

INSIDE THE COCOA POD: AN ANALYSIS OF THE HARKIN-  
ENGEL PROTOCOL IN COTE D'IVOIRE

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# INSIDE THE COCOA POD: AN ANALYSIS OF THE HARKIN-ENGEL PROTOCOL IN COTE D'IVOIRE

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## ABSTRACT

In November of 2011, Senator Tom Harkin traveled to West Africa to evaluate the progress of child labor reduction efforts in the region. His trip coincided with the tenth anniversary of the signing of the Harkin-Engel Protocol, a commitment by the cocoa and chocolate industry, along with civil society groups, to eradicate the worst forms of child labor in the cocoa supply chain. Since the signing of that protocol, dozens of projects have been implemented in West Africa in efforts to make educational alternatives more accessible to families, sensitize the public to the negative effects of child labor, and reduce the worst forms of child labor. While some efforts have been made to analyze the effects of these projects, none have performed a rigorous, statistical analysis to investigate whether these programs have been effective. The effects of remediation projects in Cote d'Ivoire have been particularly unclear. This study uses data on over 2,500 children from regions in Cote d'Ivoire gathered by Tulane University in 2008 to test whether these projects have reduced the amount of child labor in cocoa growing regions and the amount of physical harm that children have endured as a result of their work on cocoa plantations. Results indicate that children's participation in a remediation project was associated with lower probabilities of working on a cocoa plantation. Children who participated in such projects also worked fewer hours in agriculture and had a lower probability of machete use. While these results are promising, remediation projects alone are insufficient in achieving widespread eradication of child labor in the cocoa sector.

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## **Section 1. Introduction**

Americans spend about \$13 billion per year on chocolate. Once a delicacy consumed by only the highest classes of society, today chocolate has become a staple food product for almost every major American holiday. Indeed, the chocolate business would hardly survive without the massive retail sales during Valentine's Day, Easter, Halloween, and many December holidays. However, over the past decade, consumers of chocolate have shown increasing interest in where their chocolate comes from.

In the mid 1990s, reports of child labor and child trafficking in the cocoa industry became public, triggering outcries from consumers and activists. Children were reportedly working long hours, being exposed to working hazards, and being prevented from receiving a formal education because of their work. In response to this issue, dozens of civil society groups and business partnerships have been formed to combat the problem. The reputations of many major chocolate brands have been damaged as consumers demand more transparency of company supply chains and an assurance that the chocolate they buy has not been made with child labor.

September 19, 2011, marked the 10th anniversary of the signing of the Harkin-Engel Protocol, an international agreement signed by the Chocolate Manufacturers Association (CMA) and the World Cocoa Foundation (WFC), which represent many of the largest chocolate brands in the world. The protocol, witnessed by U.S. Senator Tom Harkin (D-IA) and U.S. Representative Eliot Engel (D-NY), was a response to the concerns and demands of consumers, governments, and advocacy groups about the problems in the cocoa sector. By signing the protocol, the chocolate industry committed to address the "worst forms of child labor" in West Africa and eliminate any traces of this type of child labor in their own chocolate manufacturing supply chains (Harkin-Engel Protocol, 2001). Implementation of the programs outlined in the

protocol has been slow, and all of the target deadlines for significant progress have passed unmet.

Children who work in hazardous situations like those in cocoa fields suffer from long-term negative effects. In cocoa plantations, children are often emotionally and physically abused, and many have had lasting health defects from using pesticides on cocoa trees. On a national scale, widespread child labor stunts economic growth because work is substituted for school and educational attainment. As children are trapped in low-skilled labor through adulthood, poverty passes from generation to generation.

For decades, governments, chocolate companies, and civil society have debated about the best solutions to the child labor problem in the cocoa industry. One of the current strategies focuses on remediation programs. Remediation of child labor refers to the actions necessary to ensure the safety, health, education, and development of children who have been subjected to child labor (Mares, 2004). Remediation programs are considered successful when children are withdrawn from exploitative work as a result of a direct project intervention. According to the Department of Labor and Tulane University, children withdrawn from exploitative work in the cocoa industry are

“a) children who have been completely withdrawn from work, which is required by ILO Convention 182 for unconditional worst forms of child labor, and b) children who were involved in exploitative or hazardous work...or work that impedes their education...but who are no longer working under such conditions due to improved working conditions (i.e. fewer hours or safer workplaces) or because they have moved into another acceptable form of work. To be considered as withdrawn from exploitative child labor, each child must have benefited or be benefiting from services that are provided by projects funded by the international cocoa industry, the Governments of Cote d’Ivoire and Ghana, or organizations with whom they may be partnering in this effort.” (Tulane, 2007, p. 51)

Remediation projects have been in place for years but have not been rigorously tested in Cote d'Ivoire. With tens of millions of dollars being poured into the projects, it is important to understand their true effectiveness. This paper proposes a quantitative analysis of child labor in the cocoa sector in Cote d'Ivoire and the effects of the Harkin-Engel Protocol on the levels and characteristics of child labor in the country.

## **Section 2. Background**

While cocoa was discovered thousands of years ago in the Amazon basin, it has been several hundred years since Central and South America were the leading producers of the crop. West Africa now supplies 70 percent of the world's cocoa, and Cote d'Ivoire is the leading supplier, at 37 percent of world production (World Cocoa Foundation, 2011).

### **Cote d'Ivoire**

Once a prospering economy in Sub-Saharan Africa, since the mid-1990s Cote d'Ivoire has been stuck in a cycle of poverty and civil war. When Félix Houphouët-Boigny, the country's father of independence and president for over 30 years, died in December 1993, a new sense of xenophobia swept across the country. Ivorian citizens began to preach a doctrine called "Ivrité," which meant that no one but those of pure Ivorian blood should enjoy full civil rights (including land rights) in the country. Because a large portion of the farmers that worked on cocoa plantations were immigrants, or the children of immigrants, the xenophobia quickly escalated into a conflict over cocoa producing land. Groups fought for control over cocoa profits as a way to gain political power in the country (Off, 2006).

Conflict in the country continued for the next two decades. In early 2011, Cote d'Ivoire's president refused to resign from office after being defeated in what was internationally considered a free and fair election. As a result, an armed standoff between supporters of the new government and supporters of the old government killed as many as 3,000 people and sent tens of thousands of refugees fleeing into neighboring countries. While the most recent armed conflict

has subsided and the duly elected president has taken office, the process of rebuilding a damaged country and economy will take years, and maybe decades.

### **Child Labor on Cocoa Plantations**

In February, 2003, Cote d'Ivoire ratified the International Labor Organization's (ILO) Worst Forms of Child Labour Convention, Convention 182. The most basic definition of the worst forms of child labor (WFCL) is "[W]ork which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety or morals of children." A child is defined as any individual under the age of 18 (ILO, 1999).

Article 4 of the convention states that the types of work that are considered to harm the health, safety or morals of children are to be decided by national laws. In Cote d'Ivoire, national child labor laws prohibit the type of work that is typically performed on cocoa plantations. In March 2005, Cote d'Ivoire's Ministry of Public Service and Employment released a list of dangerous types of work that are forbidden to be performed by children under the age of 18 in all types of agriculture. This list includes: cutting of trees, burning of fields, application of chemicals (e.g., insecticides, herbicides, fungicides, etc.), application of chemical fertilizer, chemical treatment of fields/plants, and carrying of heavy loads.

Other laws in Cote d'Ivoire are similarly intended to protect children. The Ivorian Constitution prohibits forced labor and slavery (Cote d'Ivoire Constitution). The Government of Cote d'Ivoire expanded its laws on child labor when it adopted the Trafficking and Worst Forms of Child Labor Law, which prohibits debt bondage or servitude and the sale or trafficking of children. The penalty for submitting a child to forced labor or any form of bondage is 10 to 20 years' imprisonment and a fine (U.S. Department of Labor, 2011).

Despite the illegality of the worst forms of child labor, the abusive practice continues. The U.S. Department of State estimated in 2009 that there were more than 109,000 children working in Cote d'Ivoire's cocoa industry, and about 10 percent of those were victims of human trafficking or enslavement (U.S. Department of State, 2009).

