each of which contains 8 study hours.}. The household is constrained by the school time endowment $T$. By this definition, $T$ does not include work that does not interfere with formal education as child labor. For example, non-interfering works such as doing household chores or working 1 or 2 hours per day for wages in non-school time during the school year or working full-time during the summer are not counted as child labor because they do not affect $T$. For simplicity, $T$ is normalized to 1.

The parents assign the child’s school time endowment between working and schooling and then allocate the total sum of non-child labor and child labor income over consumption $c$ and education $s$ to maximize family utility. Consumption and education are assumed to be normal goods. Parents have strictly convex preferences, or equivalently, the utility
function has the properties of a strictly quasi-concave function. Formally stated, the model is

\[
\max U(c, s)
\]

\{c, s, L\}

subject to: \[s + L \leq 1\]
\[c + d.s = L.w + I, \text{ where}\]

c is the joint consumption whose price is normalized to 1,
d is the costs of education,
s is the time invested in schooling and also educational attainment,
I is parents’ income,
L is the amount of time the child works, and
w is the child’s wage.

The weak inequality of the time constraint warrants special attention. It has become a standard in the literature to impose the equality constraint, e.g., \[s + L = 1\]. Such an equality constraint artificially forces child labor by definition to be harmful to children. Under this constraint, the relationship between child labor and education is negative and one-to-one. For example, when child labor is constrained to zero (by a child labor ban or by zero demand for child labor), education is automatically equal to one, which is certainly not the case for hundreds of million hungry children worldwide. The equality completely excludes the income effect. It effectively makes a controlled experiment setting impossible because under the control of no work opportunity, children by definition go to school full-time. In contrast, the inequality constraint allows for slackness of child labor and education, and thus makes it possible to identify the level of education endogenously chosen in the absence of work.

Since there is a slackness between school time and work, there is a temptation to explicitly account for utility from leisure. This turns out to be unnecessary. The optimal utility-maximizing decisions remain unchanged whether leisure is included or not. The reason is that when a household is poor enough to choose partial or zero schooling in the absence of work - the only situation that child labor is relevant - the marginal utility gained from additional child labor income would most likely dominate the marginal utility from leisure.

Intuitively if a household is so poor that it chooses partial or zero schooling even when children are not allowed to work, then when allowed it would prefer to let the children work to turn their non-school time into additional income to buy more food or pay for more schooling rather than continue staying hungry and enjoying some leisure utility. In short, play time is not that important when a child does not have enough to eat or to go to

\[10\] In other words, if a household chooses full-time schooling in the absence of child work, then they clearly do not resort to child labor.
school. In this case, it does not matter if we explicitly consider leisure or not. In fact, I implicitly account for leisure by assigning a constant marginal utility of zero to leisure. Of course, assigning some positive value function to the marginal utility of leisure and then assume it is lower than the marginal utility from additional income from child labor would yield the same result.

The control scenario in which there is no work opportunity for children

The control scenario of no work opportunity can be theoretically established by a fully enforced ban on child labor. In practice, this situation can arise in poor rural areas where economic activities are so scarce that jobs for children essentially do not exist. When work opportunity for children does not exists, parents’ task of maximizing utility is simplified to deciding how much of the non-child labor income will be spent on consumption versus education.

$$\max \ U(c, s)$$

$$\{c, s\}$$

subject to $s \leq 1$

$$c + d.s = I.$$

This is a standard utility maximization problem of two goods. There are three possible solutions shown in Figure 2. The horizontal axis, if read from left to right, shows $s$ which is both the time devoted to schooling and the level of education attained. If read from right to left, it shows the amount of time the child stays idle under the control of no child labor constraint. The vertical axis shows the consumption of a composite numeraire good $c$.

Corner solution A: No education. The family spends all non-child labor income $I$ on consumption and none on schooling. This solution most likely occurs when income endowment is below subsistence level. When the family cannot afford enough food, then it is best for the child to have food rather than schooling. In this situation, the slope of the indifference curve at bundle A is flatter than the price ratio $d$ (MRS$_A < d$). The household is willing to forgo a large amount of education for a small increase in survival consumption.

Interior solution B: Some education. The family spends endowment $I$ on both consumption and schooling but not enough to achieve full education. The intuitive explanation is that if parents invest in full education, the remaining income would be insufficient to meet subsistence needs. Hence, the family spends on both consumption and schooling up to the point where the per dollar marginal utility from education is equal to that from consumption.

---

11 My argument is basically the same as the luxury axiom first proposed by Basu and Van (1998). The luxury axiom asserts that child non-work is a luxury good: “Households whose non-child labor incomes (or, in brief, adult incomes) are very low cannot afford to indulge in keeping children out of some productive activity” (Basu and Tzannatos, 2003). Empirical evidence seems to largely support this axiom (Edmonds, 2001; Admassie, 2002; Wahba, 2002; Grootaert and Patrinos, 1999; Grootaert and Patrinos, 2002).

12 Actually, this is the case in the empirical study.

13 or the amount of time the child works under the treatment when child labor is allowed.
Corner solution C: Full education. Given that education is a normal good, if income endowment $I$ is sufficiently high, the household will acquire full education. This solution is trivial with regard to the examination of the impact of child labor.

![Diagram of human capital impact and child labor decisions](image)

**Figure 2:** The impact of child labor on human capital when the household chooses zero education in the absence of work.

**The treatment scenario in which children can work as much as the parents wish**

When parents can let children work as much as they wish, their task now is to assign the child’s time endowment between working and schooling, and then allocate total income over consumption and education in order to maximize family utility. The problem can be formalized as

$$\max U(c, s)$$

$$\{c, s, L\}$$

Subject to: $s + L \leq 1$

$$c + ds = Lw + I.$$
Now that children can work, going to school incurs an opportunity cost, the forgone child labor income. As a result, the price of education - which is the slope of the budget line - increases to \( d + w \). To see this, consider bundles D and C in Figure 2. At bundle C, the household attains 1 unit of education, which costs \( d \), and spends \( I - d \) on consumption. At bundle D, the parents invest nothing in education, let the child work full time and spend all total income \( I + W \) on consumption. It follows that the slope of the budget line DC is

\[
\text{slope} = \frac{(I + w) - (I-d)}{1} = d + w.
\]

Again, \( d + w \) is the economic cost of education which includes a direct schooling cost \( d \) and an opportunity cost of \( w \), which is the wage forgone when the child goes to school. An optimal bundle \((c, s)\) of the treatment scenario will lie on the budget line DC.

**Comparing the levels of education and consumption between the control and treatment scenarios.**

To distinguish between the treatment and control, I shall use single star * superscript to denote the optimal choices under the treatment scenario (parents can let children work as much as they wish) and the double-star ** superscript denote the optimal choices under the control scenario (existence of a strictly enforced ban on child labor).

**Hypothesis 1:** if \( \frac{\partial u_c}{\partial u_s}(0, I) < d \), child labor always leads to an increase in human capital.

This proposition states that if the household is so poor that in the absence of child labor, all non-child labor income is spent on consumption (the marginal rate of substitution at bundle \((0, I) <d\)), child labor always leads to an increase in human capital because it will either increase both education and consumption or increase consumption without harming education.

Intuitively, in the absence of work parents optimally choose not to send their child to school because they are so poor that they need bread more than books. By not investing any amount of the school time endowment \( T \) in education in the absence of work, the household does turn all school time endowment \( T \) into non-school time. So the necessary condition for child labor to increase human capital exists. In particular, in the presence of work opportunity the child can work up to \( T \) and bring home additional income without harming her education.

What about the sufficient condition that the income effect has to dominate the substitution effect? The sufficient condition is automatically satisfied because the substitution effect can never dominate the income effect. Note that in this case the optimal choice of education in the absence of work is already zero. Therefore, it is not possible for the household, in the presence of work, to substitute further away from education to a level less than zero.

As a result, there are only two possibilities. First, if the income effect exactly cancels out the substitution effect, the optimal choice of education in the presence of work will be zero. All child labor income will be spent on consumption, leading to an increase in
physical well-being without harming education. Second, if the income effect dominates the substitution effect, the optimal choice of education in the presence of work will be positive, leading to an increase in both education and physical well-being.

**Proof.** The proof is straightforward. The starting point is corner solution $A = (0, I)$ under the control. When the marginal rate of substitution at bundle $A$ is smaller than the price ratio $d$ (MRS$_A < d$), the parents spend all non-child labor income $(I)$ on food for survival and choose zero education. Now consider the treatment setting. When child work becomes possible, there are only two possible solutions: corner or interior.

If $\text{MRS}_D > d + w$, the interior solution

$$F = (s^*, I + L^*.w - s^*.d)$$

occurs. $F$ has more of both education and consumption than bundle $A = (0, I)$.

If $\text{MRS}_D < d + w$, the corner solution

$$D = (0, I + w)$$

occurs. Bundle $D$ has as much education as and more of consumption than bundle $A = (0, I)$.

**Policy implications from Proposition 1**

In practice what we often see is bundle $D$ where a child works full-time and does not go to school. When this child reaches adulthood, conventional wisdom would convince us that because he worked, he became a poor adult with no education – a loss in human capital due to child labor. Further, his children will likely have to work and sacrifice schooling. Hence, child labor perpetuates a poverty trap.

This argument has been widely popular among the public, policy makers and even accepted by some academics. But this argument is not quite right because it implicitly assumes that *if the child had not worked, she would have gone to school full-time*. This assumption is a far cry from reality. As Proposition 1 shows, it is possible that if the child had not worked, she would have acquired zero education and less consumption, a decrease in her human capital.

How many children in the world may fall into the corner solutions of $A$ and $D$? According to the United Nations World Food Program, globally there are about 100 million children who are hungry and do not go to school. These hungry children can be put into two mutually exclusive groups: (i) those who do not have work and (ii) those who work. Note that group (i) corresponds to bundle $A$ and group (ii) corresponds to bundle $D$ in Figure 2.

The children in the bundle $A$ group are hungry, are not going to school, and do not have work. Children in Picture 3 would be a good example of this group. For this group, the opportunity cost of child labor in terms the education forgone is zero because these children already chose not go to school in the absence of work. Since the opportunity cost of child labor is zero, working can never harm but benefit their human capital. In
particular, child labor provides a means for hungry children to convert their non-school time into income to acquire either more food or more of both food and education.

Let’s put ourselves into the shoe of those children in Picture 3. If we were them, would we be grateful to have work and thus be able to bring home more food? I believe most of us would say yes. To starving children child labor clearly incurs no cost to education but only helps. Having work will allow all of them to have more food and some of them more of both food and schooling.

Picture 3 – Starving Children in Africa

For children in the bundle D group, they are hungry, are not going to school, and are working (see Appendix 3 - Children Work Full-Time without Going to School). Conventional wisdom would easily convince us that they are the typical “victims” of child labor – being full-time laborers without any education. What proposition I reminds us is that we must not forget the counterfactual. Since these children are already hungry even with additional income from child labor, they would have been even hungrier once left with only non-child labor income if they had not had the opportunity to work in the first place. To survive it is almost certain that they must have spent all non-child labor income on food and nothing on education. If they would choose zero education in the absence of work, then child labor simply does not cause any harm to education. Indeed, child labor in this case generates additional income that leads to an increase in consumption without harming education of the children.
**Proposition 2:** When the optimal solution in the absence of work is interior, if
\[
\frac{\partial s}{\partial (I+wL)} L > - \frac{\partial s}{\partial w} \bigg|_{w=0},
\]
child labor will lead to an increase in both education and consumption.

Proposition 2 states that when the optimal solution in the absence of work is interior, if the income effect of a change in child’s wage dominates the substitution effect, child labor will lead to an increase in both education and consumption of the working children.

Intuitively, because the household invests only a fraction \(s^{**}\) of the school time endowment \(T\) in education in the absence of work, there exists the necessary condition for child labor to increase human capital. The child can now work up to \(1-s^{**}\) and generate additional income without harming her education. If the income effect dominates the substitution effect, the sufficient condition also exists and child labor must lead to an increase in both education and consumption.

**Proof.** The proof is done in three steps and is shown diagrammatically in Figure 3.

**Step 1:** The utility maximization problem under the constraint of zero child labor \(L = 0\) (child labor ban) has the same solution as under the constraint of zero wage \(w = 0\).

