A Theory of Exploitative Child Labor

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ABSTRACT

We develop a model of exploitative child labor with two key features: first, parents have imperfect information about whether employment opportunities available to their children are exploitative or not. Second, firms choose whether or not to exploit their child workers. In our model, a ban on exploitative child labor is desirable, because it resolves the problem of imperfect information faced by parents, and therefore leads to Pareto efficiency. We also find that a ban leads to an increase in the wages of child workers, and that firm profits, even for firms that do not exploit child workers, fall. Finally, a ban has ambiguous effects at the macroeconomic level: aggregate child employment and aggregate output can rise or fall.

JEL CLASSIFICATION NUMBERS: D1, J2, J4

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I. Introduction

The purpose of this paper is to construct a model of *exploitative* child labor. The contribution is to bring the recent discussion of child labor in the formal economics literature–which has focused on any work that children do--more in line with the discussion that has taken place among policymakers–which addresses primarily certain forms of work. As Kaushik Basu (1999) notes, the main reason for analyzing child labor is to inform policy. If the child labor with which analysts concern themselves differs too much from that about which policymakers worry, the usefulness of the analyses to policy making will be compromised.

Starting with Kaushik Basu and Pham Hoang Van (BV, 1998) there has been an upsurge in theoretical work that isolates the reasons why children work. In BV, low household income or wealth and the possibility of substituting children for adults in production can lead to equilibria in which children work. We (Swinnerton and Rogers, 1999; Rogers and Swinnerton, 2002) and Sylvain Dessy and Désiré Vencatachellum (2001) extend this work to map out the effects of income or resource inequality in an economy on its incidence of working children. Jean-Marie Baland and James A. Robinson (2000) and Priya Ranjan (2001) link the phenomenon of working children to imperfect capital markets; children may end up going to work in part because their families are unable to borrow against future earnings to finance schooling. Dessy and Stéphane Pallage (2001) trace child labor to the absence of coordination between parental decisions to invest in their children's human capital and firms' decisions to invest in skill-intensive technologies.

It is important to note that none of this work addresses the distinction between any work done by children and *exploitative* child labor. This distinction is currently very important in policy-making circles, where it is recognized that the "Worst Forms of Child Labor" can do damage to children.[1] Current economic theory on child labor views parents as altruistically seeking to maximize their children's utility. But if parents seek to maximize their children's utility and we accept that children are harmed by the Worst Forms of Child Labor, why do we observe children in Worst-Forms situations?

Dessy and Pallage (2002) suggest that it is because Worst-Forms jobs pay better than other jobs available to children. Parents recognize the harm the Worst Forms can do to their children, but may send their children into Worst-Forms jobs anyway if they view the higher wage paid by those jobs as compensating for the harm. Particularly in the context of extreme poverty, the compensating differential for the harm done by the Worst-Forms of Child Labor may be enough to make that harm preferable to the harm that might be done by accepting a lower paid job and suffering a dismally low material standard of living. In this context, Dessy and Pallage are right to emphasize that policymakers need to give utmost consideration to the poverty that causes this child labor, and to avoid simply seeking to ban the Worst Forms of Child Labor.

We think the policy interest in the Worst Forms of Child Labor emanates from a concern that these types of labor are exploitative *per se.* We construct our model to capture this concern. Parents seek to maximize their children's utility, but have imperfect information when they decide whether their children should enter the labor force. When they send their children to work, the parents hope that they are sending them to a

[1] The next section discusses more completely the terms "exploitative child labor" and "Worst Forms of Child Labor."

situation that makes them better off. They have this hope because they know that there are working situations that can be beneficial for their children. However, this hope is sometimes not realized and the child ends up in an exploitative work situation. That is, the parents may be "tricked" into sending their children into exploitative work. Since firms recognize that parents face imperfect information when making decisions, in equilibrium there is the opportunity for some--but not all--firms to exploit child laborers.