Child labor in the cocoa industry mainly occurs at the plantation level, where cocoa trees are grown. The majority of cocoa trees (*Theobroma*) are grown on small, independent farms. Cocoa is harvested from cocoa pods, which grow on the trunk or main branches of the tree. Pods are removed from the cocoa tree with machetes or other steel tools, and are then split open with a hammer to reveal dozens of cream-colored beans. The beans are removed from the pod and laid out on grates for several days of fermentation and drying. When the beans have been dried, they are packed in sacks and picked up by *pisteurs*, or middlemen. After passing through several more intermediary links in the supply chain, they are taken to the country's ports to be exported and manufactured into a consumer product, such as chocolate, beauty products (products that contain cocoa butter), or candy bars (World Cocoa Foundation, 2011).

Children have reportedly been employed in each of the tasks described above, including long working hours that prevent them from attending school, using machetes and other dangerous tools to remove the pods from the trees and the beans from the pods, and carrying heavy loads of cocoa pods and sacks of cocoa beans. Reports have also found that children are exposed to dangerous chemicals, including pesticides and fertilizers, without protective equipment. Children are exposed to these chemicals either through spraying trees themselves or being present while the task is performed by an adult. The International Cocoa Initiative, using Cote d'Ivoire's national survey in 2008, reported that 53.2 percent of children living on cocoa

farms carried heavy loads, 8.4 percent sprayed fertilizers, 5.5 percent cut trees, and 4.6 percent sprayed pesticides.

A study by Tulane University in 2008 provides a more in-depth analysis of the typical work performed by children on cocoa fields. (See Table 1)

Table 1: Common Activities Performed by Children on Cocoa Fields

Activities Performed by Children On a Cocoa Farm (During the Last 12 Months)	Percent Reporting "Yes"
Gathering and heaping cocoa pods	70%
Land clearing	63%
Cocoa pod breaking and fermentation	54%
Weeding	45%
Plucking of cocoa pods (from trees)	38%
Drying cocoa beans	36%
Carting fermented cocoa beans	35%
Carting dry cocoa beans to shed	21%
Sowing a stake	20%

*Source: Tulane University Payson Center, 2008*

*Note: Percentages were calculated from 657 children who reported working on cocoa fields in the last 12 months*

Seventy percent of the children who reported working on cocoa fields gathered and heaped cocoa pods, which generally involves heavy lifting. Carting fermented and dried beans also involves heavy lifting. Land clearing, which either involves dangerous tools or fire, is typically very dangerous work.

Surveys and reports from plantations have found that most children are working on small family farms, but Cote d'Ivoire also has a long history of child trafficking and enslavement on cocoa farms. Children that are trafficked and sold into slavery have either been trafficked within the country or across the border from neighboring countries such as Mali, Ghana, and Burkina Faso (U.S. Department of Labor, 2011). In cases where children have been enslaved by plantation owners they are beaten for attempting to escape or not working hard enough. It is very

difficult to capture the real volume of trafficked and enslaved children on cocoa farms in Cote d'Ivoire because of the isolation of farmers and the secrecy that slaveholders employ, but the U.S. Department of State estimates that there are around 11,000 victims of human trafficking or enslavement in the country (U.S. Department of State, 2009).

According to a survey conducted by Tulane University, the mean age for starting work in agriculture was 8 years old. (See Table 2) A portion of the children were forced – either by relatives or nonrelatives – to perform work against their will, with sometimes very painful consequences.

Table 2: Survey Questions of Interest

Question	Total Respondents	Mean/ percent of total responding "yes"
How old were you when you started working in agriculture? (mean)	1,458	8 years old
In the last 12 months have you been forced to perform work against your will?	2,734	14%
What would happen if you refused work?		
Received insults/yelled at	370	86%
Beaten	370	46%
Denied food	370	12%
Punished	370	10%

*Source: Tulane University Payson Center, 2008*

### **The Harkin-Engel Protocol**

After hearing about the child labor problem in West Africa in 2001, U.S. Representative Engel (D-NY) proposed a labeling system for chocolate which would distinguish between cocoa products that had been made with child labor and those that had not. The bill that included this proposition received widespread approval from the U.S. House of Representatives. Chocolate companies, enraged at the proposition and surprised by the support for it, lobbied against the bill

in the U.S. Senate. After much negotiation and debate, U.S. Representatives and chocolate companies established a compromise which later became known as the Harkin-Engel Protocol.

When the Harkin-Engel Protocol was signed in 2001, the cocoa industry, along with governments, civil society, and labor unions, committed to address the worst forms of child labor and eliminate it from cocoa supply chains. The protocol outlined six key commitments to eliminating the worst forms of child labor in cocoa plantations. (See Exhibit 1) The first is titled *Public Statement of Need for and Terms of an Action Plan*. Under this article, the cocoa industry committed to acknowledge the problem publicly and contribute significant resources to address it. The second article committed the signatories to the *Formation of Multi-Sectoral Advisory Groups*. These advisory groups would be responsible for researching labor practices in West Africa and formulating appropriate remedies for the elimination of the worst forms of child labor in the sector. Third, stakeholders committed to a *Signed Joint Statement on Child Labor to Be Witnessed at the ILO*. The joint statement would recognize the need to end the worst forms of child labor in the cocoa sector and identify positive developmental alternatives for those children that are removed from work on cocoa plantations. Major stakeholders committed to establishing a *Memorandum of Cooperation*, the fourth article in the protocol. This memorandum would establish a joint action program of research, information exchange, and action to enforce international standards to eliminate the worst forms of child labor. In addition, the memorandum would create independent means of monitoring and public reporting on compliance with such standards. Article five of the protocol committed the industry to the *Establishment of [a] Joint Foundation*, which would engage in field projects for the purpose of eliminating the worst forms of child labor, and would also serve as a clearinghouse on best practices to solve the problem. The final article, entitled *Building Toward Credible Standards*, committed the cocoa industry, in

partnership with other stakeholders, to develop and implement industry-wide standards of public certification that cocoa products have been grown and/or processed without any of the worst forms of child labor (Harkin-Engel Protocol, 2001).

A report by Tulane University on the status of the Harkin-Engel Protocol presents a bleak picture for the fight against the worst forms of child labor. (See Exhibit 1)

Exhibit 1: Commitments of the Harkin-Engel Protocol

Article #	Harkin-Engel Protocol Deliverables	Goal Achieved?
1	a. Commit Significant resources b. Acknowledge problem	a. Insufficient b. Yes
2	Form Multi-Sectoral Advisory Group to: a. Research labor practices b. Formulate appropriate remedies	a. Yes, in part b. No
3	Issue Joint Statement recognizing the need to: a. End Worst Forms of Child Labor (WFCL), and b. Identify positive developmental alternatives for children removed from WFCL in the cocoa sector	a. Yes b. No
4	Sign binding Memorandum of Cooperation (MOC) among major stakeholders a. Research b. Information exchange c. Action to enforce the internationally recognized and mutually agreed standards d. Independent means of monitoring and public reporting on compliance with those standards	a. Yes b. Yes c. No d. No
5	Establish joint foundation to:	
	a. Execute field projects	a. Yes
	b. Serve as a clearinghouse on best practices to eliminate WFCL	b. No
6	Develop and implement credible, mutually acceptable, voluntary, industry-wide standards of public certification	No

Source: Tulane University. Final Report. 2011.

The cocoa industry counters that it has “invested more than \$75 million since 2001 to improve conditions...in both countries,” claiming major successes in the fight against child labor (ICVB 2010).

The Harkin-Engel Protocol outlines dozens of initiatives to which major stakeholders have committed, and several types of programs have been employed by industry, government, and civil society to combat the child labor problem in the cocoa industry. Some of the strategies used to fulfill these initiatives include community action plans, child labor monitoring systems, farmer field schools, and product certification. However, the bulk of this study will focus on education and remediation projects carried out by government agencies, industry, and/or civil society organization aimed at eliminating the worst forms of child labor. These types of projects fall under initiative five, part a: the commitment to “oversee and sustain efforts to eliminate the worst forms of child labor in the growing and processing of cocoa beans and their derivative products” through field projects.