Economically they are two different utility maximization problems: one with a constraint of \(L = 0\) and the other with the constraint of \(w = 0\). But mathematically they are the same because the endogenous variable of child labor becomes irrelevant in both settings. Specifically, under the constraint of \(L = 0\), decisions regarding child labor becomes irrelevant because the term \(L \cdot w\) is zero and drops out of the budget constraint. The household only needs to allocate non-child labor income over consumption \(c\) and education \(s\) to maximize utility. Under the constraint of child labor wage \(w = 0\), decisions regarding child labor also turns out to be irrelevant because the term \(L \cdot w\) becomes zero and drops out of the budget constraint. The household’s task now is to allocate non-child labor income over consumption \(c\) and education \(s\) to maximize utility. Under constraint \(L=0\) or \(w = 0\) the problem is reduced to

\[
\max U(c, s)
\]
\[
\{c, s\}
\]

Subject to \(s \leq 1\)
\[
c + d \cdot s = I.
\]

Figure 3 shows the levels of education and consumption under the treatment and control. Under the treatment, the interior solution is \(G\). Under the control it is bundle \(B\). Note that bundle \(B\) can be interpreted as the solution of the control of a child labor ban \((L=0)\) or when the wage rate is zero \((w = 0)\).

**Step 2:** Since a child labor ban and the zero wage rate constraints have the same solution, the change in human capital due to the presence of a complete child labor ban can
be expressed in terms of the substitution and income effects due to a fall in child labor wage from a positive value to zero.

Diagrammatically, we can decompose the movement from bundle G of the treatment to bundle B of the control due to a child labor ban into the conventional income and substitution effects as if it were due to a wage drop from some positive value to zero. If the income effect from a change in child labor wage dominates the substitution effect, then bundle G contains more education than bundle B, or equivalently enforcing a total ban on child labor reduces the educational attainment of the working child.

The decomposition of the movement from G to B can be formalized as follows. From bundle G on the budget line DC, a decrease in w will cause a downward rotation of the budget line around C to CA. Normally a decrease in price of the good would cause the budget line rotate upward from DC to DH. The difference between CA and DH is because a decrease in w causes a fall in total income. So, the total income effect is not an upward move from B₁ to B₂ but downward from B₁ to B.
The total effect of a change in $w$ on education, using the Slutsky equation\(^\text{14}\), is

$$\frac{\partial s^*}{\partial w} = \frac{\partial s^*}{\partial w}\bigg|_{T+Lw} + \frac{\partial s^*}{\partial (T+wL)} S,$$

where $T$ represents the total school time endowment. Diagrammatically the term $\frac{\partial s^*}{\partial w}\bigg|_{T+Lw}$ shows the move from $G$ to $B$. It is the total effect of a decrease in $w$ on education demand. The first term on the right hand side $\frac{\partial s^*}{\partial w}\bigg|_{T+Lw}$ presents the move from $G$ to $B_2$, or the increase in education demand from a decrease in $w$ holding total income fixed. The last term on the right hand side $\frac{\partial s^*}{\partial (T+wL)}$ (1) shows the move from $B_2$ to $B$, the decrease in education demand after adjusting total income downwards for the revaluation of the time endowment.

Next, I show that the term $\frac{\partial s^*}{\partial w}\bigg|_{T+Lw}$ (or the move from $G$ to $B_2$) can be decomposed into the traditional income and substitution effects. At $G$, the Marshallian demand of education is

$$s^* = s(d + w, I + wL^*),$$

and the Hicksian demand of education is

$$s^* = h(d + w, u).$$

It follows that

$$s^* = s(d + w, c(d+w, u)) = h(d + w, u),$$

where $c$ is the minimized cost to achieve utility level $u$ at the price $d+w$.

Differentiating (2) with respect to $w$ gives the substitution effect as

$$\frac{\partial s^*}{\partial w}\bigg|_u = \frac{\partial h^*}{\partial w} = \frac{\partial s^*}{\partial w}\bigg|_{T+Lw} + \frac{\partial s^*}{\partial (T+wL)} S.$$

Rearranging the terms yields

$$\frac{\partial s^*}{\partial w}\bigg|_{T+Lw} = \frac{\partial s^*}{\partial w}\bigg|_u - \frac{\partial s^*}{\partial (T+wL)} S.$$

Substituting (3) into (1) gives

$$\frac{\partial s^*}{\partial w} = \frac{\partial s^*}{\partial w}\bigg|_u - \frac{\partial s^*}{\partial (T+wL)} S + \frac{\partial s^*}{\partial (T+wL)} 1.\tag{4}$$

\(^{14}\) My line of proof follows the approach in Deaton (1980) on income and substitution effects (p. 88-90)
Diagrammatically the term $\frac{\partial s^*}{\partial w}u$ shows the move from G to B, the substitution effect from a change in w holding the original utility constant. The term $\frac{\partial s^*}{\partial (I+WL)}s$ shows the move from B1 to B2, which is the income effect due to change in purchasing power after a price decrease (but no change in total income). The last term $\frac{\partial s^*}{\partial (I+WL)}1$ shows the move from B2 to B, which is the income effect due to a fall in total income as a result of the wage decrease. (4) can be rewritten as

$$\frac{\partial s^*}{\partial w} = \frac{\partial s^*}{\partial w}|_u + \frac{\partial s^*}{\partial (I+WL)}(1 - s).$$

Note that at interior bundle G, s + L = 1. Substituting 1 − s = L into (5) combines the move from B1 to B2 and B2 to B into B1 to B

$$\frac{\partial s^*}{\partial w} = \frac{\partial s^*}{\partial w}|_u + \frac{\partial s^*}{\partial (I+WL)}L.$$  

Now it is clear that the total effect, which is the move from G to B, consists of the substitution effect from G to B1 $\left(\frac{\partial s^*}{\partial w}|_u\right)$ and the income effect from B1 to B $\left(\frac{\partial s^*}{\partial (I+WL)}L\right)$. Note that the income effect $\frac{\partial s^*}{\partial (I+WL)}L$ is always positive. If the income effect from a change in w dominates the substitution effect, then a decrease in w causes a drop in educational attainment or equivalently, a ban on child labor will reduce the level of education attained, i.e., child labor results in higher educational attainment.

**Step 3:** If consumption c is also a normal good, a fall in the child labor wage rate will cause a decrease in consumption. This proof is straightforward. A fall in child labor wage makes schooling cheaper than consumption and also reduces total income. Since consumption is a normal good, both substitution and income effects work in the same direction of reducing consumption.

From conclusions in step 2 and 3, it follows that when the control has an interior solution, child labor will lead to an increase in both education and consumption of the working children if the income effect from a change in child labor wage dominates the substitution effect.
CHAPTER 3 - IMPERFECT CHILD LABOR MARKET

A perfect child labor market has been largely a standard assumption in the theoretical literature. For example, the multiple equilibria derived in the seminal paper on the economics of child labor by Basu and Van (1998) are based on the assumption that the child labor market is perfect. A well-functioning child labor market is also central to the results derived by Baland and Robinson (2000).

Starting with a base model in Chapter 2, I consider the impact of child labor on human capital with an implicit assumption that the child labor market is functioning smoothly. In other words, I have compared two polarized scenarios: human capital accumulation under no employment versus full employment. Specifically in the treatment setting, children have the option to work as much as they wish.

However, this is often not the case in practice. Work opportunities generally are limited in poor areas. Poor children need work, but they might not be able to engage in as much work as they wish. In “Child Farm Labor: The Wealth Paradox”, Bhalotra and Heady (2003) found that in Pakistan and Ghana, because of labor market failures, children of land-rich households where jobs are more readily available tend to work more than children of land-poor households. Edmonds and Turk (2002) found similar results in the case of Vietnam. Children in households that start their own business are more likely to work because there are more work opportunities available.

So it is important to account for the fact that poor children need work but might not be able to work as much as they wish. How would the impact of child labor on human capital change given such labor market imperfections? As it turns out, introducing market imperfection into the model helps explain the dynamics of the interaction of the income and substitution effects and yields very interesting policy implications.

A convenient way to introduce underemployment of children into the model is by way of a partial ban of child labor. Let \( \bar{L} \) be the partial ban on child labor. Let \( L^* \) be the optimal amount of child labor a household would choose when children can work as much as they wish. Suppose that \( \bar{L} < L^* \). When the ceiling \( \bar{L} \) is binding, a marginal relaxation of this ban will show the impact of child labor on human capital under child labor market imperfections.

The model can be formally stated as

\[
\begin{align*}
\text{max } U(c, s) \\
\{c, s, L\}
\end{align*}
\]

subject to:

\[
\begin{align*}
s + L & \leq 1 \\
L & \leq \bar{L} \\
c + d.s & = L.w + I,
\end{align*}
\]

where \( \bar{L} \) is the partial constraint on child labor.
Let G be the interior solution $G = (s^*, c^*, L^*)$ in the absence of the partial ban $\bar{L}$. G is shown diagrammatically in Figure 4. Note that we are only interested in the case $\bar{L} < L^*$.

**Proposition 3:** If $s^{**} < 1 - \bar{L}$, then $\frac{\partial s^{**}}{\partial \bar{L}} > 0$ and $\frac{\partial c^{**}}{\partial \bar{L}} > 0$.

Proposition 3 states that as long as there remains non-school time ($s^{**} < 1 - \bar{L}$), an increase in child labor always leads to an increase in both education of and consumption of the working children because there is an income effect but no substitution effect.

The logic behind proposition 3 is simple. As long as there is non-school time (as a consequence of underemployment), there exists the necessary condition because the household invests in education only a fraction $s^{**}$ of the total school time $1 - \bar{L}$ available. A marginal relaxation of the restriction $\bar{L}$ would allow the child to work more without taking any time away from schooling. Since a marginal increase in child labor does not consume school time, there exists an income effect but no substitution effect. The income effect of a marginal increase in child labor will lead to an increase in education and consumption since both are normal goods.

**Proof.** Figure 4 presents a diagrammatical proof. A formal proof shall follow.

As before, the budget line under a complete ban of child labor is AC. When children can work as much as they wish, the budget line is DC and the optimal interior bundle is $G = (s^*, c^*, L^*)$ where $s^* + L^* = 1$. In the presence of a binding partial ban $\bar{L}$, the budget line is now CKH and kinked at K. Note that an interior solution cannot lie on CK because there exists one and only one tangency point on CD, which is bundle $G$.

When $\bar{L}$ is binding, the total income is now $I + \bar{L}w$. The family is free to spend this total income all on consumption (bundle H), or go for a corner solution (bundle K), or an interior solution (bundle M). The solution of particular interest is bundle M. At this point, working children still have some non-school time that is neither used for work nor for school.

A marginal relaxation of the partial ban from $\bar{L}_K$ to $\bar{L}_O$ will shift the budget line out from CKH to COP. Note that the slope of the segment KH and OP does not change and is equal to the direct costs of education $d$. As a result, bundle M will become N which has more of both education and consumption since both are normal goods.

The formal proof is as follows. Define bundle $K(s, c)$ as

$$K(s, c) = (1 - \bar{L}, I + \bar{L}w - d(1 - \bar{L})),$$

and bundle $H(s, c)$ as

$$H(s, c) = (0, I + \bar{L}w).$$

$K$ and $H$ are shown diagrammatically in Figure 4.
From the first-order conditions of the maximization problem (6), constraint \( \ell \) is binding if and only if \( \frac{\ell_S}{\ell_C}\bigg|_K < d + w \), i.e., the marginal rate of substitution (MRS) at \( K \) is smaller than the price ratio \( d + w \). There are two possible cases:

(i) If \( d \leq \frac{\ell_S}{\ell_C}\bigg|_K < d + w \), it follows from the Kuhn-Tucker condition of problem (6) that the corner solution occurs at bundle \( K \).

(ii) If \( \frac{\ell_S}{\ell_C}\bigg|_K < d \), then optimal solution must lie in the interval \([H, K)\) of the budget line \( OKH \).