In our model, a ban on exploitative child labor is desirable, because it resolves the problem of imperfect information faced by parents, and therefore leads to Pareto efficiency. It also has some interesting distributional impacts. In contrast to Dessy and Pallage, who suggest that a ban leads to a fall in the wage paid to working children, we find that a ban leads to an increase in the wages they receive. We also find that all firms, whether they formerly exploited child workers or not, suffer in terms of reduced profits. Finally, we find ambiguous effects at the macroeconomic level: aggregate child employment and aggregate output can rise or fall.

The next section of the paper describes more specifically what we mean by exploitative child labor and presents anecdotes to demonstrate that our contention that parents are tricked into sending their children into exploitative child labor is true, at least in some cases. Section III presents the model. Section IV traces through the welfare implications of banning exploitative child labor. Section V concludes. An Appendix contains the proofs to all formal propositions.

II. What is Exploitative Child Labor?

Since the motivation for our theory is both to catch up with and to provide rigor to the policy discussion, it is worthwhile to consider what the term "exploitative child labor" means in that discussion.

In early policy-oriented discussion of child labor, it was often assumed that all work by children is necessarily harmful. By the mid-1990s, it became more commonly understood that some work could be beneficial for children, since it could allow them to achieve at least a subsistence level of consumption or to acquire skills. In this spirit, the term *exploitative child labor* generally came to distinguish certain work that was clearly harmful to the children involved (Organization for Economic Cooperation and Development, 1996, Swinnerton, 1997).

In 1999, the 184 member nations of the International Labor Organization (ILO) passed the "Worst Forms of Child Labor Convention" (Convention 182). An ILO Convention has the status of an international treaty. After it is passed, each country then decides whether or not to ratify it. As of April 2002, 117 countries had ratified Convention 182.[2] The rate of ratification of Convention 182 has been the fastest of any Convention in the ILO's 83-year history. [3]

In our view, Convention 182 serves both to provide some additional specificity about exploitative child labor and as a formal vehicle for demonstrating a growing consensus that the particular forms of work that qualify as exploitative do harm children. Article 3 of Convention 182 defines the "Worst Forms" 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

[2]For a listing of the countries that have ratified ILO Convention 182, including the date of ratification, see http://ilolex.ilo.ch:1567/cgi-lex/ratifce.pl?C182.

[3] "Support for the Global Ratification Campaign: The World is Uniting" on the ILO's web site at http://www.ilo.org/public/english/standards/ipec/index.htm.

> compulsory labour, 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.

To our way of thinking, Convention 182 seeks to identify a set of practices that should be avoided by children, even if it means that children do not work at all. These practices are proscribed because of a general belief that the children are better off not working at all than in a Worst Form. If children are in the Worst Forms, exploitation occurs because they feasibly could be better off doing something else. But if they would be better off doing something else, how do children end up as exploited child laborers?

One possibility is that they are stolen outright. In this case, the preferences of, or the constraints faced by, the children or their parents do not figure into what happens to the children. Other possibilities recognize that in most instances parents decide what their children will do. In these cases, one of two assumptions can be made. The first is that parents do what is in their own or the household's best interest, regardless of what is in an individual child's best interest. Under this assumption, if the child ends up as an exploited child laborer, the parent can be depicted as willingly deciding to exploit the child. The other assumption is that parents always decide for their children based on what is in the best interests of the children. Under this assumption, it is still possible for children to end up as exploited child laborers if the parents are tricked or deceived, i.e., if they rationally believe that they are doing what is best, but it turns out that they are not.

Similarly, if children make their own utility-maximizing decisions, trickery or deception could still lead them into exploitative situations.

The child labor literature suggests that all three routes to exploitative child labor exist in the world today. It also suggests that once a child enters into an exploitative situation, a variety of barriers to escape may be erected to prevent the children from leaving. Typically, these barriers involve in some way the removal of children from the parents' household, and the children lose access to the financial and emotional support that their parents may have provided.