The International Cocoa Initiative (ICI) is just one organization among many that attempts to address the child labor problem through field projects. The ICI was created out of the Harkin-Engel Protocol (article 5) and is a partnership between non-governmental organizations (NGOs), trade unions, and the chocolate industry. The foundation is funded by the chocolate industry, and it in turn funds Ivorian organizations’ projects to support children in the cocoa growing areas. Projects that are funded by the ICI fall under four categories: community sensitization, training activities, radio programs, and micro-projects. Community sensitization projects are aimed at educating farmers, children, and families about abusive labor practices and the hazards that children can suffer while working on cocoa farms. The ICI is currently working with 14 local organizations to implement these types of projects. Training activities are intended

to educate and train key local people from civil society organizations, as well as the private sector, about the negative effects of child labor. Radio programs serve the same purpose as community sensitization efforts, though this has not been an ongoing project. Finally, the ICI defines micro-projects as “small, independent projects that support community efforts to improve schools, education materials, and water pumps” (ICI, 2011) to make alternatives to work more attractive and feasible for children. Many other organizations and governments, including the World Cocoa Foundation, the government of Cote d’Ivoire, and several small nonprofit organizations have engaged in similar remediation activities.

### Section 3. Literature Review

Program evaluations have been conducted for child labor reduction programs all over the world. Strategies for reducing child labor vary, but most programs focus on conditional cash transfers (or other income-subsidizing methods) and campaigns to raise awareness about the negative effects of child labor.

Income-subsidizing programs are used as a means for reducing child labor because it is assumed that in most cases children work because their parents are poor, not because parents are indifferent toward their children's welfare. This assumption is described by Baland and Robinson (2000), who demonstrate theoretically that credit-constrained households will choose inefficiently high levels of child labor, and that as household income increases, the incidence of child labor falls.

The *Programa de Erradicacao do Trabalho Infantil* (PETI) in Brazil created an after-school program which doubled the length of the school day and provided an income subsidy to participating low-income households. Yap, et al. (2001) found that the PETI program increased academic performance and reduced the incidence of child labor in participating households. Ravallion and Wodon (1999) studied the substitutability of children's work and schooling, finding that in Bangladesh a stipend with a value considerably less than the mean child wage was enough to ensure nearly full school attendance among participants in a food-for-education program. The *Red de Protección Social* program in Nicaragua and the *Bono de Desarrollo Humano* program in Ecuador were similarly found to be effective at substantially reducing child labor through conditional cash transfers (Maluccio 2003; Edmonds, et al. 2011). These studies

provide evidence that subsidizing education may be a means for reducing incidences of child labor.

Andisha, et al. (2009) evaluated a child labor reduction program in Panama that closely resembles the programs implemented in West Africa. Programs included not only a scholarship program (similar to a conditional cash transfer), but also a national awareness campaign, a teacher training program, and income generation or vocational training activities. The overarching goal of these programs was to reduce the number of children working in agriculture by increasing elementary school completion rates through more than just an income subsidy. Using a mean differences analysis, comparing a post-intervention treatment group with a comparison group without access to the programs, Andisha, et al. found that the program produced a significant reduction in child labor in the region.

The Harkin-Engel Protocol programs similarly seek to eliminate child labor through better educational opportunities and awareness campaigns. Several attempts have been made to evaluate the achievements of the programs, but none have included a statistical analysis. Several of ICI's implementing partners have reported results of their programs (but not the methodology used to achieve those results). One implementing partner, an organization named CARITAS, reviewed the impact of its project in seven communities and reported that some of the worst forms of child labor had been reduced. The report indicated that the number of children using machetes on cocoa plantations was reduced by 19 percent, the number of children involved directly in spraying activities (i.e., pesticides and fertilizers) was reduced by 26.2 percent, and the number of children carrying heavy loads was reduced by almost 34 percent. Other implementing agencies have similarly reported reductions in the worst forms of child labor as

well as higher school attendance rates, claiming they result from the construction and rehabilitation of schools and classrooms.

Reports of success are promising, but no information is provided about the methodology of their analyses, and it is difficult to ascertain whether the results are accurate, robust or generalizable. Implementing agencies are directly funded by chocolate companies, which may make them nonobjective evaluators of their own programs.

Remediation programs are in need of a comprehensive review, studying the associations between participation in programs and the worst forms of child labor. More specifically, does participating in a child labor remediation program reduce the probability that a child will work under exploitative conditions, as defined by ILO Convention 182?

## Section 4. Methodology

### Data

The dataset for this study comes from Tulane University's Payson Center for International Development and Technology Transfer. The Department of Labor contracted with Tulane University to oversee public and private initiatives to eliminate the worst forms of child labor and to assess progress made to implement the Harkin-Engel Protocol. From November 2008 through January 2009 (which coincides with the main cocoa harvest), Tulane University conducted a survey of child labor in the cocoa growing areas of Cote d'Ivoire. Because of time and money constraints, the survey was conducted using a stratified two-stage cluster sampling method. First, the country was separated into four strata. Stratum one was for high cocoa producing districts, stratum two was for medium cocoa producing districts, stratum three was for low cocoa producing districts, and stratum four was for districts with no cocoa production. Forty census districts were selected from strata 1-3, each with an equal probability of being chosen, and ten census districts from stratum four were selected, for a total of 50 census districts.

In the second stage of cluster sampling, a minimum of 20 agricultural households per cluster (or district) were selected with equal probability. Once households were chosen, four different surveys were conducted within the household: a household interview (covering all members of the household), a head of household interview, an adult worker interview, and a child interview. For the purposes of this study, only the child interviews are included in the data. Children of the household were interviewed if they were between ages 5 and 17. The child interview dataset includes information on 2,734 children living in agricultural households.

There are several limitations inherent in this survey and the resulting data. Borgers, Eleeu, and Hox (2000) have identified some of the problems with surveying children. First, children do not always understand the question sufficiently to provide an accurate answer. Second, retrieving relevant information (such as the number of hours they worked in the last seven days) may be difficult for many children. Third, formatting their answer, either by choosing an appropriate category or describing a situation or experience is more difficult for a child than for an adult.

There are other limitations in administering a survey in Cote d'Ivoire, resulting from the complexities of the country and the nature of child labor. First, there is difficulty in capturing the presence of child trafficking on a cocoa plantation. It is often hard to draw a distinction between child trafficking and other forms of migration, such as a child moving to live with a relative or a family friend with parental consent. Furthermore, cases in which the child has been enslaved on a plantation could be intentionally concealed from the individual conducting the survey. Second, plantations in which child trafficking is used are likely to be inaccessible to both researchers and implementers of ICI projects. Many plantations that have enslaved children are in remote areas and slaveholders often refuse to speak with outsiders or allow the children working on their plantations to talk to anyone.

There is also a limitation in the data that were made publicly available. Stratum four, which includes households with no cocoa production, is included in the dataset without an identifier to indicate to which stratum the household belonged. Therefore, children who had a very low probability of ever being exposed to remediation projects targeted towards cocoa growing regions are included in the study. The inclusion of stratum four in the data should only

pose a problem if no significant results are found, as the measurement error is likely to result in less significant results.

It is worth noting that the data gathered by Tulane University was never meant to be used to evaluate the effectiveness of remediation programs. Researchers at Tulane point out that only a long-term longitudinal information and evaluation system with known baseline values could effectively evaluate the impact of the programs (Tulane, 2007). While it is true that a snapshot survey has severe limitations, a preliminary impact analysis remains useful.

### **Project Participation and Dependent Variables**

The main variable of interest in each model is a dummy variable indicating whether the child has participated in an educational or rehabilitation program. Some of the projects that children were exposed to included renovation of a school or health center, education about child labor (either to the child or the family), vaccinations, and distribution of educational materials.