Consider an interior solution \( M(s^{**}, c^{**}) \in (H, K) \) where \( s^{**} \) and \( c^{**} \) are both positive. To ease notation, define total income \( m = I + \ell w \). The interior solution \( M(s^{**}, c^{**}) \) must satisfy the following first-order conditions:

\[
c^{**}(d, m, \lambda) + s^{**}(d, m, \lambda).d - m = 0
\]

(7)
We wish to compute the impact of a marginal relaxation of \( \overline{L} \) on \( s^* \) and \( c^* \). First, consider \( \delta L \).

Differentiating (7), (8), and (9) with respect to \( \overline{L} \) and arranging in matrix form, we have

\[
\begin{bmatrix}
0 & -1 & -d \\
-1 & U_{cc} & U_{sc} \\
-d & U_{cs} & U_{ss}
\end{bmatrix}
\begin{bmatrix}
\frac{\partial \lambda}{\partial \overline{L}} \\
\frac{\partial c}{\partial \overline{L}} \\
\frac{\partial s}{\partial \overline{L}}
\end{bmatrix} = \begin{bmatrix}
-w \\
0 \\
0
\end{bmatrix}
\]

Applying Cramer’s rule yields

\[
\frac{\partial s^*}{\partial \overline{L}} = \frac{\begin{vmatrix}
0 & -1 & -w \\
-1 & U_{cc} & 0 \\
-d & U_{cs} & 0
\end{vmatrix}}{|H|} = \frac{U_{cs} - dU_{cc}}{|H|} W
\]

where \( |H| > 0 \) is the determinant of the bordered Hessian.

Next, I will show that \( \frac{U_{cs} - dU_{cc}}{|H|} = \frac{\partial s^*}{\partial m} \), the effect of an increase in total income on education demand. To see this, again we differentiate (7), (8), and (9) with respect to \( m \) and arrange the terms in matrix form.

\[
\begin{bmatrix}
0 & -1 & -d \\
-1 & U_{cc} & U_{sc} \\
-d & U_{cs} & U_{ss}
\end{bmatrix}
\begin{bmatrix}
\frac{\partial \lambda}{\partial m} \\
\frac{\partial c}{\partial m} \\
\frac{\partial s}{\partial m}
\end{bmatrix} = \begin{bmatrix}
-1 \\
0 \\
0
\end{bmatrix}
\]

By Cramer’s rule we have

\[
\frac{\partial s^*}{\partial m} = \frac{\begin{vmatrix}
0 & -1 & -1 \\
-1 & U_{cc} & 0 \\
-d & U_{cs} & 0
\end{vmatrix}}{|H|} = \frac{U_{cs} - dU_{cc}}{|H|}
\]

Substituting (11) into (10) yields

\[
\frac{\partial s^*}{\partial \overline{L}} = \frac{\partial s^*}{\partial m} W
\]

Since education is a normal good, \( \frac{\partial s^*}{\partial m} \) is positive. It follows that \( \frac{\partial s^*}{\partial \overline{L}} \) is positive. This means as long as the child has idle time, an increase in child labor will lead to an increase in her education. The derivation of \( \frac{\partial c^*}{\partial \overline{L}} \) is exactly the same as that of \( \frac{\partial s^*}{\partial \overline{L}} \). Sparing
mechanical steps, it follows that \( \frac{\partial c^{**}}{\partial L} = \frac{\partial c^{**}}{\partial m} \). Since \( c \) is a normal good, \( \frac{\partial c^{**}}{\partial m} > 0 \) which implies that \( \frac{\partial c^{**}}{\partial L} > 0 \). Hence, the proof.

Proposition 3 shows that the move from \( M \) to \( Q \) is driven by the income effect. As restriction on child labor increases from \( L_K \) to \( L_Q \), education increases along the income expansion path from \( M \) to \( Q \) due to the income effect.

What happens at bundle \( Q \) when the time constraint becomes binding? As soon as \( s^{**} + \bar{L}_Q = 1 \), the household immediately faces a higher total school costs \( (d + w) \). As a result, they substitute away from education for more consumption. Hence, proposition 4.

**Proposition 4:** If \( s^{**} = 1 - \bar{L} \), then \( \frac{\partial s^{**}}{\partial L} = -1 \).

Proposition 4 states that when the non-school time is zero \( (s^{**} = 1 - \bar{L}) \), a marginal relaxation in child labor ban results in a substitution effect, leading to a one-on-one reduction in education.\(^\text{15}\)

Intuitively, because the time constraint is now binding \( (s^{**} = 1 - \bar{L}) \), it is not possible to generate additional income from child labor without harming education. In other words, we do not have the necessary condition for child labor to increase human capital. In this case, a marginal change in child labor would result in only substitution effect but no income effect.

Propositions 3 and 4 together imply two important corollaries:

**Corollary 1:** In the existence of non-school time, the income effect is realized before the substitution effect.

**Proof.** By proposition 3 the income effect takes place as \( L \) goes from \( L_K \) to \( L_Q \). Then as soon as the non-school time reduces to zero bundle \( Q \) (at which \( s^{**} + \bar{L}_Q = 1 \)), the income effect comes to an end and by proposition 4 the substitution effect begins to take effect for \( L \in [\bar{L}_Q, \ L^*] \).

The sequential occurring of the income and substitution effects has an important policy implication. It makes it possible to craft a policy that captures the positive income effect while excludes the negative substitution effect, thereby maximizing education gain due to child labor. For example, providing work to children conditional on attendance (or even performance) at \( s_Q \) will be sufficient to induce the households to choose bundle \( Q \) instead of bundles \( M \) or \( G \). If the household breaks the conditional attendance and choose \( G \), they would lose the job and fall back to bundle \( M \). Since \( M \) has less of both education and consumption compared to \( Q \), the household has a strong incentive to stick to \( Q \), which has more education than both bundles \( M \) and \( G \). In practice, a law that encourages private sector to provide work to children with unemployed non-school time conditional on their

\(^{15}\) The substitution effect is shown diagrammatically as the move from \( Q \) to \( G \) along the budget line \( CD \) in Figure 4.
school attendance would maximize education gain by capturing the income effect while excluding the substitution effect. Moreover, this gain may be achieved at no cost to public resources.

**Corollary 2:** When child work availability is limited, a *marginal* change in child work availability only shows either the income effect or the substitution effect, not the total effect.

**Proof.** If \( \bar{L} \) initially \( \in (\bar{L}_K, \bar{L}_Q) \) and changes in \( \bar{L} \) are small, then \( (\bar{L} + \Delta \bar{L}) \in (\bar{L}_K, \bar{L}_Q) \). It follows by proposition 3 that \( \frac{\partial s^{**}}{\partial E} > 0 \) and we observe only the income effect. If \( \bar{L} \) initially \( \in (\bar{L}_Q, L^*) \) and changes in \( \bar{L} \) are small, then \( (\bar{L} + \Delta \bar{L}) \in (\bar{L}_Q, L^*) \). It follows by proposition 4 that \( \frac{\partial s^{**}}{\partial E} = -1 \) and we see only the substitution effect.

Corollary 2 has an important implication regarding empirical studies. Note that the total effect can have a positive sign as the income effect or a negative sign as the substitution effect, depending on which one dominates.

In practice the poor living in different areas are likely to face a distribution of child work availability rather than a single level. Some might be operating in the range of the income effect. Others might be experiencing a one-to-one trade-off of the substitution effect. Consequently, if changes in child work availability are small, empirical studies might capture only either the income effect or substitution effect, sending false signals about the total effect. Therefore, one must be cautious in interpreting empirical results. One must be certain whether the effect found is the income, substitution, or total effect.

My empirical study relates directly to corollary 2. Since the children in the treatment group had work but not up to the point where the substitution effect began to take effect, the estimated impact shows only the income effect.
CHAPTER 4 - EMPIRICAL STUDY

This chapter presents empirical evidence from a quasi-controlled experiment that took place in 2004 in a poor rural area in Eakar District of Dak Lak Province in the central highland in Vietnam. Eakar was one of the poorest districts of Dak Lak with 36,488 households or 21.6% of the population living below the poverty line in 2007. Eakar’s total natural area was 103,747 hectares and its inhabitants consisted of 16 different ethnic minorities. Agriculture, including forestry and aquaculture was the main drive of its economy (Eakar District, 2007).

The poor children in this area rarely finished high school. An NGO, the Compassion Foundation, wanted to help the children sustain their schooling. Giving one-time financial aid or scholarship was deemed not sustainable because the children would likely terminate their schooling after the aid ended. On the other hand, the NGO did not have resources to provide financial aid year after year.

Both the NGO and local community wished to have an intervention that could help generate a regular source of income year after year. After much discussion the NGO and the local households came up with a plan that would loan a female cow to each selected poor household with school-age children. The idea was that the children would spend time tending the cow, earn some additional income to pay for their schooling. The condition of the cow loan was that when the original cow gives birth to its first offspring, the households must return that offspring to the project as payment for the original cow.

These cows are of a local breed. A photo of the cows is included in Appendix 5. Their fully grown weight stands around 350 to 400 pounds. They are raised for meat since they do not produce milk more than necessary to feed a young calf. Female cows can produce offspring every 15 months, and they graze on wild weeds in the neighborhood. Essentially, the only input required is the time to take the cow out to graze, feed it water, and take it home. By its nature, cow tending is well-suited to children in this area.

The female cows provide two sources of income: sale of offspring and sale of the cow’s dung as manure. Manure sale averages about $20 per year and sale of offspring brings in about USD120 per year\(^\text{16}\). So gross earning including child labor tending the cow is about $140 per cow per year which translates into approximately 8 U.S. cents per hour of work. In effect, this project gave the selected children a job, which required time input from them and in return allowed them to earn an additional income of roughly 8 U.S. cents per hour.

A list of 134 poor households living below poverty line with a total of 304 children ages 1 to 15 was submitted to the NGO for consideration. The NGO was not able to finance all of the households. Instead, 20 families out of the 134 were selected into treatment. The 20 families in the treatment had a total of 50 children while 114 households in the control had 254 children. The setting of the quasi-controlled experiment is summarized in Figure 5.

\(^{16}\) Sale of offspring by reproduction cycle is normalized to yearly income.
Validity of the quasi-controlled experiment

There are three main concerns regarding whether this project can serve as a valid controlled experiment for inferring causality from child labor to education.

The first concern is the selection bias into the treatment. It would be ideal if the treatment were randomized. Instead, the NGO chose to provide the cows to the most needy children who they determined would have a greater chance of dropping out from school if they did not receive any assistance. The NGO collaborated with the local Red Cross to conduct visits to the families during which the NGO observed the living conditions of the families and discussed with them the difficulties in keeping their children at school. After the visits, the NGO selected 20 families they believed to be more likely to terminate their children’s schooling prematurely if they did not receive any assistance.
<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Treatment</th>
<th>Diff.</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obs</strong></td>
<td><strong>Mean</strong></td>
<td><strong>Obs</strong></td>
<td><strong>Mean</strong></td>
<td></td>
</tr>
<tr>
<td>SAGE in 2004</td>
<td>114</td>
<td>-0.88</td>
<td>34</td>
<td>-1.47</td>
</tr>
<tr>
<td>% household having dropout</td>
<td>78</td>
<td>0.09</td>
<td>20</td>
<td>0.20</td>
</tr>
<tr>
<td>Father's education</td>
<td>108</td>
<td>6.2</td>
<td>19</td>
<td>3.3</td>
</tr>
<tr>
<td>Mother's education</td>
<td>111</td>
<td>5.5</td>
<td>20</td>
<td>3.8</td>
</tr>
<tr>
<td>% of indigenous children</td>
<td>254</td>
<td>0.08</td>
<td>50</td>
<td>0.22</td>
</tr>
<tr>
<td>Distance to schools in kilometer</td>
<td>225</td>
<td>5.03</td>
<td>49</td>
<td>6.15</td>
</tr>
<tr>
<td>Math score in 2004</td>
<td>97</td>
<td>6.52</td>
<td>26</td>
<td>6.41</td>
</tr>
<tr>
<td>Vietnamese language score in 2004</td>
<td>97</td>
<td>6.54</td>
<td>26</td>
<td>6.52</td>
</tr>
<tr>
<td>Household size</td>
<td>114</td>
<td>5.2</td>
<td>20</td>
<td>5.1</td>
</tr>
<tr>
<td>Number of children in household</td>
<td>114</td>
<td>2.2</td>
<td>20</td>
<td>2.5</td>
</tr>
<tr>
<td>Land per capita in hectare</td>
<td>249</td>
<td>0.24</td>
<td>50</td>
<td>0.18</td>
</tr>
<tr>
<td>Age in 2004 - whole sample</td>
<td>254</td>
<td>6.28</td>
<td>50</td>
<td>8.2</td>
</tr>
<tr>
<td>Age in 2004 of those aged 7 or above</td>
<td>114</td>
<td>9.39</td>
<td>34</td>
<td>10.2</td>
</tr>
<tr>
<td>Age in 2004 of those aged below 7</td>
<td>140</td>
<td>3.8</td>
<td>16</td>
<td>3.9</td>
</tr>
</tbody>
</table>

*p<0.1, **p<0.05, ***p<0.01, SAGE = Grade attained + 6 – age

The statistics in Table 1 show that at baseline the treated households were more disadvantaged than those in the control group along critical socio-economic indicators with regard to the potential to sustain their education. First, consider the difference in “schooling for age” (SAGE) between the treatment and control groups. SAGE is defined as

\[
SAGE = \text{grade attained} + 6 – \text{age}
\]

If a child sustains normal schooling progress, say, completing 12th grade at age of 18, SAGE is zero. Negative values in SAGE show the number of years a child lagged behind the normal progress supposed to be for her age. At baseline, the children in the treatment group already lagged 1.5 years behind while the number for the control group was only 0.9 years.