We give just a few anecdotes. The United States Department of Labor (USDOL, 1999) reports that in Burma, young boys are often abducted from school and forced to act as porters for the military. Lim (1998) discusses how children enter the sex sector in Southeast Asia. She emphasizes the role of persuasion, deception or threats from adults in getting children to enter the trade. Sometimes the adult responsible is a child's parent, but other times parents agree to the removal of children from their home on the belief that the child is going to be offered a training, educational, or work opportunity, that will actually improve the child's situation. In a case study of the trafficking of Nepali girls and women to brothels in Bombay, Human Rights Watch/Asia (1995) establishes that while outright abduction is sometimes the way that girls are forced into prostitution, deception or fraud is more common. Promises of marriage or better jobs lead poor parents or the girls themselves to decide that the girls leave Nepal for Bombay. In many cases these promises are not realized, and the girls find themselves in brothels. A number of different strategies may be employed to keep girls compliant and to prevent them from leaving. These include physical restraint from escape, violent beatings, psychological

abuse, depriving the girls of appropriate street clothing, and concealing from them where they actually are. Typically any money that changes hands in payment for the girls' work is not seen by the girls, and they have no idea of the amounts paid. Anti-Slavery International (1998) describes the practice of "placing" children, and also their trafficking into bondage, that occurs among West African Countries. In Benin, some impoverished parents seek to make themselves and their children better off by placing their children in the homes of strangers or distant relatives, whom the parents believe will offer training opportunities to their children. Instead the children become domestic servants, often unpaid. Some children are trafficked across borders to destinations as far away as Nigeria and Gabon. The distance placed between parent and child can only serve to remove the parent's ability to choose for the child, and to make it unlikely that the child can escape from the exploitative situation.

III. The Model

The model we analyze in this section is concerned with instances when parents are tricked. At the outset we wish to emphasize that we do not model this trickery as "full deception." Instead, the parents have some idea that their children might end up in an exploitative situation. In many situations of trickery described in the child labor literature, including those described above, the villages that the exploited children come from are often the same ones from generation to generation. Additionally, former child laborers, exploited or not, sometimes return home. So, it is unlikely that latter-generation parents in these villages can be completely unaware that an undesirable fate is a possibility for the children who are sent away from home to work. At the point when

they decide whether or not their children will enter the labor force, they somehow have to deal with this possibility in their decision making.

We also note that the model is static. This is not to deny the very important dynamic issues associated with child labor. Indeed some of the most persuasive arguments against child labor spring from analyses that recognize the dynamic and long-term connection between going to school instead of working, and the future benefits that accrue from following this strategy [e.g., Ranjan (2001), Baland and Robinson (2000), USDOL (2000)]. But there is a question as to whether and under what conditions the immediate elimination of exploitative child labor can also yield immediate positive net benefits. A simple static model provides a good tool for addressing this question that should neither belittle nor contradict the findings of models cast in a dynamic framework.

A. Households

Parents make decisions for their children. They seek to maximize each child's utility.[4] Each child has a utility function of the form

$$u(c, 1-\ell)$$

where c is total consumption, $1-\ell$ is leisure, and the endowment of time is 1 ($\ell \in [0,1]$). The utility function is increasing in its arguments and is quasi-concave. The consumption good is the numeraire.

In competitive employment, each child has non-child-labor ("outside") income Y, which we assume to be a parental contribution. In addition, child labor earns the wage w, so the budget constraint is $c = Y + w\ell$. The utility maximization problem can be written:

$$\max_{\{\ell \in [0,1]\}} u(Y + w\ell, 1 - \ell) \quad (1)$$

The utility-maximizing level of labor, ℓ^*, satisfies:[5]

$$w u_1(Y + w\ell^*, 1 - \ell^*) - u_2(Y + w\ell^*, 1 - \ell^*) = 0 \quad (2)$$

Note that ℓ^* depends on the child's wage, *w*, and on the parental contribution, *Y*. If leisure is a normal good, then $\partial \ell^* / \partial Y < 0$.