One of the limitations in using a survey question to determine participation is that many children may have been exposed to projects without knowing about it. Furthermore, this variable does not differentiate between projects funded by the International Cocoa Initiative, the World Cocoa Foundation, or individual actors, meaning that the results of this study have no implications for which programs are more effective than others. However, using a survey with simple questions may be the only economical and timely way to capture participation among children.

Several models are used to test whether educational and remediation projects in Cote d'Ivoire have been effective in their goal of reducing the presence of the worst forms of child labor in cocoa supply chains. Each model contains a different dependent variable measuring

some characteristic of work. (See Exhibit 2) The models will test whether the main independent variable, participation in an educational or remediation project, has an effect on work or working characteristics.

Exhibit 2: Descriptions of Dependent Variables

	Variable Name	Variable Description
Y <sub>1</sub>	Cocoa Work	Child worked on a cocoa farm during the last 7 days
Y <sub>2</sub>	Agricultural Work	Child worked in agriculture during the last 7 days
Y <sub>3</sub>	Agricultural Working Hours	Number of hours child worked in agriculture per day (averaged over the previous 7 days)
Y <sub>4</sub>	Exposed to Injury	Child was injured while working in agriculture in the last 12 months
Y <sub>5</sub>	Machete Use	Child used a machete while working in agriculture in the last 12 months
Y <sub>6</sub>	Carried Heavy Loads	Child carried heavy loads as a part of agricultural work in the last 12 months
Y <sub>7</sub>	Exposed to Dangerous Substances	Child was exposed to smoke, flames, dust or chemicals while working in agriculture in the last 12 months

First, a dummy variable is created to indicate whether a child works on a cocoa farm in the country. This variable is defined by a survey question that asks if the child had worked for at least one hour on a cocoa farm during the seven days prior to the interview.

An additional dummy variable will measure the presence of child labor in agriculture as a whole. This variable is measured in the same way as the variable for cocoa work: a child is asked whether he/she has worked at least one hour in agriculture during the last seven days. This secondary variable is important because very few children participating in the survey had worked on a cocoa plantation *and* participated in a project. The lack of variance could pose problems for

significance. Using agricultural work as an independent variable also contains some additional benefits. First, cocoa is grown in a mixed crop agriculture environment, so children are often working on many different crops throughout their week and sometimes do not know if their work has to do with cocoa or not. Second, while the program is targeted to the cocoa sector, programs intended to reduce the worst forms of child labor on cocoa plantations may have spillover effects in other areas of the agricultural sector.

It is possible that remediation projects do not reduce the presence of child labor, but rather reduce the number of hours that children work, allowing more time for children to attend school even if the child does some work in the field. For this purpose, a continuous variable will be used to test whether there is a relationship between participation in projects and the number of hours that a child works in agriculture. To obtain the most accurate and unbiased estimate of a child's working hours, an average is taken from the daily working hours of the seven days prior to the interview.

Finally, it is important to test the projects' effectiveness on the nature of child labor in agriculture. The official goal of the Harkin-Engel Protocol is to reduce "the worst forms of child labor," which includes any work performed by children that is dangerous in nature. To test whether the dangers of agricultural work have been reduced among children who were exposed to remediation projects, a dummy variable is used to indicate whether a child was injured and three dummy variables are used to indicate whether a child was involved in dangerous work.

First, a dummy variable is created to indicate whether a child was injured as a result of his or her work in agriculture. In addition, three variables are used to represent dangerous work. The three indicators include machete use, carrying heavy loads, and exposure to dangerous substances (e.g., smoke, flames, dust, or chemicals). While many different types of hazardous

work could be tested, machete use, the carrying of heavy loads, and exposure to hazardous substances were chosen because they represent the most common and the most hazardous types of work in cocoa. Furthermore, according to Ivorian law, these three forms of hazardous work are included in the list of banned activities for individuals under the age of 18.

Table 3 below displays summary statistics for each of these dependent variables. While the survey was conducted in cocoa growing regions, few children reported having worked on a cocoa farm, in comparison to the number of children who reported having worked in agriculture. Injuries and working hazards are very prevalent among children in agriculture. Taken together, 93 percent of the children who answered questions about working hazards reported being involved in at least one of the three hazards used in this study: machete use, carrying heavy loads, and exposure to hazardous substances.

Table 3: Descriptive Statistics for Dependent Variables

Dummies for Work	Total responding	Number reporting yes	Percent of total
Worked on a cocoa farm during the last 7 days	2,734	397	14.5%
Worked in agriculture during the last 7 days	2,734	1,105	40.4%
Working Hours for Children	Total responding	Mean	% of total
Daily working hours in agriculture	2,201	.78	NA
Daily working hours in agriculture (non-zero)	2,201	2.2	NA
Daily working hours on cocoa farms	2,201	2.5	NA
Working Hazards in Agriculture	Total responding	# reporting yes	% of total
Exposed to injury while working in agriculture*	1,556	1,065	68.4%
Engaged in the following types of hazardous work while working in agriculture:			
using a machete	1,555	1,110	71.4%
carrying heavy loads**	1,555	977	62.8%
exposed to dangerous substances***	1,546	836	54.1%

Notes: A child is defined as an individual between the ages of 5 and 17 years

\*Injuries include: wounds or cuts, broken bones, snake bites, insect bites, back pains, muscle pains, other pains, burns by fire or sun, skin itchiness or scratches, injuries from dangerous tools, or other injuries

\*\*Heavy loads include: carrying water, wood, cocoa pods, cocoa beans, or other loads

\*\*\*Dangerous substances refers to: dust or dangerous fumes; fire, gas or flames; pesticides, herbicides or insecticides

Bivariate correlation associations of project participation and each dependent variable show mixed results. Children who participated in a project were disproportionately less likely to work in cocoa than those who did not participate. However, there was virtually no difference between the frequency of children working in agriculture for children who participated in a child labor-reduction project and those who did not. (See Table 4)

Table 4 Correlations Between Children’s Work and Project Participation

Worked in the Last 7 Days	Participated in a Project		
	Total	Yes (%)	No (%)
Worked in Cocoa	100 (364)	.5	99.5
Did Not Work in Cocoa	100 (2,097)	3.8	96.2
Total	100 (2,461)	3.3	96.7
Worked in Agriculture	100 (1,031)	3.3	96.7
Did Not Work in Agriculture	100 (1,430)	3.3	96.7
Total	100 (2,461)	3.3	96.7

*Note: Frequency totals are reported in parentheses under percent totals.*

Children who participated in a project worked disproportionately fewer hours in agriculture than those who did not participate, providing evidence that remediation programs reduce the number of hours that a child works. (See Table 5)

Table 5: Children’s Mean Working Hours in Agriculture by Project Participation Status

Variable	Participated in a Project		
	Overall	Yes	No
Agriculture	.78	.10	.83
Agriculture (non-zero values only)	2.2	.85	2.2

*Note: Mean hours are averaged over the seven day period prior to the survey.*

A simple analysis of the worst forms of child labor (i.e., injury and participation in hazardous work) shows that a disproportionate 4.8 percent of children who participated in a project did not use a machete, compared to 3 percent who did. Likewise, a disproportionate 4.1 percent of children who participated in a project did not carry heavy loads, compared to 3.1 percent who did. However, a disproportionately higher number of children who participated in projects were injured and exposed to hazardous substances. (See Table 6)

Table 6: Correlations Between Children’s Injuries/Working Hazards and Project Participation

Working Hazards	Participated in a project		
	Total	Yes (%)	No (%)
Experienced injury	100 (1,023)	3.6	96.4
Did not experience injury	100 (440)	3.2	96.8
Total	100 (1,463)	3.5	96.5
Used a machete	100 (1,043)	3	97
Did not use a machete	100 (419)	4.8	95.2
Total	100 (1,462)	3.5	96.5
Carried heavy loads	100 (928)	3.1	96.9
Did not carry heavy loads	100 (534)	4.1	95.9
Total	100 (1,462)	3.5	96.5
Exposed to hazardous substances (dust, flames, chemicals)	100 (650)	4.1	95.9
Not exposed to hazardous substances	100 (807)	2.8	97.2
Total	100 (1,457)	3.5	96.5

*Note: Frequency totals are reported in parentheses under percent totals.*

### Explanatory Variables

To obtain a more accurate model, other variables are necessary to control for variances in child labor and working characteristics not caused by participation in a remediation program.