There is, however, still a concern over pre-treatment trends in educational outcomes. For example, if the treatment group had already been improving at a faster rate than the control group, perhaps because they were so badly off to start with or because of other unobserved factors, then the bias would work in the same direction of the treatment effect.
To check this potential problem I investigate the trends in SAGE across the treatment and control groups since 2001. Figure 5 shows no sign of convergence in SAGE prior to the treatment in 2004. The gap in SAGE slightly widened from 2001-2004 and only started to narrow in 2006. This is consistent with the main results that child labor started improve schooling outcomes from 2006, two years after the program began in 2004.

The treatment group also had higher dropout rates. 20% of the households in the treatment group had at least one school-aged child who had dropped out of school compared to 9% in the control group. Further, fathers and mothers of the treated children had 3.3 and 3.8 years of education on average compared to 6.2 and 5.5 years in the control. The positive impact of parents’ education on children’s schooling attainment is well supported in the literature (see Chevalier 2004 for an example). This suggests the impact of parental education on the children’s educational outcomes in the treatment group would be more negative than in the control group.

The treatment group also had higher dropout rates. 20% of the households in the treatment group had at least one school-aged child who had dropped out of school compared to 9% in the control group. Further, fathers and mothers of the treated children had 3.3 and 3.8 years of education on average compared to 6.2 and 5.5 years in the control. The positive impact of parents’ education on children’s schooling attainment is well supported in the literature (see Chevalier 2004 for an example). This suggests the impact of parental education on the children’s educational outcomes in the treatment group would be more negative than in the control group.

![Figure 6 – Trends in SAGE from 2001-2009](image)

The treatment group also had higher percentage of minority children. 22% of the children in the treatment group were indigenous compared to only 8% in the control group. National household surveys indicate that on average indigenous children acquire by far lower education levels than the main ethnicity. Regarding distance to school, children in the treatment group lived about 1.15 kilometers farther away from school than those in the control group.
A logit regression of being in the treatment on the household observables at baseline provides further evidence that the treatment group was selected because they seemed to struggle more in sustaining their children’s education than the control group. The results in Table 2 show that a child that had lower SAGE, was indigenous, lived further away from school, and had lower father’s education was statistically significantly more likely to be selected into the treatment.

Table 2. Selection into treatment based on observables at baseline

<table>
<thead>
<tr>
<th>Dependent variable: binary with 1 being in treatment and 0 in control</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAGE in 2004</td>
</tr>
<tr>
<td>Indigenous (1 being indigenous, 0 main ethnicity)</td>
</tr>
<tr>
<td>Distance from school (in kilometer)</td>
</tr>
<tr>
<td>Father’s education</td>
</tr>
<tr>
<td>Mother’s education</td>
</tr>
<tr>
<td>Land per capita</td>
</tr>
<tr>
<td>Constant</td>
</tr>
<tr>
<td>No. of observation</td>
</tr>
</tbody>
</table>

*p<0.1, **p<0.05, ***p<0.01. Standard errors are clustered at household level.

One of the main concerns was that there might exist a selection bias in terms of the innate ability to do well at school. To address this issue, I investigate the scores in mathematics and Vietnamese language of all children who were going to school at baseline 2004. Table 1 shows that those in the treatment group scored 6.41 for mathematics and 6.52 for Vietnamese language compared to 6.52 and 6.54 respectively in the control group. These scores were virtually identical. This alleviates the concern that the two groups might differ in unobserved factors such as IQ.

I also investigate the difference in age. The mean age of the treatment group was 1.92 years higher than that of the control group. This raises the concern that if the control group had disproportionately more children under school age (younger than 7) at baseline, then the difference in education gained during the study period can simply be due to age difference.

This problem, however, can be effectively addressed. I separate the sample into those aged 7 or above and those under 7 at baseline. This separation serves two purposes. First, it allows me to test the treatment effects only on those going to school at baseline versus the whole sample. Conditioning on going to school at baseline would eliminate the gain in education due to age difference. Second, I can investigate the age distributions of those under 7 at baseline across the control and treatment groups. As shown in Appendix 6, the age distributions are virtually identical. This eliminates the concern that at baseline the treatment group might contain a lot of 6 year-old children while the control group contains a large portion of 1 year olds, which would result in gain in schooling due to age
difference. Since those under school age at baseline had same age distributions across the treatment and control groups I can test the treatment effects for the whole sample. The results of whole sample test are similar to those conditional on going to school at baseline.

In summary, all indicators - especially the fact that the treatment group had higher drop out ratio and lower SAGE values at baseline - suggest that those in the treatment group, in absence of the treatment, would be more likely to attain less education than those in the control. The selection bias, therefore, works against the treatment effect. As a result, estimates of the impact are likely to be the lower bounds of the true effect.

The second concern is whether the cow generates the household income solely through child work or through some other channels. Since the cow is a loan and not a give-away to the family, the intervention does not imply any non-child labor income shock to the selected families\textsuperscript{17}. If it were a grant, then education of the selected children would benefit from an increase in asset (the cow) and therefore the gain in education partly comes from such positive income shock.

Another potential issue is that adults might tend the cow instead of the children or at least share part of the work. Surveys indicate that average daily adult wage was $2 per day or 25 cents per hour while gross hourly income from raising cow, including labor was about 8 cents. Surveys also show children had about 2.9 hours of free time a day. Given the wage difference, it is not economically sensible for adults to substitute their higher wage work for what the children can do in their non-school time.

The third concern is whether there are any exogenous shocks that can affect the education of the treatment and control disproportionately over the 5-year length of the study. For example, an improvement in a school or some subsidy program that might benefit the treatment more than the control would contaminate the impact of the cow project. Since the children in both the control and the treatment live in the same area and they all go to the same schools, any change in the schooling environment would affect them evenly.

Further, they are all officially considered as poor by the government and have the same eligibility for government support programs. It is very unlikely that they would benefit differentially from government support programs. However, there still remains a potential issue with non-government charity projects that might affect the treatment and control differentially. This issue was discussed in detail with the management team of the District’s Red Cross whose responsibility was to coordinate allocation of charity gifts to beneficiaries in the area. The team reported that there has been no other long-term support project that had similar nature as the cow program. Most of the assistance received has been one-time relief donations which were distributed independently from the cow program.

\textsuperscript{17} For example, if the cow (valued $250) was a gift to the family, then the children’s education would benefit from an increase in non-child labor income of $250, in addition to the flows of child labor income from the cow.
Since the cow is a loan to the households, some have questioned that the cow intervention addresses the problem of credit constraint rather than child labor. Note that the cow intervention did not provide a loan in form of money that would have allowed the households to spend on a particular need that it is facing a credit constraint. Rather, it provided a loan in a physical form of a cow on the condition that the household had to keep and raise it. And it turned out that children’s time was the only economically optimal input needed to raise the cow. So unlike other conventional loans, the cow loan brought additional income to the households exclusively by providing a job to the children.

Others have raised the concern that children might consume milk produced by the cows and therefore the education gain was due in part to improved nutritional intake apart from the income effect from child labor. This concern turns out to be irrelevant. First, these local cows are raised for meat, not milk as they do not produce milk more than necessary to feed a young calf. So the concern is irrelevant for this practical specific.

The second reason is even more significant. Even if children consume milk produced by the cows, the milk impact on education is still part of the income effect from child labor. At the root of the issue, the milk produced by the cows is an in-kind output of child labor. Suppose a child works outside for wages, gets paid with money and uses it to purchase milk. Then the educational gain due to the additional consumption of milk is clearly part of the income effect from child labor. Obviously, it does not make any difference as far as the income effect is concerned if the child gets milk directly from her work and consumes it or gets paid and uses the money to purchase it. Conversely, a child can choose to sell the milk produced by the cow she tends for money and use it to buy other foods. But if she prefers to keep the milk at home and consume it, she simply optimally enjoys the output of their child work directly.

It would be ideal if we could compare both the education and health status of the treatment group against the control group before and after the experiment. Unfortunately, data regarding health status such as body mass index, height for age, etc. were not collected at baseline in 2004. As a result, this study focuses only on educational attainment measured by the years of schooling completed during 2004-2009.

**Econometric specification**

I estimate the impact of child labor on years of schooling attained using the following specification.

\[
\text{Grade}_{it} = b_0 + b_1 \text{After}_t + b_2 \text{Treat}_i + b_3 \text{After}_t \times \text{Treat}_i + u_{it},
\]

where \(\text{grade } i\) is the years of schooling completed by child \(i\) at time \(t\). \(\text{Treat } i\) can be either

(i) the number of hours child \(i\) spent tending the cow or

(ii) a dummy indicating whether child \(i\) is in the family who received a cow.

\(\text{After}\) is a dummy with 0 for the baseline year 2004 and 1 for each year from 2005 – 2009. The coefficient of interest is \(b_3\), which shows the gain in education between year \(t\) and 2004 due to child labor. The coefficient \(b_1\) shows how much education the students in both control and treatment gain on average in \(t\) year(s) from 2004. Equation (12) is
estimated for those going to school in 2004 and for the whole sample. The results are reported in Table 3. The dependent variable is the years of schooling completed up to year \( t = (2005, 2009) \).

**Results**

Table 3 reports the impact of each hour worked on years of schooling acquired. The impact has been significant since 2006, two years after the treatment started. Panel A of table 3 reports estimates for those going to school in 2004. Over 5 years, each hour of work daily helped the children gain 0.31 years of schooling. Each child in the treatment worked on average 1.9 hours per day, which translates into a total gain of 0.59 years of schooling \( (0.59 = 1.9 \times 0.31) \). Panel B reports result for the whole sample, including those who were under 7 and were too young for schooling in 2004. Column 2009 of Panel B presents estimates for all children aged 7 or above in 2009. Considering the whole sample, each hour of daily work leads to a gain of 0.45 years of schooling. Since younger children spent less hours than older siblings tending the cows, including those under 7 in 2004 into the regression leads to a larger impact of work hour on schooling \( (0.45 \text{ years compared to } 0.31 \text{ years}). \)

**Table 3. Impacts of Work Hours on Education**

<table>
<thead>
<tr>
<th>Panel A: going to school at baseline</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours worked</td>
<td>0.05</td>
<td>0.08***</td>
<td>0.16***</td>
<td>0.26***</td>
<td>0.31***</td>
</tr>
<tr>
<td>After</td>
<td>0.94***</td>
<td>1.75***</td>
<td>2.52***</td>
<td>3.24***</td>
<td>3.93***</td>
</tr>
<tr>
<td>No. of observation</td>
<td>262</td>
<td>264</td>
<td>264</td>
<td>264</td>
<td>264</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: Whole sample</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours worked</td>
<td>0.02</td>
<td>0.12***</td>
<td>0.20***</td>
<td>0.36***</td>
<td>0.45***</td>
</tr>
<tr>
<td>After</td>
<td>0.91***</td>
<td>1.59***</td>
<td>2.18***</td>
<td>2.67***</td>
<td>3.21***</td>
</tr>
<tr>
<td>No. of observation</td>
<td>306</td>
<td>364</td>
<td>426</td>
<td>498</td>
<td>558</td>
</tr>
</tbody>
</table>

* for p<0.1, ** for p<0.05, *** for p<0.01. Standard errors are clustered at household level.