When children enter exploitative employment, we assume they are exploited to the maximum extent possible: they must use all of their time endowment on labor ($\ell = 1$), and in return receive only that level of support from their employers that ensures their survival. We will denote this support as *s*. We also assume that exploited child laborers are cut off completely from their parents, so they lose access to outside income. Exploited children therefore have utility equal to $u(s,0)$. But it is not this absolute level of utility that is necessary to our results. Rather, the necessary assumption is suggested by our discussion of Convention 182: that children are worse off in exploitative employment than not working at all. That is,

Assumption 1: $u(s,0) < u(Y,1)$

When deciding to send their children to the labor market, the household does not know for certain whether the work the children will end up doing will be exploitative or not, but they do know that there is some probability, *p*, of exploitation.[6] Accordingly,

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[4] We could generate equivalent results if we assumed the children made their own decisions. No principal-agent or intra-family bargaining or budgeting issues are assessed in this model. The description of parents as the decision makers is adopted solely to conform with predominant social and legal practices.

[5] We assume the utility function is such that the solution is an interior one. Allowing for corner solutions in which ℓ^* is equal to zero or to 1 either rules out child labor or complicates the model without producing any new results.

[6] The literal interpretation that parents know precisely the odds that the child will end up in exploitative child labor is contestable. It would be more realistic to assume that they guess *p* with some error. Similarly, in a dynamic model one could incorporate learning about the true value of *p* from one generation to the next. We believe that this added realism would add complexity without changing the qualitative nature of our results. For simplicity and convenience, we maintain that parents know *p*.

parents view allowing a child to participate in child labor as a lottery. There is some chance of "winning" a job in the competitive sector and some chance of losing by ending up in exploitative employment. Given this uncertainty, the household will send its children to work so long as the expected utility from working is no smaller than the utility from not working, i.e., so long as

$$pu(s,0) + (1-p)u(Y + w\ell^*, 1-\ell^*) \geq u(Y,1) \qquad (3)$$

When equation (3) holds with equality, it defines the maximum probability of exploitation that is consistent with parents allowing their children to enter the labor market. We normalize the population of children to unity, so that p is also the number of exploited child laborers

Note that exploitative child labor cannot exist unless non-exploitative child labor also exists. Because of Assumption 1, (3) cannot hold if $p = 1$. Thus, if exploitative child labor exists, it must be the case that $p < 1$.

B. Firms

One unit of capital is required to start a firm. Assuming that there are K units of capital in the economy, there will be K firms. Firms can be classified into two different sectors, based on their human resource policies. We call the first sector the *competitive sector*. The second is the *exploitative sector*. In this section of the paper we describe the profit-maximizing decisions of these firms, and how capital and child labor are allocated across both sectors of the economy.

Each firm produces output according to a production function, $f(.)$, that depends only on child labor, ℓ, with $f' > 0$ and $f'' < 0$.[7] Whether a firm operates as an exploiter or

[7] The existence of adult labor could be accommodated in this model in a variety of ways without changing its qualitative results. For example, instead of assuming that a unit of capital is needed to run a firm, we

in the competitive sector will depend on the returns to capital in each sector. Competitive firms each hire ℓ_c hours of child labor, so that the return to capital in that sector equals $\pi_c = f(\ell_c) - w\ell_c$. Exploitative firms hire ℓ_x hours of child labor, so that the return to capital in the exploitative sector equals $\pi_x = f(\ell_x) - s\ell_x$. No firm has any incentive to move from one sector to the other when

$$f(\ell_c) - w\ell_c = f(\ell_x) - s\ell_x. \tag{4}$$

This condition, which we will refer to as the entry/exit condition, determines the allocation of firms across the two sectors.

1. The Competitive Sector

In the competitive sector, firms face a perfectly competitive labor market. In equilibrium there are *N* competitive firms. Profit maximization implies:

$$f'(\ell_c) - w = 0 \tag{5}$$

Equation (5) defines the firm's demand curve labor in the competitive market, $\ell_c(w)$.

The market for non-exploitative child labor clears when

$$N\ell_c(w) = (1-p)\ell^*(w;Y) \tag{6}$$

Equation (6) states that the aggregate (non-exploited) labor demanded by competitive firms, $N\ell_c(w)$, equals the aggregate amount of non-exploited labor supplied, which in turn equals the number of non-exploited workers, (1-*p*), times the amount of labor supplied by each of them, $\ell^*(w;Y)$.