**Gender.** Evidence from multiple studies and surveys show that boys are more likely to engage in work on cocoa plantations than girls (Lange, 2009; Patrinos and Psacharopoulos, 1995). In the rural areas of many developing countries, boys are expected to work in agricultural settings,

while girls tend to do work that relates to the home. It is expected that being male will be positively related to the probability that a child works in agriculture or cocoa and that working hours will be longer for males. Furthermore, because working hazards are more common in agriculture than in housework, it is expected that there will be a positive relationship between being male and encountering working hazards.

**Age.** Because of the difficulty in some of the tasks on cocoa farms (e.g., using machetes, carrying heavy loads), it is more likely that older children will be more involved in work on cocoa farms than younger children. To mask some of the identifying information about the children surveyed for privacy purposes, these data have been transformed into a set of three dummy variables so that children are grouped into age brackets. The three age brackets are: 5 to 11 years, 12 to 14 years, and 15 to 17 years.

**School Attendance.** A child's attendance at a school is a critical variable for this study, as it has been known to be negatively related to child labor in previous studies. For this study, school attendance is measured by a dummy variable which indicates whether or not the child attended school during the year that the survey was given. The question asked was, "Have you attended school or preschool in the last 12 months?" This may seem like a weak measure of school attendance since a child could respond in the affirmative even if he/she went to school for only one day. However, of the children who reported that they attended school, very few reported that they missed more than 10 days of school over the year.

**Religion.** Culture and religion have been found to be partial determinants of the presence of child labor in a community. Some authors have found evidence that certain religions are associated with fewer incidences of child labor than others. Canagarajah and Coulombe (1997) found fewer instances of child labor in Christian religions than in non-Christian religions in Ghana.

**Child Expenditures and Living on a Family Farm.** In a typical labor supply model, variables are included that account for both the income effect (i.e., family wealth) and substitution effect (i.e., child's wages) for work-leisure (or in the case of children, education) choices. In the case of the market for child labor, it is expected that as wages rise, the demand for school and leisure decreases, a child's labor becomes more valuable, and the demand for child labor rises (i.e., the substitution effect dominates). However, when a family owns a lot of assets, the children's labor decreases in value and education becomes more affordable. This income effect results in a decline of child labor (Kruger, 2007). Two proxy variables have been chosen to represent these effects: child expenditures and a dummy variable for whether the child lives with his/her immediate family on a farm.

One option for measuring the substitution effect is to use the compensation that a child receives for his or her work. However, most children are not actually paid for their labor (either because they work on family farms or they are paid in-kind), so using wages would not achieve accurate results. Moreover, children are not their own free agents, meaning that the choice of work over leisure or education is predominantly determined by the parents.

The best proxy available for wages is the amount of money the child spent the previous day. Whether the child is spending the money on behalf of the family or on his/her own behalf, it

can be used as a measure of the wage income of the family. It is expected that a higher amount of child expenditures is associated with a higher probability of work.

Family wealth, an indicator for the income effect, is typically measured by a family's non-wage wealth (i.e. assets). However, because this information is not available, the best proxy available is an indicator for whether the child lives with his or her family. In Cote d'Ivoire, much of the child labor that occurs on cocoa plantations happens on family farms. However, when a family is very poor, the parents will often send their child to work for a distant relative or for an unrelated employer. However, if a family has a substantial amount of permanent wealth, they can afford to keep their children in the household. The variable used for this indicator is a dummy variable for whether the child lives with his/her parents or grandparents. It is expected that this variable will be negatively associated with child labor. Living on a family farm is predicted to be related to fewer hazardous work conditions, as the parents are more concerned and invested in their child's health and safety.

Exhibit 3 below provides a summary of all independent variables, their hypothesized relationships, and the justification for including them in the models.

Exhibit 3: Variables and Hypothesized Relationships

	Variable	Expected Relationship to Dependent Variables	Justification
X <sub>1</sub>	Exposed to project activities	Negative	Hypothesis
X <sub>2</sub>	Female	Positive	Lange, 2009; Andisha, et al., 2009; Patrinos and Psacharopoulos, 1995
X <sub>3</sub> – X <sub>4</sub>	Age Brackets	Positive	Off, 2006; Andisha, et al., 2009
X <sub>5</sub>	Child attended school in the last year	Negative	Andisha, et al., 2009; Jensen and Nielsen, 1997
X <sub>6</sub> X <sub>7</sub>	Religion: Muslim Other	Positive Positive	Canagarajah and Coulombe, 1997
X <sub>8</sub>	Amount of money child spent the previous day	Positive	Baland and Robinson, 2000; Montgomery, 1999; Basu, 1998
X <sub>9</sub>	Child Lives on a Family Farm	Negative	Kruger, 2007

Notes: Reference categories are “Christian” (religion), “Male” (gender), and 15 to 17 year olds (age bracket).

## Hypotheses

This study will test seven different hypotheses, requiring six logit regressions and one tobit regression. The logit regression approach is used when the dependent variable takes on a value of zero or one. The tobit regression is used for the model testing for changes in working hours because of the concentration of observations at zero hours. The following is a list of all of the hypotheses and the models used to test them.

*Hypothesis 1:* There is a negative relationship between participation in Harkin-Engel Protocol programs and the probability that a child worked in cocoa during the last seven days.

*Model 1:*  $Y_1 = B_0 + B_1X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + B_9X_9 + \varepsilon$

*Hypothesis 2:* There is a negative relationship between participation in Harkin-Engel Protocol programs and the probability that a child works in agriculture.

$$\text{Model 2: } Y_2 = B_0 + B_1X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + B_9X_9 + \varepsilon$$

*Hypothesis 3:* There is a negative relationship between participation in Harkin-Engel Protocol programs and the number of hours that a child works in agriculture.

$$\text{Model 3: } Y_3 = B_0 + B_1X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + B_9X_9 + \varepsilon$$

*Hypothesis 4:* There is a negative relationship between participation in Harkin-Engel Protocol programs and being injured while working in agriculture.

$$\text{Model 4: } Y_4 = B_0 + B_1X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + B_9X_9 + \varepsilon$$

*Hypothesis 5:* There is a negative relationship between participation in Harkin-Engel Protocol programs and machete use while working in agriculture.

$$\text{Model 5: } Y_5 = B_0 + B_1X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + B_9X_9 + \varepsilon$$

*Hypothesis 6:* There is a negative relationship between participation in Harkin-Engel Protocol programs and carrying heavy loads while working in agriculture.

$$\text{Model 6: } Y_6 = B_0 + B_1X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + B_9X_9 + \varepsilon$$

*Hypothesis 7:* There is a negative relationship between participation in Harkin-Engel Protocol programs and being exposed to hazardous substances while working in agriculture.

$$\text{Model 7: } Y_7 = B_0 + B_1X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + B_9X_9 + \varepsilon$$

Descriptive statistics for the main variable of interest and the control variables show that only about 3 percent of the children surveyed actually participated in a project. (See Table 7)

Table 7: Descriptive Statistics for Independent Variables

Variable	Number Responding "Yes"	Percent of Total
Exposed to project activities	81	2.96%
Female	1,245	45.54%
Age Brackets:		
5-11	1,714	62.69%
12-14	519	18.98%
15-17	501	18.32%
Child attended school in the last year	1304	54.9%
Religion:		
Christian	1,260	46%
Muslim	1,016	37.2%
Other	458	16.8%
Amount of money spent the previous day (mean)	196.84 (CFA)	NA
Child lives on a family farm	2,341	85.6%

*Notes:* Total number of children surveyed: 2,734, except in the case of children's spending, in which only 2294 gave answers. CFA is the currency of Cote d'Ivoire. In April 2012, 1 USD  $\approx$  500 CFA francs.