Table 4 reports the impact of being a child in a family that received a cow on the years of schooling completed by that child. The coefficient of the treatment dummy shows the average impact of having a cow on the education of all children in the family. For example, column 2009 of Panel A shows that each child who was going to school in 2004 and was in a family that received a cow gained an average of 0.71 years of education over 5 years. The estimates for the whole sample were approximately the same. Each child aged 7 or
above in 2009 and in a family that received a cow gained an average of 0.73 years of education over 5 years.

The time trend (After) coefficient is also informative. It shows the education the whole sample gained on average between year $t$ and 2004. So ideally this coefficient should increase by 1 for each year forward from the base year 2004. Over 5 years, however, the children in the whole sample gained an average of 3.22 years of schooling instead of 5. The gap of 1.78 years indicates the severity of education loss among the poor children in the sample. Indeed, the majority of them do not finish high school.

Table 4. Impacts of Being in the Treatment on Education

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment dummy</td>
<td>0.02</td>
<td>0.22***</td>
<td>0.47***</td>
<td>0.69***</td>
<td>0.71***</td>
</tr>
<tr>
<td>After</td>
<td>0.94***</td>
<td>1.75***</td>
<td>2.50***</td>
<td>3.21***</td>
<td>3.89***</td>
</tr>
<tr>
<td>No. of observation</td>
<td>278</td>
<td>280</td>
<td>280</td>
<td>280</td>
<td>280</td>
</tr>
</tbody>
</table>

Panel B: Whole sample

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment dummy</td>
<td>0.05</td>
<td>0.26***</td>
<td>0.47***</td>
<td>0.72***</td>
<td>0.73***</td>
</tr>
<tr>
<td>After</td>
<td>0.91***</td>
<td>1.59***</td>
<td>2.18***</td>
<td>2.68***</td>
<td>3.22***</td>
</tr>
<tr>
<td>No. of observation</td>
<td>322</td>
<td>380</td>
<td>442</td>
<td>514</td>
<td>574</td>
</tr>
</tbody>
</table>

* for p<0.1, ** for p<0.05, *** for p<0.01. Standard errors are clustered at household level.

Table 5 yields interesting insights from the reported hours children spent on daily activities. At first sight, the treated children seemed to do light, non-interfering work, utilizing 1.9 hours of their non-school time to tend cows to support their education. Because the children worked less than 2 hours in their non-school time, they seem to be similar to those who simply do household chores, as is typical in most families, even in First World countries. This cow work, as it turns out, is indeed very different from the non-interfering work adopted by richer families. The households that do not need to resort to child labor generally let their children work as a means of learning only after their children have invested all school time endowment in studying. The rich generally would not let their children’s work interfere with their schooling. The children participating in the cow project by contrast, had non-school time because in the absence of work they would invest in education only part of their school time endowment. Specifically, they would spend only 5 hours on studying, 3 hours short of the 8 hours required to acquire all the
knowledge taught\(^\text{18}\). Given the existence of 3 hours of non-school time, the children can work up to 3 hours without harming their education. In summary, this cow work satisfies the definition of child labor employed in this paper: shifting out the budget constraint and consuming school time endowment. Despite such time tradeoff, their work still led to an increase in their educational attainment.

**Table 5: Daily Allocation of Time in Number of Hours by Activities**

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Treatment</th>
<th>diff.</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Obs</td>
<td>Mean</td>
<td>Obs</td>
<td>Mean</td>
</tr>
<tr>
<td><strong>During school year</strong></td>
<td>10.81</td>
<td>10.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>245</td>
<td>5.3</td>
<td>42</td>
<td>5.2</td>
</tr>
<tr>
<td>Work outside</td>
<td>245</td>
<td>0.1</td>
<td>42</td>
<td>0.0</td>
</tr>
<tr>
<td>Tending cow</td>
<td>245</td>
<td>0.3</td>
<td>38</td>
<td>1.9</td>
</tr>
<tr>
<td>Household chores</td>
<td>246</td>
<td>2.2</td>
<td>43</td>
<td>2.1</td>
</tr>
<tr>
<td>Idle</td>
<td>246</td>
<td>2.9</td>
<td>42</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>During summer</strong></td>
<td>9.36</td>
<td>10.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>246</td>
<td>1.8</td>
<td>42</td>
<td>1.5</td>
</tr>
<tr>
<td>Work outside</td>
<td>246</td>
<td>0.1</td>
<td>42</td>
<td>0.7</td>
</tr>
<tr>
<td>Tending cow</td>
<td>246</td>
<td>0.4</td>
<td>42</td>
<td>2.2</td>
</tr>
<tr>
<td>Household chores</td>
<td>246</td>
<td>2.9</td>
<td>43</td>
<td>2.4</td>
</tr>
<tr>
<td>Idle</td>
<td>246</td>
<td>4.1</td>
<td>42</td>
<td>3.3</td>
</tr>
</tbody>
</table>

\(^*p<0.1, **p<0.05, ***p<0.01.\)

In terms of the necessary and sufficient conditions, the necessary condition was met because by not investing all 8 hours of school time endowment in learning, the children gave rise to 3 hours of non-school time. In addition, the fact that children in the treatment group still had 1.8 hours of unemployed non-school time per day after tending the cows presents evidence that they did not work up to the point at which the substitution effect

\(^{18}\) To complete the curricula set by the Ministry of Education, elementary and secondary students are required to attend 4-hour in-class sessions and encouraged to participate in an optional 3-hour tutoring at school plus 1-hour study at home.
starts to take effect. In this case, there was an income effect from cow work but no substitution effect.

The empirical estimates, therefore, measure only the income effect. Accordingly, the estimates reported in Table 3 and 4 should not be interpreted as the total effect\(^{19}\). In a nutshell, this empirical study shows that because the children did not invest all school time endowment in education in the absence of work, there existed 3 hours of non-school time. The cow project provided a means to convert part of the 3-hour non-school time into income to purchase more education\(^{20}\).

\(^{19}\) Indeed, if the children had been able to work as much as they wished, the total effect could have been larger or smaller than the reported estimates or even negative.

\(^{20}\) and possibly more consumption which, due to lack of data, cannot be measured.
CHAPTER 5 - ANALYSIS OF ALTERNATIVE POLICIES

In this chapter I will first give an overview the current situation of child labor in the world and how the international community has responded to this problem with current child labor control policies. I will then discuss the effectiveness of these policies and whether they can be replicated and un-scaled to other settings. Finally, based on my theoretical and empirical results, I propose new interventions for addressing the problem of child labor.

Current situation and international responses

Realizing the enormity of the problem of child labor, as early as 1973, International Labor Organization (ILO) passed Minimum Age Convention (No. 138), setting the minimum ages a child can legally be employed with the hope that the Convention would become “one of the most effective methods of ensuring that children do not start working too young” (http://www.ilo.org/ipec/facts/ILOconventionsonchildlabour/lang--en/index.htm). As shown in Table 6, Convention 138 made it illegal for any children under 12 to work even for small amount of light work that does not interfere with schooling. As of today a total of 161 countries including many least developed countries such as Cambodia, Lao, Mongolia, Botswana, Ethiopia, Haiti, etc. have ratified the convention.

Table 5: Main Principles of Convention No. 138 Concerning the Minimum Age of Admission to Employment

<table>
<thead>
<tr>
<th></th>
<th>The minimum age at which children can start work.</th>
<th>Possible exceptions for developing countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous work</td>
<td>18 (16 under strict conditions)</td>
<td>18 (16 under strict conditions)</td>
</tr>
<tr>
<td>Basic Minimum Age</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>Light work</td>
<td>13-15</td>
<td>12-14</td>
</tr>
</tbody>
</table>
Despite the effort, according to the ILO, today there remain around 215 million child laborers throughout the world. Many of them are working full-time, neither go to school nor have proper nutrition and care. What is worse is that more than half (53%) or 115 million children are currently engaged in hazardous work (IPEC, 2011)\textsuperscript{21}, being exposed to physical, emotional or sexual abuse, dangerous machinery, equipment and tools, hazardous substances, agents or processes, temperatures, noise levels damaging to their health.

Perhaps realizing the goal of reaching complete elimination of all child labor originally targeted by Convention 138 is not achievable in any near future, the ILO concluded that it was necessary to focus international effort on a narrower target of eliminating the worst forms of child labor (WFCL). In 1999 the ILO adopted the Worst Forms of Child Labour Convention (also known as Convention 182) which as of today has been ratified by 174 countries. The Convention requires ratifying states to “take immediate and effective measures to secure the prohibition and elimination of the worst forms of child labor as a matter of urgency” (ILO, 1999, p. 1). The goal is to have no children engaged in the worst forms of child labor by 2016.

After 10 years of implementation, the ILO (2009, p. 2) reports that “scores of ILO member States have taken immediate and effective measures under the Convention to secure the prohibition and elimination of the worst forms of child labor as a matter of urgency. As a result, the number of children in the worst forms of child labor is decreasing more rapidly than the overall decline in all forms of child labor.” By 2006, while the number of general child laborers fell by 11%, the numbers in WFCL dropped much more sharply, by 26% overall, and by 33% for children in the 5-14 age group (ILO, 2009).

As recently as October 3, 2011 the United States Department of Labor has signed two cooperative agreements granting the ILO USD 17.5 million to support activities to combat child labor. Specifically, part of the fund will “aim to increase the knowledge base on effective interventions that can be replicated and up-scaled within and across countries. It will also support the use of monitoring and evaluation techniques to identify the most effective strategies to combat the worst forms of child labour. The Project will build on the progress achieved since 2000 through several other USDOL-funded ILO projects on areas such as impact evaluation, tracer studies, beneficiary monitoring and tracking, project monitoring systems and policy impact.” (ILO, 2011, p. 1).

The agreement clearly shows that the international community is still in search for

\begin{itemize}
  \item[i)] the \textit{most effective strategies} to combat child labor, and
\end{itemize}

\textsuperscript{21} ILO Convention No. 182 (ILO, 1999) officially defines the worst forms of child labor as:
(a) all forms of slavery or practices similar to slavery, such as the sale and trafficking of children, debt bondage and serfdom and forced or compulsory labor, including forced or compulsory recruitment of children for use in armed conflict;
(b) the use, procuring or offering of a child for prostitution, for the production of pornography or for pornographic performances;
(c) the use, procuring or offering of a child for illicit activities, in particular for the production and trafficking of drugs as defined in the relevant international treaties;
(d) work which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children.
ii) effective interventions that can be replicated and up-scaled within and across countries.

In order to replicate and up-scale a policy, it is important to have a proper theoretical understanding of how that policy works. I will use economic theory to analyze the specific piecemeal interventions undertaken in practice and touted by ILO as effective and successful in order to gain a better understanding of why a policy works and to see whether there is a sound theoretical ground for universal replication and up-scaling. Policies having been undertaken by ILO’s member countries to withdraw children from child labor generally fall into the following two categories:

1) **Coercive measures** which center around actions against child labor:
   - Enact law that makes engagement of children in child labor illegal.
   - Enforce sanctions against those who break the law concerning child labor.
   - Run awareness-raising campaigns to change attitudes and behaviors toward child labor at household and community level so that parents choose to keep their children away from child labor.
   - Trade sanctions against products using child labor.
   - Consumer boycott by labeling products tainted with child labor.
   - Setting international labor standards that restrict use of child labor.