2. The Exploitative Sector

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could assume that a unit of adult labor is needed and that *K* is the population of adult laborers. Or, we could use the Basu and Van (1998) "substitution axiom" to model the productive value of child labor vis-a-vis adults. In any case, there seems to be little loss in generality by not considering adult labor explicitly.

In the *exploitative sector*, firms gain total and permanent control over their workers. These firms do not "hire" workers; they "capture" them. That is, they follow a policy of enslavement. Workers exploited in this fashion cannot migrate away from the firm, and except for what it needs to pay the worker to survive (*s*), an exploitative firm can extract all surplus from any worker it exploits. In contrast to the competitive sector, there is no market-mediated price mechanism that allocates workers across exploitative sector firms.[8] We emphasize that these firms seek to profit by capturing workers, forcefully keeping the workers in their employ, and forcefully extracting the full value of the surplus from each exploited or enslaved workers. In equilibrium, there will be $K - N$ exploitative firms.

If we assume that each exploitative sector firms is as adept as any other at capturing child laborers to be exploited, the maximum size of the pool of exploited child laborers *potentially available* to any exploitative-sector firm is $\frac{p}{K-N}$. Given *s*, the maximum size of the pool of exploited child laborers an exploitative sector firms *would like* to employ, ℓ_x^d, is given by the usual first-order condition for profit maximization, i.e., $f'(\ell_x^d) - s = 0$. Actual employment at an exploitative firm, ℓ_x, will clearly equal its labor demand if $\ell_x^d \leq \frac{p}{K-N}$. Thus,

$$\ell_x \leq \min\{\ \ell_x^d,\ \frac{p}{K-N}\} \tag{7}$$

The entry-exit condition (4) has direct implications for the size of exploitative-sector firms, the solution to (7), and for the efficiency of this solution.

[8] We also do not allow exploitative firms to buy and sell the individuals they capture, i.e., there is no

Proposition 1: For any *p*, firms in the exploitative sector are smaller than firms in the competitive sector (they use fewer hours of child labor), i.e., $\ell_x < \ell_c$.[9]

Corollary 1: $\ell_x = \dfrac{p}{K - N}$

Corollary 2: $f'(\ell_x) > s$

The Proposition is surprising, because the exploitative sector firms have the same production technology as the competitive sector firm, but they pay a lower wage. Thus, they have a higher demand for labor than do firms in the competitive sector. But the entry-exit condition (4) implies that they cannot satisfy this demand. If they could, their profits would exceed those of competitive firms, and competitive-sector firms would migrate over to the exploitative sector. This migration would continue until profits were the same in both sectors. But because the exploitative sector wage (s) is lower than the competitive wage (*w*), equation (4) can only hold if each exploitative-sector firm uses fewer hours of child labor than each competitive-sector firm.

We note that exploitative sector firms maximize profits in the presence of a binding "labor-supply" constraint (Corollary 1).[10] Exploitative firms do not operate efficiently, since the marginal product of labor at these labor-supply-constrained firms exceeds the marginal cost of labor (Corollary 2).

While we explicitly consider firm behavior only in a static setting, three dynamic issues should be noted. First, we rely on the usual implicitly dynamic story about how

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secondary market for slaves.

[9] The proofs of all propositions may be found in the appendix.

[10] It is worth noting that what we have assumed here is that the exploitative sector is made up of a number of firms each of which has an extreme form of monopsony power over each worker it employs. The monopsony power results from the lack of mobility of exploited workers, and its implications are not much different than the local monopsony power that motivates much of the economics literature on job-search (even though the reason assumed for this lack of mobility is different). In the job-search literature, the uniform allocation of workers across firms is called "random search." Also, labor-supply constrained firms are common because the technology is linear in labor (e.g., Albrecht and Axell, 1984) or because, as is the case here, entry and exit of firms is endogenous to the model (e.g., Swinnerton, 1996).

potential worker migration enforces market clearing in the competitive sector. Second, we assume implicitly that worker sorting into sectors is once and for all. Workers who start to work in the exploitative (competitive) sector always work in that sector. Finally, we suppose that firms look into the future, and resist taking actions (driving p above the maximum value that would be tolerated by households) that would drive them out of business, because they would then forfeit all future returns to capital. Households are unforgiving: if firms ever exploit more than p children, households withdraw their children from the labor force completely and forever.[11]