The lack of substantial variation in the main independent variable of project participation may cause problems in finding significant or accurate results between child labor and project participation. Descriptive statistics of the other control variables also provide interesting information. Only about half of the children surveyed attended school. This is nearly consistent with the primary school participation net enrollment ratio of the country overall, despite the overwhelmingly rural population being surveyed. In Cote d'Ivoire, UNICEF (2010) estimated that 62 percent of males were enrolled in school between 2007 and 2010, compared to 52 percent of females. UNICEF also estimated that 32 percent of males attended secondary school between 2007 and 2010, while only 22 percent of females attended.

Descriptive statistics also show that the majority of the children surveyed were very young – between the ages of five and eleven – and most lived with their parents or grandparents. The average amount of money that a child spent on the day before being surveyed was approximately 197 CFA francs, which is about 40 cents in U.S. dollars.

## Section 5. Results

According to the results, project participation was found to be statistically related to child work and several working characteristics. Tables 8 and 9 report regression results for all seven hypotheses and predicted probabilities for the logit models are presented in Table 11.

A negative relationship was found between participation in a child labor reduction project and the probability that a child will work on a cocoa farm (model 1). Children who were exposed to project activities had a .03 probability of working on a cocoa farm, whereas children who were not exposed to project activities had a .15 probability of working on a cocoa farm. (See Table 11)

Participation in a project was also associated with fewer working hours in agriculture (model 3). Participating in a project was associated with a decrease in working hours of 48 minutes per day.<sup>1</sup> This effect is quite large considering the average number of working hours for children who worked was only 2.2 hours.

Project participation was statistically significantly related to a lower probability of a child using a machete while working in agriculture, supporting the hypothesis (model 5). Many of the organizations that have worked toward preventing the worst forms of child labor have focused on educating communities about machete use, and it appears that their efforts have been successful.

Model (7), however, while statistically significant, demonstrates results in the opposite direction than was hypothesized. Project participation was associated with a higher, not lower, chance of exposure to hazardous substances. Children who participated in programs were found to have a .70 probability of exposure to dangerous substances, while children who did not

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<sup>1</sup> The coefficient (-2.15) is multiplied by the proportion of non-limit observations in the model. In this case, there were 584 non-zero observations out of a total of 1560 observations, for a proportion that equals .374. The product of these two numbers is -.8, or 48 minutes.

participate in programs had a .56 probability of exposure. (See Table 11) Perhaps the programs were well-targeted toward areas with high incidences of child exposure to dangerous substances, resulting in a higher likelihood of program participation among those exposed.

The results do not show a statistical relationship between project participation and the probability of a child working in agriculture (model 2). The distribution of children who worked in agriculture is the same for program participants and non-participants. It does not appear that the remediation programs were targeted toward the entire agricultural sector or that there were any spillover effects from the projects in the cocoa sector.

The lack of significance in the relationship between project participation and injuries while working in agriculture (model 4) and carrying heavy loads (model 6) is a result of one of two problems: either the programs are not working well in their efforts to reduce injuries and the carrying of heavy loads, or the programs have not reached enough children to provide statistically significant results. Given that only about 3 percent of children surveyed reported participating in a project, a more comprehensive survey is needed to understand the true effect of the projects on those models.<sup>2</sup>

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<sup>2</sup> Diagnostics were performed on the seven models to test for multicollinearity and model specification errors. Heteroskedasticity tests are not typically performed in Logit models or Tobit models. No multicollinearity was found. For model specification tests, there were almost no issues found in the Logit models except for in model 2, where specification issues could have led to biased results. Tobit models do not allow for model specification testing. See Appendix 1 for tables and more information.

Table 8: Logit Regression Results for Hypotheses 1-2 and 4-7

Regressor	(1) Work in Cocoa	(2) Work in Agriculture	(4) Injuries While Working in Agriculture	(5) Machete Use	(6) Carrying Heavy Loads	(7) Exposure to Hazardous Substances
<i>Participation in a project</i>	-1.832** (-2.52)	-.068 (-.25)	.397 (1)	-.955*** (-2.64)	-.456 (-1.38)	.625* (1.77)
<i>Female</i>	-.742*** (-5.44)	-.296*** (-3.04)	-.129 (-.96)	-.861*** (-6.18)	.052 (.42)	.007 (.06)
<i>Age bracket: 5 to 11 year olds</i>	-.691 (-4.19)	-.902*** (-7.00)	.198 (1.17)	-.901*** (-4.87)	-.245 (-1.54)	.155 (.99)
<i>Age bracket: 12 to 14 year olds</i>	-.114 (-.61)	-.002 (-.01)	.694*** (3.45)	-.199 (-.09)	.026 (.15)	0.11 (.63)
<i>Attended school in the last year</i>	-.219 (-1.63)	-.573*** (-5.63)	-.428*** (-2.95)	.539*** (3.66)	-.253* (-1.91)	-.507*** (-3.90)
<i>Muslim</i>	-.044 (-.3)	.467*** (4.31)	.678*** (4.42)	-.397** (-2.49)	-.206 (-1.49)	.727*** (5.3)
<i>Other</i>	.246 (1.33)	.439*** (3.02)	.492** (2.42)	-.136 (-.65)	.098 (.52)	.467*** (2.6)
<i>Child expenditures in one day</i>	.00009 (.21)	-.0003 (-.85)	.002*** (3.03)	.002*** (2.59)	.0002 (0.49)	-.00005 (-.11)
<i>Child works on a family farm</i>	.337 (1.76)	-0.005 (-.04)	-.254 (-1.34)	-.513** (-2.47)	.141 (.84)	-.089 (-.53)
<i>Constant</i>	-1.164*** (-4.97)	.434** (2.4)	.734*** (3.02)	2.145*** (7.60)	.764*** (3.4)	.11 (.51)
<b>Regression Summary Statistics</b>						
<i>Pseudo R<sup>2</sup></i>	.045	.065	.041	.093	.011	.037
<i>Chi<sup>2</sup> statistic</i>	77.42	173.49***	56.46***	128.90***	17.06*	58.96***
<i>N</i>	1967	1967	1177	1176	1176	1174

Note: Z scores are in parentheses below coefficients.

Reference categories are: Age bracket: 15- to 17- year-olds, Religion: Christian, Gender: Male.

A \*\*\* denotes significance at a .01 p-level, \*\* at a .05 level, and \* at a .10 level.

Table 9: Tobit Regression Results for Hypothesis 3

<b>Regressor</b>	<b>(3) Hours Worked in One Day</b>
<i>Participation in a project</i>	-2.149** (-2.53)
<i>Female</i>	-.646*** (-3.62)
<i>Age bracket: 5 to 11 year olds</i>	-2.188*** (-9.09)
<i>Age bracket: 12 to 14 year olds</i>	-.436 (-1.58)
<i>Attended school in the last year</i>	-1.222*** (-6.55)
<i>Muslim</i>	.111 (.55)
<i>Other</i>	.216 (.83)
<i>Child expenditures in one day</i>	-.0001 (-.22)
<i>Child works on a family farm</i>	.103 (.42)
<i>Constant</i>	1.464*** (4.64)
<b>Regression Summary Statistics</b>	
<i>Pseudo R<sup>2</sup></i>	.049
<i>Chi<sup>2</sup> statistic</i>	202.82***
<i>N</i>	1560

Note: T statistics are in parentheses below coefficients. Reference categories are: Age bracket: 15- to 17-year-olds, Religion: Christian, and Gender: Male  
A \*\*\* denotes significance at a .01 p-level, \*\* at a .05 level, and \* at a .10 level.