2) **Collaborative measures** which focus on tackling poverty and increase access to education:
   - Increase the scale of social service for working children and their families such as promotion of social welfare, poverty reduction, and health.
   - Expand programs that reduce schooling costs such as reducing school fees, providing free meals and textbooks, providing cash transfer conditional on schooling, building new schools which makes it more accessible to students.
   - Programs that improve school quality such as improving teacher/student ratios, improving curriculum, providing training and retraining of teachers. These programs will change the benefits of education relative to current income from child labor.
   - Increase household income by supporting employment opportunities for adult family members.
   - Improve working conditions (labor contract, wage, protection) of children engaged in employment other than prohibited jobs listed for minors.
   - Remove and rehabilitate children engaged in WFCL.
   - Provide direct assistance to the affected children and their families.

Consider as typical examples three real interventions recommended as good practices by the ILO for replication elsewhere. Box 1 presents a typical coercive measure of enforcing

BACKGROUND
The IPEC Project “Sustainable Elimination of Child Bonded Labour (SECBL) is implementing in eight districts in western and eastern Nepal. The SECBL Project used community-based Child Labour Monitoring Committees (CLMCs) at village level in order to prevent child labour as well as to withdraw and offer referrals to working children identified by the community. The practice was to extend the scope of the monitoring beyond the target group (in this case child bonded labour in agriculture) to all forms of child labour. The practice was initiated in 2008, and institutional building and other capacity building support is still being provided in order to complete the process by June 2010.

ACTION
Before the SECBL Project, there was no labour inspection mechanism in the rural areas of Nepal. With full participation of various stakeholders in the designated village community, a need to monitor each household for child labour was realized. This motivated stakeholders to keep their village child labour free. After providing training and conceptual clarity on the system, a committee comprised of 7-11 members (including women, marginalised persons and teachers) was formed and trained on child rights, the negative effects of child labour, legal provision under the existing laws and international labour standards. This led them to identify potential centres to which children could be referred depending upon the circumstances. The committees monitored the households in their villages and identified children at risk of falling victim to child labour as well as working children.

ACHIEVEMENTS/ACCOMPLISHMENTS
As a result of the full involvement of stakeholders and training of committees, efforts to prevent children from entering into child labour and actions to withdraw children already engaged in child labour were taken immediately. One of the CLMCs has withdrawn 67 children from situations of child labour, prevented 58 children from entering into child labour, and provided referrals to 32 children to date.

The practice involves community members from various social classes, ethnicity and religious groups. It builds ownership among those involved by bringing tangible results that develop the committees’ confidence and is sustainable beyond the completion of the Project. This has been informally evaluated by NGOs, community leaders and the Project. This practice will eliminate all forms of child labour from the village.”

LESSONS LEARNED
It is beneficial to encourage the participation of women, men, youth and children’s clubs during the initial period in order to build ownership of the mechanism. Supporting the committee in the identification of potential resources within the community will help ensuring the Project’s unstainability. The practice
The story in Box 1 shows that having a child labor inspection mechanism to put social pressure on local households, forcing them to respect child labor rights and law seems to be effective in freeing children from work. It was even stated that “This practice will eliminate all forms of child labour from the village” (ILO, 2010, p. 26). If enforcing child labor law is that effective, it is hard to explain why the ILO for some reasons not entirely clear resorted to a totally different approach in the case of Pakistan.

Box 2 (ILO, 2010, p. 27-28) “Addressing Poverty to Eliminate Child Labour in Post-crisis Settings (Pakistan)

BACKGROUND
The earthquake that ripped across Northern Pakistan on 8th October 2005 caused extensive damage to human lives and livelihoods. The earthquake damaged and destroyed houses, household assets, agricultural stock, livestock and poultry. Water sources were blocked, irrigation channels severed, and community infrastructure such as roads, hospitals and schools crumbled down. Markets collapsed and market infrastructure suffered greatly. A drastic fall in incomes coupled with inflated commodity prices resulted in the situation becoming desperate for the poor.

The large number of families and children affected by the earthquake became highly vulnerable. Many school-going children were left without schools, teachers and teaching supplies. The destruction of the educational facilities and resources, and thus safe shelter, left children exposed to serious risks of abuse and exploitation, including the worst forms of child labour. The loss of families’ livelihoods and assets resulted in numerous short and long-term consequences for children. A large number of the households affected by the earthquake were already living below the poverty line before the disaster. Child labour prevalence increased from 5% to 13% after the earthquake.

ACTION
The IPEC Project “Pakistan Earthquake Child Labour Response” (PECLR) aimed to provide non-formal education (NFE) to children in the worst forms of child labour and initiated skills training programmes for mothers of working children studying in the rehabilitation centres established under the Project. It was important to equip families of working children with marketable skills for economic recovery and ultimately the elimination of child labour. Community members and families of working children were involved in the selection of the trades in which they would be trained. The families, especially mothers and children, received skills trainings in dress making, embroidery and tailoring. Successful trainees were given certificates on completion. The trainings were held by seven union councils in Tehsil Balakot (the Project intervention area). The selection of trades was done through a consultation process involving members of the Committee for Management of Rehabilitation Centres and family members of
working children.

**ACHIEVEMENTS/ACCOMPLISHMENTS**

One of the batches of adult trainees won a bid from the Kaghan Memorial Trust for stitching uniforms for its students. The Project and implementing agency encouraged and facilitated the group’s application. This particular group was trained for another three months by an experienced trainer. All the members of the batch were the mothers of working children studying in Rehabilitation Centres under the PECLR Project.

**LESSONS LEARNED**

A sound social mobilization campaign leads to sustainability. Given the urgency of delivery of project components in the post-earthquake response, not much time was spent on social mobilization. Intervention was over a short span of time. Despite this, positive results were still evident. It is suggested that interventions allocate sufficient time and resources (both human and financial) in order to obtain the best results.

The PECLR Project was started as an emergency response in an extremely difficult climate/terrain at high elevations in the Himalayan mountain range - where it was the only project addressing the need of working children in the area. Coordinated efforts were not possible with other interventions. The people of the area lacked information on seeking support from various sources. The first step was to identify families of working children, then to include them in a skills training programme. Evaluations conducted after the skill training revealed that participants lacked knowledge on how to utilize and benefit from the skills they had learned. In response, the Project lobbied different social safety nets and microfinance institutes working in the area to include families of working children in their programmes. Awareness sessions on available source and process on seeking financial assistance were also held with the beneficiaries. A resource kit is being designed on available resources, methods for obtaining financial assistance and modes of payment and repayment.

In the case of Pakistan the intervention was to provide *free non-formal education* to the child laborers together with *skill training to provide the mothers a better opportunity to earn income*. In a nutshell, the intervention reduced the price of education and relaxed the budget constraint facing the poor families. Box 3 shows another collaborative approach that relaxed the household budget constraint.

**Box 3 (ILO, 2011a) “From Child Labourer to Child Advocate: How Rodel Succeeded in Leaving the Mineshaft”**

MANILA (ILO Online) – As the school year ends and millions of children in the Philippines look forward to their summer vacation, there are hundreds of thousands who will get no holiday – child labourers. These children – who are mostly from rural areas - have no choice but to keep working and earning to help their families, even if their workplaces are hazardous.
Rodel Morcozo used to be one of them. Every day, Rodel had to bend his back to carry a heavy wooden pan with sand and gold. His skin was sun-burned while his tiny hands were soaked in mercury-laden muddy water. He had to work for 8-12 hours to earn a maximum of US$1-2 a day, searching for gold or selling cigarettes and candies around a small-scale gold mining site.

“I was so tired, so weak since I had to work at night and go to school the next day. At some point, I had to work full time, when my parents could not afford to send me to school anymore,” recalls Rodel.

One day, the ten-year old boy suffered a 100-200 feet fall because his father had blasted the tunnel with dynamite. “I had to run and get out but it was too dark,” remembers Rodel, who worked in the mines of Bicol in the Camarines Norte province, one of the poorest regions in the Philippines. “I felt so miserable, and then I realised that I did not like what I was doing. I just wanted to go back to school.”

Mines such as this one produce a fifth of the world's gold by UN estimates. They also produce gems for our jewellery and rare minerals for our cell phones. They are generally remote and unofficial but often highly organized. The doubling of world-market gold prices in recent years has made such gold prospecting all the more attractive to the abject poor and all the more dangerous.

Not unexpectedly, a sizeable percentage of the workers drawn to these gold, gem, mineral mines and stone quarries are children – both girls and boys.

**But times are changing**

However, as the new ILO report on hazardous child labour shows, times are changing and there is plenty that can be done against hazardous child labour.

Rodel who is 25 years old now, is again a good example. Through the ILO, a scholarship from Senator Loren Legarda helped him to finish his education.

“The scholarship gave me a chance to leave the dark tunnel,” Rodel said during a press conference organized by the ILO last April in Manila. “Now I can see the fulfilment of my dream to find a decent job and help other children to get out of child labour.”

Rodel became a child advocate at an ILO summer youth camp ten years ago. “My number one aim was to end child labour in the Philippines. I joined the first ever Global March against Child Labour. I marched on the streets holding a banner on Let’s Work Together against Child Labour,” Rodel explains.

The most important question regarding replication and up-scaling is that why the ILO did not replicate the coercive inspection intervention successfully applied to Nepal to the cases of Pakistan and Rodel? My theoretical model suggests that the Nepalese households opted to withdraw their children from work because they were not so poor such that they could tolerate the disutility from forgone child labor income to avoid the disutility from the social pressure on child labor. But for the poor as hungry as the earthquake-stricken households in Pakistan and Rodel, the disutility from forgone child labor income would be
so great that they would not yield to regulations on child labor. Banning the hungry Rodel from work would not have brought him to school simply because his family could not afford it. When children are hungry, an intervention to remove children out of work can be effective only if it compensates the households for the forgone child labor income. When the poor are suffering hunger, there is no miracle of getting rid of child labor without relaxing the household budget constraint, which requires external assistance such as a scholarship, free meals, cash transfer, or better income earning opportunities for parents, and so forth. Collaborative interventions generally provide such assistance but coercive measures do not. Blindly imposing coercive interventions will have the exact unintended consequences on the poorest children. Such measures will reduce their calorie intake, their health, while doing nothing good to their schooling.

What do economists think about collaborative and coercive measures?

Economists generally oppose legislative actions such as prohibition of child labor. The main concern is that coercive legislation would force the affected households to choose a sub-optimal allocation and therefore make both the households and the children worse off. However, many argue that if the interests of children are the main concern, then legislative actions would benefit the working children in the long run. The reason is that although non-child labor choices forced by coercive policies may make the households worse off in the short run, they allow time for children to go to school and therefore is better for the child laborers’ human capital. Again, this argument is not right in that it implicitly assumes that if children do not work, they would spend their time at school. On contrary, my model shows that prohibition of child labor would reduce not only household welfare of the most desperately poor but also the human capital of the children.

Lesson 1: Coercive policies will reduce human capital of the working children living below subsistence level.

An outright ban of child labor, if fully enforced, would eliminate the child labor market. Legal penalties, consumer boycotts, or trade sanctions would make it costlier for employers to hire children and thereby reduce the wage rates. These policies effectively shift the budget line towards the origin as shown in Figure 6 from CD either to CH or all the way to CA as in the case of a complete ban. As a result, by proposition 1 they would harm the human capital of those at corner solution D or by proposition 2 would hurt those at interior solution G whose income effect dominates its substitution effect.

Generally coercive interventions can be effective in removing children from work to school as long as non-child labor income is sufficient for the household to live above subsistence level. In this case, when the marginal utility from child labor income and saved schooling costs is lower than the disutility from breaking the social norms or legislature on child labor plus the marginal benefit from schooling, a coercive intervention would drive the household away from child labor toward schooling. However, in the case of the poorest, who would choose zero education in the absence of the intervention, coercive measures will have the exact consequences of reducing not only the household welfare but also the human capital of the working children.
Lesson 2: Policies reducing schooling costs increase education and reduce child labor.

Most economists support collaborative policies. Many empirical results have found interventions that make schooling more beneficial relative to child labor effective in reducing incidence of child labor and increase school attendance.

Programs that improve school quality such as improving teacher/student ratios, improving curriculum, providing training and retraining of teachers were found to increase the benefits of education relative to current income from child labor. Handa (2002), for example, notes that school enrollment in Mozambique is affected by the number of trained teachers.