C. Equilibrium

In an equilibrium with child labor, four conditions must hold. First, equation (3) must hold with equality, so that the expected utility from children working equals the utility from keeping the child out of the labor force. This follows directly from the fact that if (3) remains as an inequality, the measure of exploited children would be smaller that households would tolerate, *ex ante*. There would be opportunities to exploit that are not pursued. But since exploitative sector firms have an excess demand for workers to exploit, this cannot happen. They will exploit everyone they can. The equilibrium condition from the household side of the model is thus:

$$pu(s,0)+(1-p)u(Y+w\ell^*(w;Y),1-\ell^*(w;Y))=u(Y,1) \tag{8}$$

The remaining equilibrium conditions are the profit maximization condition (5); the labor-market clearing condition (6); and, the no-entry/exit condition (4), in which we

[11] Essentially we are assuming that competitive-sector firms recognize the impact of their actions on p and their own future viability, so that they do not "bait and switch" by portraying themselves as competitive-sector firms during recruitment and then acting as an exploitative-sector firm when the children are secured. A potentially more satisfying, but more complicated, mechanism for ensuring that firms sort into sectors is to model a system of fines and some probability of detection for exploitative-sector firms that

replace ℓ_x with $p/(K-N)$. There are four unknowns in this system of equations: *w*, *p*, *N*, and ℓ_c.

As noted earlier, Assumption 1 ensures that exploitative child labor cannot exist unless non-exploitative child labor does as well. We now would like to focus attention on economies that always have child labor. Let us define $\tilde{w}$ as the marginal product of labor if $p = 0$, that is, if no children are in exploitative work. We now introduce

Assumption 2: $\ell^*(\tilde{w};Y) > 0$.

This assumption states there is a positive supply of child labor even if there is no exploitative child labor.

Note that when *p* is determined in equilibrium, it cannot be the case that there is a complete absence of exploitative child labor: Assumption 2 ensures that equation (8) cannot hold if $p = 0$.[12] This guarantees the following.

Proposition 2: An equilibrium with both exploitative and non-exploitative child labor exists.

It can also be shown that an upward-sloping labor supply curve, i.e., $\frac{\partial \ell^*}{\partial w} > 0$, is sufficient to guarantee uniqueness of the equilibrium. However, as becomes clear in the next section, whether or not equilibrium is unique is of little consequence in determining the effects of banning exploitative child labor. A ban has the same welfare implications, regardless of how many equilibria exist initially, or from which one the economy begins.

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deters competitive-sector firms from pursuing a "bait-and-switch" strategy. This is a matter that we intend to pursue in future work.

[12] If $p = 0$, then the expected value of working exceeds the expected value of not working, i.e., $u(Y + \tilde{w}\ell^*(\tilde{w};Y), 1-\ell^*(\tilde{w};Y)) > u(Y,1)$; therefore, $p > 0$ if (8) holds.

IV. Welfare Effects of Banning Exploitative Child Labor

We have established that when there is imperfect information about the fate that awaits children in the labor market, exploitative and non-exploitative jobs will exist for children in equilibrium. It is well known that imperfect information is a source of economic inefficiency. An effective ban on exploitative child labor, i.e., a policy that sets p equal to zero, eliminates this inefficiency. A ban also affects the distribution of the proceeds from economic activity in our model, and so it is worthwhile to continue our discussion of the welfare implications of banning exploitative child labor by looking more at the effects on children, firms, and society in the aggregate.

Proposition 3 summarizes the effect of a ban on exploitative child labor on individual working children.

Proposition 3: A ban on exploitative child labor increases the wage paid to working children.

In our model, an effective ban on exploitative child labor has the effect of creating a one-sector competitive economy. Children released from exploitative work join other children in seeking work from competitive firms, thereby increasing the aggregate supply of labor in the competitive sector. At the same time, former exploitative-sector firms can either shut down, in which case they earn zero profits, or adopt the competitive human resource policy and earn a positive profit. They adopt the competitive policy, thereby increasing the aggregate demand for labor in the competitive sector. Since the scale of firms in the exploitative sector was smaller than in the competitive sector to begin with, and since non-exploited children do not work as many hours as exploited children, the increase in the supply of labor in the competitive sector is smaller than the increase in labor demand; therefore, the competitive-sector wage goes up.