Table 10: Predicted Probabilities for all Binary Dependent Variables

Variable	Worked on a Cocoa Farm	Worked in Agriculture	Injured While Working in Agriculture	Machete Use	Carried Heavy Loads	Exposed to Dangerous Substances
Model Number	(1)	(2)	(4)	(5)	(6)	(7)
Entire Model	0.14	0.41	0.73	0.75	0.64	0.56
Participation in a project						
Yes	0.03	0.39	0.80	0.54	0.54	0.70
No	0.15	0.41	0.73	0.76	0.65	0.56
Gender						
Female	0.10	0.37	0.72	0.65	0.65	0.56
Male	0.19	0.44	0.74	0.81	0.64	0.56
Age						
5-11	0.11	0.33	0.75	0.65	0.61	0.58
12-14	0.13	0.41	0.82	0.72	0.65	0.58
15-17	0.20	0.54	0.68	0.83	0.67	0.54
School Attendance						
Yes	0.13	0.35	0.69	0.79	0.62	0.51
No	0.16	0.49	0.78	0.69	0.67	0.63
Religion						
Christian	0.14	0.35	0.66	0.78	0.66	0.47
Muslim	0.14	0.48	0.80	0.70	0.61	0.66
Other	0.17	0.50	0.81	0.73	0.67	0.66
Expenditures (at the mean)	0.14	0.41	0.73	0.75	0.64	0.56
Family Farm						
Yes	0.14	.41	.77	.73	.65	.56
No	0.11	.41	.72	.82	.61	.58

Other independent variables in each model had varying levels of significance. Models (1) and (2) showed that gender was an important factor for determining whether a child participated in cocoa work or agricultural work in the last seven days. It was also an important factor in model (3), where working hours varied by gender, and model (5), where machete use varied by gender. In each case, being female was associated with a lower probability of working, fewer working hours, and lower probability of using a machete. This finding is consistent with the

literature on gender in child labor, where boys are more likely to engage in agricultural work than girls (Andisha, et al., 2009; Patrinos and Psacharopoulos, 1995).

A few of the models showed significant differences in working characteristics and age. Younger children were less likely to work and use machetes, and were likely to work fewer hours than older children. This result is consistent with previous studies that show an increase in probability and amount of work with age (Andisha, et al. 2009).

Twelve- to fourteen-year-olds are significantly different from older children in the category of injuries. According to model (3), 12- to 14-year-olds were more likely to be injured than older children. Perhaps employers felt that these children were old enough to handle tools more safely than younger children, but they were not.

In general, school attendance was negatively correlated with working and the working characteristics of children. Children who attend school were likely to work fewer hours, and they were less likely to work in agriculture, carry heavy loads, be injured while working or be exposed to hazardous substances. The significant results are consistent with past literature (Andisha, et al. 2009). However, model (5) shows a relationship that is inconsistent with the other models. Children's school attendance was associated with a *higher* probability of machete use, not a lower probability. It is difficult to explain the inconsistency with these results as there is a sufficient amount of variance between both variables, but perhaps parents and employers felt that educated children were more responsible and were capable enough to use a machete.

Children who identified with Islam were more likely to work in agriculture, be injured, and be exposed to hazardous substances, compared with children who identified with a Christian faith. These results are, in general, consistent with past literature that has found Christian religions to be associated with fewer instances of child labor than non-Christian religions in West

Africa (Canagarajah and Coulombe, 1997). These statistically significant results could be partially due to the relationship between religion and immigration in the country. When Cote d'Ivoire increased cocoa production in the 1980s many Muslim immigrants came to the cocoa fields from northern countries to work as tenant farmers. Muslim immigrants in cocoa producing regions are much more likely to lack labor mobility and access to wealth, potentially resulting in a higher need for child labor.

Children who spent more money on the previous day were more likely to have been injured or used a machete. This result is consistent from an earnings perspective. Earning more money generally implies working more hours, but more hours of work may increase the chance of being injured.

The last independent variable, which indicates whether a child works on a family farm or for someone else, is only statistically related to machete use. Children who work on family farms (where their parents primarily take care of them) are less likely to use machetes. The lack of significance for this variable is most likely due to a poor operationalization of the income effect. However, an indicator for living on a family farm was the best proxy variable available from the data.

## Section 6. Policy Implications and Prescriptions

The results provide some evidence that the efforts made by industry, governments, and civil society have had an impact on children's working conditions in Cote d'Ivoire. Project participation was associated with fewer working hours and a lower probability of working on a cocoa farm, using a machete, and being exposed to hazardous substances. However, the study has many limitations, the most severe being sample size and a lack of longitudinal data. The latter could be used to establish baseline values for individual children and then evaluate the impact of remediation on them over time. A second-best methodology would be a mean differences analysis, comparing a treatment group with a comparison group, as was used in the analysis by Andisha, et al. (2009). Unfortunately, given the lack of a good treatment and control group in the data being used, these methods were not possible for this study.

Furthermore, while the results from this study were promising, it is clear that remediation projects alone could not solve the problem of child labor. After millions of dollars of investment by the chocolate industry in West Africa, remediation efforts had still not reached 96.2 percent of cocoa growing communities in Cote d'Ivoire by 2011 (Tulane, 2011). But even if the remediation projects could achieve widespread coverage, it is unclear how *large* of an effect they would have on child labor. Building schools, health clinics, and increasing education among children may help reduce overall poverty levels within a country, but will not directly change the low amount of money that farmers receive for their cocoa beans.

Given that the root cause of child labor in Cote d'Ivoire is poverty among cocoa farmers, child labor reduction strategies must focus on the challenge of sustainably raising farmers' income. As long as farmers are not receiving a living wage, they will remain in poverty and

continue to use free (or very cheap) child labor on their farms. While the diagnosis of the problem is clear (poverty), the cure is much more nuanced.

### **Supply Chain Traceability**

A deeper look at the supply chain reveals why farmers are paid so little for their cocoa beans and, ultimately, why so many children are working on plantations. The chocolate industry is defined by an enigmatic supply chain full of inefficiencies and a lack of traceability.

A large network of middlemen and a very high tax on cocoa in Cote d'Ivoire has prevented much of the cocoa profits from reaching the farmer. A study of the value chain by McKinsey and Company, in connection with the Bill and Melinda Gates Foundation, found that farmers in Cote d'Ivoire only receive 40-45 percent of the export price of their cocoa beans, while Ghanaian farmers receive about 72 percent of the price of their cocoa beans. Export taxes in Cote d'Ivoire hover around 34 percent, while they are kept at 15 percent in Ghana.

Traceability in cocoa from the chocolate bar down to the bean has always been very difficult because of the abundance of middlemen and the chocolate industry's unwillingness to investigate their supply chains. Only very recently have chocolate companies begun to invest time and money into tracing their supply chain.

Fortunately, the traditional, enigmatic supply chain also has a counterpart: the traceable supply chain. The traceable supply chain is one in which companies have a slightly closer connection to farms in Cote d'Ivoire. Typically, traceable cocoa comes from cooperatives that have been certified by companies such as Fair Trade, Rainforest Alliance, and UTZ Certified. Cooperatives are generally preferred to individual farms because they have better access to markets and more control over the price paid for their cocoa. The certifications are meant to

ensure that the cocoa has been grown using certain standards, and with no child labor. The cocoa is coded and documented as it moves from the farm to the final buyer.

While there are many issues associated with certified cocoa, including a lack of regulation and monitoring on many certified farms, the traceable supply chain does provide the benefit of a closer link between the chocolate company and the farmer, reducing the profit sharing of middlemen and large cocoa traders and bringing it back down to farmers.

The other benefit of certified chocolate is the pressure that it places on companies to change their supply chain practices. All else equal, nearly every consumer of chocolate prefers a child-labor-free certified label. A 2011 study by researchers from MIT, Harvard, and the London School of Economics found that bulk coffee sales can increase by 10 percent just by adding a fair-trade label on the package. Sales of certified goods have increased rapidly over the past decade. Fairtrade International, the world's largest certifier, increased sales of goods with its label by 27 percent in 2010 alone, to more than \$5.7 billion (Clark, et al. 2012).

These consumer demands have placed pressure on companies to put more certified cocoa into their supply chains, and have achieved some successes. Nestle has committed to selling 100 percent certified chocolate in Europe and Canada by 2014. Mars, Incorporated has committed to 100 percent certified chocolate worldwide by 2020.

### **Government Responsibility**

Any discussion about eradicating a widespread illegal practice in a country is incomplete without discussion of the government. Many look to the government as the body responsible for the country's child labor practices.