Reducing schooling costs such as dropping school fees, providing free meals and textbooks, providing cash transfer conditional on attendance, building new schools which makes it more accessible to students has also been effective. Schultz (2001) finds that conditional cash transfer has resulted in a fall in child labor and an increase in schooling of about two-thirds of a year. Deininger, Klaus (2003) notes that abolishing all school fees and uniform requirement in primary schools in Uganda led to a significant increase in enrollment.

Figure 7 shows that policies reducing schooling costs rotate the budget lines outward from AC to AK and DC to DK. Both income and substitution effects work in the same direction of inducing more education. As children devote more time to school, time available for child work is reduced, leading to a drop in child labor. If child labor market is
perfect, bundle G will become $G_1$ which has more education. Given an imperfect child labor market, bundle B will become K because more is better.

Notice, however, reducing education costs typically decreases child labor by only a small proportion of the increase in schooling (as found by Ravallion and Wodon 2000). Figure 7 suggests that this case can arise if there exists unemployed non-school time among some of the children. Consider bundle B in Figure 7 where schooling is OB and non-school time is 1-OB. When schooling costs go down from d to zero, Bundle B will become K since more is better. Schooling increases from OB to 1 but there is no reduction in child labor. In the presence of non-school time, a reduction in schooling costs would increase schooling but reduce child labor by a smaller magnitude.

Although reducing schooling costs generally increases education and reduces child labor, is free schooling sufficient to draw all child laborers out of work to school? The model suggests the answer is no.

Lesson 3: Free schooling is inadequate to remove children, who live below subsistence level, from work to school. A sufficient incentive to draw them to school requires a full compensation of their forgone child labor income.

To see this, consider corner solutions D and A in Figure 7. D represents to those who are hungry, not going to school and working and A refers to those who are hungry, not going to school, and not working.
Recall that the corner solution A occurs when there exists no work opportunity. This case may arise in the presence of a fully enforced ban on child labor or demand for child labor does not exist in the economy. In this case, because more is better free schooling is sufficient to induce all children at bundles A and B to move to bundle K of full schooling and no work.

But if work opportunities exist, the opportunity cost of education in terms of forgone child labor income is now positive. What does forgone child labor income mean to the hungry poor? It means forgone necessity consumption critical to their survival. Further, children cannot learn much, if anything, when they are too hungry. Meeting a minimum calorie intake is a necessary biological condition for learning to have any effect. Hence, it is totally rational that most of the critically poor prefer to let go schooling even if it is free and send their children to work in order to increase critical consumption. Diagrammatically, bundle D is likely to yield better utility than bundle K, which is made possible from a free schooling intervention.

Indeed, this is the case of the Harkin’s bill. Driven by the concern about the 60,000 dismissed children, ILO, UNICEF and BGMEA, came to sign in July 1995 a Memorandum of Understanding (MOU) called “The Placement of Child Workers in School Programmes and the Elimination of Child Labour”. The purpose of the MOU is to remove child workers from BGMEA factories and place them in appropriate schools. The program provides a monthly stipend of taka 300 which is about $7 to the dismissed child workers attending school on a regular basis. A year after the signing of the MOU, the total number of dismissed child workers enrolled in the schools was a mere 2,000 (ILO Midterm Review 1997). Notice that this offer was better than free schooling. It offered a positive net earning of $7 per month. It was strikingly counterintuitive that most of the poor declined to take it. The majority of the children still worked illegally in the factories or left the factories and were engaged in other jobs where they could make on average around 500 taka ($12) per month. The families declined the offer because $7 only partially compensated them for the $12 their children could earn elsewhere. In other words, they would have to forgo $5 worth of critical consumption if they went to school. The benefits of $5 in survival consumption simply outweighed the perceived benefits of schooling. Diagrammatically, bundle D is still preferred to bundle N.

What we might learn from this incident is that the effectiveness of a policy varies across the poverty spectrum. A partial compensation that reduces direct education costs to zero would be sufficient to induce the moderately poor (interior solutions) to choose full education but would appear to be inadequate to those whose non-child labor income is below subsistence level (corner solutions). Free schooling plus full compensation for the loss in child labor income is needed to move the hungry out of work into school.

Lesson 4: Providing work to children with unemployed non-school time conditional on their school attendance would maximize education gain by capturing the income effect while excluding the substitution effect.

This lesson comes directly from corollary 1 that as long as there exists involuntarily unemployed non-school time, the income effect is realized before the substitution effect. A
law that encourages the private sector to provide work to children conditional on their school attendance or performance would be sufficient to induce children, who need work but are not able to find work as much as they wish, to attain more education by capturing the income effect while excluding the substitution effect. Given the fact that lack of education occurs where poverty is prevalent and where public assistance is scarce, the private sector has great potential in increasing education of poor children. More importantly, the impact of having more work and the effects from a reduction in schooling costs provided by public assistance reinforce each other. Instead of wasting scarce public resources to enforce direct control policies that counterproductively impose friction on child labor market, governments should use these resources to subsidize schooling and encourage the market to provide work to poor children, conditional on their school attendance or performance. The potential contribution of the private sector can only be realized, of course, after policy makers and the public are convinced that the poor can resort to child labor to attain more human capital.
CHAPTER 6 - CONCLUSION

In this research I am not arguing that child labor is good and desirable per se. In fact, I agree that in an ideal world, children would not have to work and be able to spend all their time on education and play as necessary. What this research makes clear is that such an ideal world of schools and playgrounds can be afforded only if households are not constrained by poverty. The harsh truth is that poverty and extreme poverty, the root causes of child labor, still exist and will continue for the foreseeable future.

Facing poverty and costly education, it can be optimal for children, in the absence of work, to invest only a fraction or none of the school time endowment in education. In the former case, a child can work up to the amount of survival-induced non-school time to bring home additional income without harming her education. And if the income effect from child labor dominates the substitution effect, children will allocate part of the non-school time to work, part of it to schooling, and use additional income from child work to pay for the increases in education and consumption. In the latter case of investing none of the school time endowment in the absence of work, child labor generates a positive income effect while its opportunity cost of time in terms of the education forgone is zero. This results in an unambiguous gain in human capital of the child laborers.

The finding that child labor can help child laborers accumulate more human capital has significant policy implications. First, coercive measures that put restrictions on the child labor market will have perverse consequences of reducing human capital of a subset of child laborers, especially the poorest. Second, collaborative interventions that reduce schooling costs or improving the returns to education are effective in removing children out of work to school. However, while free schooling is sufficient to draw children living above subsistence to school, the poorest children who live below subsistence level need to be compensated not only the direct costs of education but also the opportunity cost of going to school (the forgone child labor income).

Finally, because providing collaborative policy to the mass population would require massive state funding which poor countries usually cannot afford, it is important to use market forces to promote child laborers’ human capital. Policies that make the child labor market functioning more smoothly such as reducing transaction costs, increasing information to the children and their families regarding occupational risks, incentivizing fair child labor practice (similar to green products), improving the bargaining power of the children will likely result in an increase in child labor wages and improvement of working conditions, which in turn will improve the human capital of child laborers, especially the poorest.

Due to limitation in data availability, the empirical study cannot test all propositions proposed by the theoretical model but only proposition 3 – the impacts of a marginal increase in child labor on education in the existence of unemployed non-school time. The test shows that the income effect from child labor results in a significant gain of 0.59 years of education.
This leaves propositions 1, 2 and corollary 1 open to future empirical studies. First, proposition 1 posits that providing work to those who, in the absence of work, would not invest in education will lead to an increase in their human capital. It seems that children living in certain desperately poor areas in Africa and South Asia might be in this situation. Many of them might not be going to school and might be unable to find any work. A randomization of work provision would be an ideal approach to see whether the ones with work would acquire better health and/or more education and the extent of any improvement. A randomized controlled design would allow us to measure the impact of child labor not only on (i) physiological development, (ii) formal education, but also on (iii) soft skills learnt from work, (iv) psychological changes of the child laborers.

Second, it is important to test proposition 2 to see whether the income effect would dominate the substitution effect among children who invest only part of their school time endowment. One way to test this is to randomly offer these children the option to work as much as they wish and then check if their schooling outcomes are better than their controlled counterparts.

In addition, it would be interesting to test how much education can be gained from the policy that provides work conditional on schooling attendance or performance. This can be done by randomly providing work to those still having non-school time, conditional on their attendance or performance at school and then compare their educational outcomes against their controlled counterparts. Such a policy is expected to maximize education gain by capturing the income effect while excluding the substitution effect.

Finally, I want to discuss the feasibility of conducting a randomized controlled experiment on child labor and why it should be done. So far, it has been unthinkable to conceive a randomized controlled experiment on child labor. Why? Perhaps because child labor has been viewed as synonymous with harm to child laborers, it is just naturally immoral to conduct an experiment that imposes harm on children. As has been shown, this seemingly genuine concern is misleading. Child labor is not necessarily harmful to child laborers. On the contrary, the poorest children who live below subsistence and who most desperately need work would unambiguously benefit from working.

Perhaps the second barrier to a randomized controlled experiment is that child labor often involves exploitation. In most cases, the agents who employ child laborers are seen as reaping immoral gains on the backs of the poor children. How can an experiment that exploits poor children possibly meet the moral codes on experiments involving human subjects? The cow project shows that child labor can be non-exploitative. It is possible to provide children with work such that no party except the children and their families would benefit from their work. For example, none of the parties involved in the cow project such as the NGO, the local Red Cross staff, local officials benefited from the children’s work except themselves and the families.

Lessons from this study show that child labor can be designed to be (i) safe to children, and (ii) non-exploitative. Given these two necessary conditions and given the fact child labor can benefit the human capital of child laborers, a randomized controlled trial on child labor can be acceptable.
While the theoretical model explains clearly with economic theories the mechanisms through which child labor can benefit the human capital of child laborers, the empirical test still comes short of the gold standard of a randomized controlled trial. Given the magnitude of policy implications regarding child labor, which can affect the lives of hundreds of million children, a more rigorous randomized controlled trial is strongly desirable. Such an experiment would provide an undisputable answer to the question whether child labor benefits human capital and if yes, to which particular groups of child laborers and to what extent. The public and policy makers need such unquestionable answer in order to accept the counter-intuitive phenomenon that child labor can help child laborers accumulate more human capital and then take actions to change policies accordingly.
REFERENCES


Handa, Sudhanshu. 2002. ‘Raising Primary School Enrollment in Developing Countries: The Relative Importance of Supply and Demand.’ Journal of Development Economics. 66/1, 103-128.

Hillman, Arye L., and Jenkner, Eva. (2004), ‘Educating Children in Poor Countries’ IMF.

ILO, 1997. ‘Midterm Review’


ILO, 2009. ‘Ten Years of Progress under ILO Convention 182’

ILO, 2010. ‘Good Practices on Child Labour 2010 - Asia region’


ILO, 2011a. Articles, ‘From child labourer to child advocate: How Rodel succeeded in leaving the mineshaft’
International Programme on the Elimination of Child Labour (IPEC), 2011. ‘Children in hazardous work: What we know, what we need to do’.


Morris, James, (2003), ‘Hunger through the eyes of a child’.


APPENDIX 1: A STORY OF KYRGYZSTAN - CHILDREN LABOR TO PAY SCHOOL FEES

KYRGYZSTAN: Children labor to pay school fees [News]

With the Kyrgyz school year finished, many children are away at Soviet-era summer camps. But many other school children, especially from poorer families, have to work in order to provide support for their families or to earn money to pay for the forthcoming school year. In Kyrgyzstan, in addition to textbooks, families have to pay for the upkeep of the school as well as many other expenses associated with education.

The majority of such children are from migrant labour families, who frequently come to the capital Bishkek in search of work. Almost all of such children express a desire to attend school but almost all of them also have to work if they are to do so. Many children are important contributors to family budgets in this poor republic with few natural resources. "Focus group research indicates that, in some cases, 30 percent of the family budget is earned by children," according to Mira Itikeeva, director of the Centre for the Protection of Children, a local NGO working with child labourers in the capital.