All working children, whether they started in exploitative- or competitive-sector jobs, clearly benefit from the ban, because all now earn a higher wage. Moreover, every child is now working for the utility-maximizing number of hours, $\ell^*(w;Y)$. We note that while formerly exploited child labors can clearly work no more than they did before, child laborers who always worked for competitive-sector firms may respond to higher wages by supplying more hours.

Proposition 4 summarizes the effect on firms of banning exploitative child labor.

Proposition 4: A ban on exploitative child labor reduces the size of competitive firms, and reduces the return to capital.

Because the wage paid to child laborers rises in response to a ban on exploitation, competitive sector firms reduce the number of hours of child labor that they employ. Profits, which in this model are the returns to capital, therefore fall. Since all firms earned the same profit when the two-sector equilibrium was allowed to exist, all firms now earn lower profits because of the ban.

Proposition 5 establishes that the effects of the ban on exploitative child labor on common aggregate indicators of welfare are ambiguous.

Proposition 5: A ban on exploitative child labor may cause aggregate hours worked by children to rise or fall, and may cause aggregate output to rise or fall.

The ambiguous effect on aggregate employment traces directly to the observation already made that formerly exploited child laborers will work less because of the ban, while other children will work more (so long as labor supply is upward-sloping), so that the total increase in competitive-sector employment could exceed the decrease in exploitative employment. The size of the increase in employment in the competitive sector is

bounded above by the amount of the increase in labor demand, *at the initial equilibrium wage*. This increase in labor demand exceeds the fall in exploitative employment. The increase in competitive employment is bounded below by the amount of the increase in labor supply. At the initial equilibrium wage the increase in labor supply is less than the reduction in hours of exploitative labor (the formerly-exploited workers work fewer hours in the competitive sector). In equilibrium, whether competitive employment rises by more or by less than exploitative employment falls will depend on whether equilibrium employment is closer to the demand side or to the supply side effect. This in turn depends on relative elasticities of labor demand and labor supply.[13] The interesting point to note is that a ban on exploitative child labor could mean that overall measured work activity among children rises.

That aggregate output may rise or fall follows, almost directly, from the fact that aggregate labor inputs may rise or fall. The connection is not completely straightforward, however, because it turns out that aggregate labor input may fall some, but not too much, and there still may be some increase in output.

Proposition 6: If aggregate employment does not fall as a result of the ban on exploitative child labor, then aggregate output rises.

Corollary: If a ban leads to a sufficiently small fall in employment, output still rises.

From Proposition 4 we know that employment at firms that were always competitive (AC) must fall as the result of the ban. The hours released from the AC firms are the marginal ones, i.e., those yielding a marginal product below the new competitive wage, but above the old competitive wage. If aggregate employment does not fall, then it must be the case that hours released by AC firms are picked up by formerly exploitative (FE)

[13] We were able to construct numerical examples where employment rose or fell as a results of the ban.

firms. But since the wage now paid by the FE firms is the new competitive wage, the hours newly employed by the FE firms yield a higher marginal product than they did in AC firms. Thus redistributed labor moves from lower to higher productivity activities and aggregate output increases. Clearly, there is some room for this "redistribution effect" to have a dominant effect even when there is a small reduction in overall employment, hence the Corollary to Proposition 6. However, if employment falls by too much, so must output.