In the case of child labor in Cote d'Ivoire, better law enforcement is needed at country borders to prevent the smuggling and enslavement of children coming from neighboring countries; it is also needed in removing enslaved children from farms and holding farmers accountable. But because most of the child labor that occurs in the region is on small, family farms where children work for parents or relatives, government enforcement in these situations is very difficult and would only impoverish the farmer and his family further.

In 2011, only a few months after the political unrest in the capital had subsided, the Ivorian government announced a reform that would guarantee minimum prices for cocoa farmers in the country. A similar program has been in place in Ghana for decades. While the success of the program is unclear given Cote d'Ivoire's history of corruption and the strains already imposed on a brand new government, price supports may be helpful in raising farmer income and by extension lowering the need for child labor.

## **Section 7. Conclusion**

Senator Harkin and Representative Engel, who championed the Harkin-Engel Protocol, have threatened to institute a child labor labeling system like the one proposed in 2001 if chocolate companies are not able to live up to the promises set forth in the protocol by their deadlines. Over the past decade, the deadlines for Harkin-Engel Protocol deliverables have been pushed back numerous times. The current commitment is that cocoa companies will supply child labor-free chocolate for 70 percent of their supply chains by 2020. There is evidence that remediation projects in the region have been effective at reducing the worst forms of child labor, but the dissemination of these projects in Ivorian communities has been minimal. As activists, consumers and politicians become restless about the slow progress toward the elimination of child labor on cocoa plantations, a chocolate labeling system becomes increasingly a real threat. A chocolate labeling system has the potential to transform the chocolate industry, boosting sales of “child labor free” chocolate companies and damaging the reputations of non-compliant companies.

Chocolate companies need to facilitate the expansion of remediation projects into more Ivorian communities, but these efforts must be coupled with changes in supply chain practices and efforts to bring profits back to farmers.

The cocoa industry is heavily invested in the sustainability of their products’ main ingredient: cocoa beans. This precious resource has had a rocky history since the time that cocoa permeated the world market in the 1800s. At that time, most of the world’s cocoa was sourced from the island of São Tomé, off the western coast of Africa. Through media reports, it was discovered that the cocoa farming industry on the island survived on the free labor of thousands

of slaves coming from the mainland. Officially, slavery had been outlawed by most industrialized countries, including Portugal, the island's sovereign. Cocoa companies came under condemnation for almost a decade before finally instituting a boycott of cocoa from the island in the early 1900s.

While the type of enslavement that was used in Sao Tomé is quite different than the child labor problem that exists today in West Africa, the outrage of consumers, politicians, and activists about the issue is strikingly similar to the campaign from 100 years ago. If chocolate companies ignore the outcries, they may be forced to find a new source for most of their cocoa, which is a challenge considering cocoa trees can only be grown within ten degrees of either side of the equator.

## Appendix 1: Model Diagnostics

### Multicollinearity:

Pairwise Correlations Between Independent Variables

Variables	project	Female	age5to11	age12to14	school12	muslim	other	spend	familyfarm
project	1.00								
female	0.00	1.00							
age5to11	-0.04	0.03	1.00						
age12to14	0.02	-0.02	-0.63	1.00					
school12	0.13	-0.09	0.04	0.08	1.00				
muslim	0.07	-0.02	-0.02	-0.03	-0.15	1.00			
other	-0.06	-0.03	0.02	0.01	-0.10	-0.35	1.00		
spend	-0.04	-0.03	-0.24	0.02	0.00	-0.13	-0.05	1.00	
familyfarm	0.00	-0.03	0.11	-0.02	0.07	0.05	0.01	-0.05	1.00

### Model Specification:

#### Model 1 (work on a cocoa farm):

Linktest:

```
Iteration 0: log likelihood = -851.91566
Iteration 1: log likelihood = -814.07851
Iteration 2: log likelihood = -811.81347
Iteration 3: log likelihood = -811.79226
Iteration 4: log likelihood = -811.79225
```

Logistic regression

```
Number of obs = 1967
LR chi2(2) = 80.25
Prob > chi2 = 0.0000
Pseudo R2 = 0.0471
```

Log likelihood = -811.79225

cocoawork7	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_hat	1.760919	.4414237	3.99	0.000	.8957444	2.626093
_hatsq	.2173645	.1181732	1.84	0.066	-.0142507	.4489797
_cons	.5967547	.3925968	1.52	0.129	-.1727208	1.36623

This linktest shows no serious problems for model specification, though the *\_hatsq* variable does have a small p-value.

### Model 2 (work in agriculture):

#### Linktest:

```
Iteration 0: log likelihood = -1335.7765
Iteration 1: log likelihood = -1244.9201
Iteration 2: log likelihood = -1244.6734
Iteration 3: log likelihood = -1244.6734
```

```
Logistic regression                                Number of obs   =      1967
                                                    LR chi2(2)      =      182.21
                                                    Prob > chi2     =      0.0000
Log likelihood = -1244.6734                       Pseudo R2       =      0.0682
```

agfarming7	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_hat	1.207376	.1088846	11.09	0.000	.9939665 1.420786
_hatsq	.3479482	.1183742	2.94	0.003	.115939 .5799575
_cons	-.0953275	.0634289	-1.50	0.133	-.2196459 .0289908

This linktest demonstrates very low p-values for both the *\_hat* and *\_hatsq* variables, indicating that there may be a model specification issue.

### Model 3 (injuries):

#### Linktest:

```
Iteration 0: log likelihood = -697.3765
Iteration 1: log likelihood = -669.88669
Iteration 2: log likelihood = -669.12613
Iteration 3: log likelihood = -669.12001
Iteration 4: log likelihood = -669.12001
```

```
Logistic regression                                Number of obs   =      1177
                                                    LR chi2(2)      =      56.51
                                                    Prob > chi2     =      0.0000
Log likelihood = -669.12001                       Pseudo R2       =      0.0405
```

injuries	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
_hat	1.086554	.4164351	2.61	0.009	.2703567 1.902752
_hatsq	-.0439452	.1984365	-0.22	0.825	-.4328735 .3449832

```

-----
      _cons |  -.0322379   .2034891   -0.16   0.874   -.4310692   .3665934
-----

```

This linktest shows no model specification issues for model 3.

### Model 4 (machete use):

#### Linktest:

```

Iteration 0:  log likelihood = -694.19253
Iteration 1:  log likelihood = -633.26264
Iteration 2:  log likelihood = -629.6865
Iteration 3:  log likelihood =    -629.6
Iteration 4:  log likelihood = -629.59989
Iteration 5:  log likelihood = -629.59989

```

```

Logistic regression                               Number of obs   =      1176
                                                    LR chi2(2)      =      129.19
                                                    Prob > chi2     =      0.0000
Log likelihood = -629.59989                       Pseudo R2      =      0.0930

```

```

-----
      macheteuse |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----+-----
           _hat |   .9051031   .2027748     4.46  0.000     .5076718    1.302534
          _hatsq |   .0521908   .099098     0.53  0.598    -1.1420377   .2464193
           _cons |   .0163921   .1103708     0.15  0.882    -1.1999308   .232715
-----

```

This linktest shows no model specification issues for model 4.

### Model 5 (heavy loads):

#### Linktest:

```

Iteration 0:  log likelihood = -768.78727
Iteration 1:  log likelihood = -760.13895
Iteration 2:  log likelihood = -760.11766
Iteration 3:  log likelihood = -760.11766

```

```

Logistic regression                               Number of obs   =      1176
                                                    LR chi2(2)      =      17.34
                                                    Prob > chi2     =      0.0002
Log likelihood = -760.11766                       Pseudo R2      =      0.0113

```

```

-----
      heavyload |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----+-----
           _hat |   1.359975   .7307605     1.86  0.063    -.0722896    2.792239
          _hatsq |  -.3344969   .6380539    -0.52  0.600    -1.58506     .9160657
           _cons |  -.075585    .2096154    -0.36  0.718    -1.4864236   .3352536
-----

```



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