"I do not know what a summer camp for children is, can you explain it to me?" asked an 11-year-old known as Talant, who works cleaning shoes on the streets of Bishkek. He earns 50-80 soms (about US .1 to 1.7) per day. Each month, along with his working sisters, he has to send money to his parents in the desperately poor southern province of Batken. Despite the privations, Talant makes just enough to attend school. He is among thousands of children who sell cigarettes, bubble gum, newspapers and other commodities on the streets or sweat pushing handcarts in bazaars. There are also cases in which children have been the object of human trafficking and sexual exploitation.

Another boy, 12-year-old Manas, also works as a cart pusher at the bustling Osh bazaar in Bishkek. One of six children, his parents moved to the capital from the eastern province of Issyk-Kyl to improve their economic condition. "There is no difficulty in my job. I earn 100-150 soms (about .2 to 3.3) per day, but I am very afraid of police raids. They take children like me and send us to prison. They usually take a bribe from us. Either my dad or elder sister brings money to them."

The majority of urban child labourers in Kyrgyzstan sell cheap goods or work in markets and roadside small shops, while children in rural areas tend to work on plantations and commercial tobacco farms. Other children herd cattle or work in unregulated gold mines. "For example in Jal-abad [province], mining is one of the few sources of income for families. In mining, children earn 50-70 soms [US .2- 1.8] per day," Migrigul Ablezova, of the Sociology Department at the American University of Central Asia, who researches child poverty, told IRIN. Death and injury among child miners are common.
"If children in the south are exposed to different diseases and danger due to working, children in Bishkek are under huge physiological pressure and in real danger, because wherever adults work, children work too," Ainura Sagynbaeva, head of SIAR-Bishkek, an organisation that has researched child labour for the International Labour Organisation (ILO) and the Kyrgyzstan Federation of Unions, told IRIN.

Poverty remains the main factor behind the rise in child labour in Kyrgyzstan. Average monthly salaries are very low at between 800-1000 soms (about $22), and as a result many people put their children to work to make ends meet. Young women are often found working the streets as prostitutes.

The UN children's organisation UNICEF said it was supporting several projects in Kyrgyzstan working to reduce child labour. UNICEF is striving to improve children's access to schools as well as promoting the fundamental rights of children. "We are trying to prevent child labour and the main idea is to promote education, and through education to realise the fundamental rights of children. Next year UNICEF starts a new five-year programme and we want to have more long-term projects for children," Gulsana Turusbekova, programme coordinator for UNICEF in Bishkek, said.

The official response to the problem is mixed. "I was shocked when I heard one government official remark that it is good that children work, because they are learning how to live. We need more information campaigns and we have to work with parents to change people's minds," Sagynbaeva said. [Source: IRIN]

Posted on 2004-07-28
ABUJA, 26 December 2003 (IRIN) - ABUJA, 26 December 2003 (IRIN) - More than 15 million Nigerian children under the age of 14 are working, mostly to help pay for the cost of going to school, according to a new survey by the Federal Office of Statistics (FOS).

The survey, conducted with support from the International Labour Organisation (ILO), showed that over eight million of the country's working children were also attending school. These children said they were forced to work part time in order to pay for their school fees and books. However, they admitted that the need to earn money often caused them to skip classes.

Head of the FOS, Ahmadu Umani, said on Tuesday that the survey showed there were 7.8 million boys and 7.2 million girls between the ages of five and 14 working in Nigeria. The country has an estimated population of more than 120 million.

The survey showed that about six million of the working children were not in school at all. Nearly one million of these had been forced to drop out due to poverty or because their parents demanded that they work in order to boost the family income. Of the six million children not attending school, 51 percent were girls and 49 percent were boys.

However, the survey found that more than eight million children were working and going to school at the same time. About 61 percent of working children were able to remain in school because they saved money from their work to pay for their education, it said.
However, many children in this category said they often skipped school because of the demands of work. “This indicates that working children lose valuable school days,” Umani said.

The survey found that working children in rural areas engaged in activities such as agriculture and hunting, while those in towns were often street traders or apprenticed to artisans. Most started working between the ages of five and nine and continued into adulthood.

The FOS chief said the report was intended to provide information that would be useful in designing “various government intervention programmes, or projects and policies on child labour”. He said there was urgent need to fight against child labour in Nigeria, not only by mounting a sustainable public information campaign, but also through policy measures.

Nigeria signed a memorandum of understanding with the ILO in 2000 for cooperation in implementing the International Protocol for Elimination of Child Labour. Subsequently, a national programme on the elimination of child labour was created. This set up a monitoring system to gather data on child labour practices in Nigeria.

This is known officially as the Statistical Information and Monitoring Programme on Child Labour. It is managed by the FOS and the conducted survey was just published. There is no legal minimum age for starting work in Nigeria, but the ILO recommends that children should be in school until the age of 14.
APPENDIX 3: A STORY OF AFGHANISTAN – CHILDREN WORK FULL-TIME WITHOUT GOING TO SCHOOL

AFGHANISTAN: Children work in brick factories to help pay off family debts

JALALABAD, 8 April 2008 (IRIN) - Over 2,200 children are working long hours in dozens of brick-making factories in Nangarhar Province, eastern Afghanistan, to pay off their families' debts, a survey by the Child Action Protection Network (CAPN), an Afghan body, has found.

Up to 90 percent of 2,298 children - boys and girls - who work in 38 brick-making factories in Sorkhrod District of Nangarhar Province do not go to school and are deprived of other means of education, said the survey conducted by a local non-government organisation (NGO), Wadan Afghanistan.

The survey which was completed in March and made available to IRIN in April has been endorsed by CAPN, a network of several government and non-governmental organisations involved in child protection and development efforts.

The UN Children's Fund (UNICEF) and other partner NGOs said efforts were under way to establish community-based schools and facilitate vocational training for children in Sorkhrod's brick-making community.

“Slaves”

Almost all of the 556 families that live in mud-huts and shacks around brick-making factories in Sorkhrod District said they owed large amounts of money to factory owners and a group of brick merchants who have employed them as wage labourers.

"Debt levels vary from 40,000 Afghanis [US$800] to 100,000 Afghanis [$2,000]," said Haji Hayat Khan, director of the department of labour and social affairs in Nangarhar Province, whose organisation is also a member of CAPN.

Many families not only find it difficult to pay-off their debts but also remain trapped in a cycle of unending debt due to high interest rates imposed by some lenders.
"Some families are in debt for many years," Hayat Khan told IRIN, adding that the only available option for families to survive was to work as "slaves" in factories.

Officials at the Ministry of Labour and Social Affairs in Kabul said the government would encourage NGOs and aid agencies to help indebted families pay off their debts through short- and long-term loan schemes.

"Obviously the government alone cannot pay all their debts," said Wasil Noor Mohmand, a deputy labour and social affairs minister.

**Broken bones**

In an effort to simultaneously pay-off debts and meet daily requirements almost all parents in Sorkhrod's brick-making community make their children work alongside them as wage labourers, the CAPN survey found.

"Children work 8-12 hours a day to help their parents meet their financial needs," said Mohammad Afzal, the head of Wadan Afghanistan in Nangarhar Province.

Children face various risks at work and some of them sustain serious injuries such as broken bones due to the heavy nature of the brick-making labour, child protection NGOs said.

Afghanistan is a signatory to the UN Convention on Children's Rights and other treaties which prohibit child labour, but the country's human rights watchdog said institutional mechanisms designed to translate formal commitments into appropriate action were absent.

APPENDIX 4: THE NECESSARY AND SUFFICIENT CONDITIONS FOR CHILD LABOR TO INCREASE HUMAN CAPITAL

1) Existence of the necessary condition: investing only a fraction $x$ of the school time endowment $T$ in education in the absence of work is a necessary condition for child labor to increase human capital because it gives rise to a non-school time ($T-x$) up to which a child can work to bring home additional income without harming her education.

School time endowment $T$ (e.g. 8 hours/day). Investment of $T$ in learning is a necessary condition to acquire all knowledge taught by school.

Necessary condition: Only a fraction $x$ of school time endowment $T$ is invested in education in the absence of work.

Not investing all school time endowment $T$ gives rise to non-school time ($T-x$). By working children can turn the non-school time ($T-x$) into income without harming their education.
2) Existence of the sufficient condition: *If the income effect dominates the substitution effect, then in the presence of work children will invest in education a fraction y > x, work T – y, and use child labor income to pay for more schooling (y-x) and more consumption.*

A fraction \( y > x \) will be invested in education in the *presence* of work.

In the *presence* of work, children work \( T - y \) hours and use this income to pay for more education and more consumption.

Gain in education due to child labor = \( y - x \)

3) The sufficient condition is *not met*: *If the substitution effect dominates the income effect, then in the presence of work children will invest a fraction z < x in education, work \( T - z \), and spend all child labor income exclusively on more consumption.*

A fraction \( z < x \) will be invested in education in the *presence* of work.

In the *presence* of work, children work \( T - z \) hours. All of this income is used to purchase more consumption.

Loss in education due to child labor = \( z - x \)
APPENDIX 5: PHOTOS OF COW TENDING

Picture 1: A Cow Provided by the Project
Picture 2: A Child in the Treatment and the Cow Provided by the Project
APPENDIX 6: AGE DISTRIBUTIONS OF CHILDREN UNDER 7 IN 2004

Age Distribution of Children under 7 in the Treatment Group in 2004

Age Distribution of Children under 7 in the Control Group in 2004
### APPENDIX 7: SURVEY FORMS OF THE COW PROJECT IN VIETNAM

#### SECTION 1: LIST OF CHILDREN AGED 6-18 IN THE HOUSEHOLD

<table>
<thead>
<tr>
<th>No.</th>
<th>Full name of all children aged 6 to 18 in the household</th>
<th>Sex: M: F:</th>
<th>Year of birth</th>
<th>Grade completed</th>
<th>Are you going to school in 2008?</th>
<th>Math score</th>
<th>Viet. score</th>
<th>Ranking (excellent, good, average, poor)</th>
<th>Math score</th>
<th>Viet. score</th>
<th>Ranking (excellent, good, average, poor)</th>
<th>Math score</th>
<th>Viet. score</th>
<th>Ranking (excellent, good, average, poor)</th>
<th>Math score</th>
<th>Viet. score</th>
<th>Distance from home to school</th>
<th>Grade completed by father (if never go to school, write 00)</th>
<th>Grade completed by mother (if never go to school, write 00)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 2a: Daily Allocation of Time in Number of Hours by Activities - BEFORE RECEIVING COW

<table>
<thead>
<tr>
<th>Full Name</th>
<th>During school year</th>
<th>During Summer</th>
<th>Average daily wage a child would earn if work outside for money</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>on average how many hours do you spend studying (including time spent at school)?</td>
<td>on average how many hours do you spend tending cow?</td>
<td>on average how many hours do you spend doing household chores (cleaning the house, cooking, washing clothes, fetching firewood, ...)?</td>
</tr>
<tr>
<td></td>
<td>on average how many hours do you work outside for money?</td>
<td>on average how many hours do you spend playing?</td>
<td>on average how many hours do you spend outside for money?</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SECTION 2b: Daily Allocation of Time in Number of Hours by Activities - AFTER RECEIVING COW

<table>
<thead>
<tr>
<th>Full Name</th>
<th>During school year</th>
<th>During Summer</th>
<th>Average daily wage a child would earn if work outside for money</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>on average how many hours do you spend studying (including time spent at school)?</td>
<td>on average how many hours do you spend doing household chores (cleaning the house, cooking, washing clothes, fetching fire wood,...)</td>
<td>on average how many hours do you spend doing household chores (cleaning the house, cooking, washing clothes, fetching fire wood,...)</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Section 3: Household Expenditure

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount of land owned by the household:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of people in the household:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Monthly Expenditure</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Of which:</strong></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td></td>
</tr>
<tr>
<td>Education (school fees, books, …)</td>
<td></td>
</tr>
<tr>
<td>Clothes for children</td>
<td></td>
</tr>
<tr>
<td>Other expenses for children (pocket money,….)</td>
<td></td>
</tr>
<tr>
<td>Clothes for adults</td>
<td></td>
</tr>
<tr>
<td>Tea, coffee, cigarettes</td>
<td></td>
</tr>
</tbody>
</table>