Even if employment and output do fall because of the ban on exploitative child labor, it would not be correct to conclude that the ban has led to a reduction in societal welfare. The ban still has the effect of bringing about efficiency and so it has to potential to yield Pareto improvements. The fact that output and employment may fall but welfare may have been enhanced illustrates that assessing country-level efforts to address exploitative child labor is an area where common empirical measures of aggregate welfare, e.g., per-capita gross domestic product or its growth rate, may be misleading, or at least not very informative.[14]

V. Conclusion

In this paper, we modeled formally a situation commonly cited as an explanation for how children end up in exploitative child labor: they or their parents are tricked by promises of a better life that prove not to be true. In our model, the deception is not complete, as we assume that parents have some knowledge of the possibility of exploitation when they enter their children into the labor force. In equilibrium, they are willing to (need to) gamble. Some firms take advantage of this willingness by exploiting children. But other firms do not: in fact, if some firms did not indeed offer a better life

for children than they could obtain without working at all, parents would not be willing to gamble. Thus, trickery or deception as a route into exploitative child labor can only exist as an equilibrium phenomenon if parents have some reason to believe that their children can be better off working, and that reason, we presume, is that *some* children do end up better off by working.

The optimal policy response to the uncertainty that supports an equilibrium with exploitative child labor is to implement a ban on such labor. Doing this means that parents no longer gamble when they send their children to work. If a child works, it is because the child is better off working than not. The ban also is Pareto efficient. However, absent other policy interventions, not everyone gains from the ban. Owners of capital lose. The children gain more than the capitalists lose.

This paper contains words of caution for policymakers seeking indicators of progress toward the elimination of exploitative child labor. Common measures of work activity by children and common empirical measures of aggregate economic welfare may give a misleading picture of the progress that is made in improving the working conditions and welfare of children. In our model, an effective ban on exploitative child labor can lead to an increase in work activity by children. Thus, an increase in measured work activity by children does not imply a lack of progress. Similarly, a fall in aggregate output that results from banning exploitative child labor does not imply lack of progress. When banning exploitative child labor leads to a decrease in aggregate measured output (it need not always do so), welfare still rises. The increase in welfare stems from children's increased consumption of leisure time, rather than from increased consumption

[14] Cf. Swinnerton (1997) with regard to forced labor.

of a good or service that is captured in standard empirical welfare measures such as per-capita gross domestic product.

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Appendix: Proofs

Proof of Proposition 1: Let $\pi(v)$ be the maximized profit of any firm that pays the wage rate *v* and faces no restrictions on its ability to satisfy its labor demand. It is straightforward to show that $\pi'(v) < 0$; therefore, $\pi(w) < \pi(s)$. If exploited firms satisfy their labor demand, then equation (4) cannot hold. Therefore, exploitative firms must be supply-constrained.

Given exploitative sector wages, *s*, and employment constrained so that $\ell_x < \ell_x^d$, an exploitative-sector firm's first-order condition for profit maximization is $f'(\ell_x) - s > 0$, which means that profits decrease with decreases in ℓ_x and that firms will use all the labor they have at their disposal, i.e., $\ell_x = \frac{p}{K-N}$. Suppose $\ell_x \geq \ell_c$. Then, since $f'(\ell_x) - s > 0$, we know that $f(\ell_x) - s\ell_x \geq f(\ell_c) - s\ell_c > f(\ell_c) - w\ell_c$, so that equation (4) is violated. Thus, in order for profits in the exploitative sector to equal those in the competitive sector, it must be the case that $\ell_x = \frac{p}{K-N} < \ell_c$.

Proof of Proposition 2: For households, equation (8) implicitly defines $w = \eta(p)$. Because of the continuity of the utility function, $w = \eta(p)$ is continuous on [0,1). $\lim_{p\to 1} \eta(p) = \infty$, i.e., as the probability of exploitation goes to one, the wage necessary to induce families to send their children into the labor force goes to infinity.

For firms, first note that equation (5) implies a labor demand curve $\ell_c(w)$ with $\ell_c'(w) < 0$. Substitute $\ell_c(w)$ into equations (4) and (6). Substitute *p/(K-N)* for ℓ_x in equation (4). The resulting two-equation system

$$N\ell_c(w) = (1-p)\ell^*(w;Y), \text{ and}$$
$$f(\ell_c(w)) - w\ell_c(w) = f(p/(K-N)) - sp/(K-N)$$

implicitly defines $w = \mu(p)$. So long as the production and utility functions are continuous, $w = \mu(p)$ is continuous on [0,1). As $p \to 1, N \to 0$ and the two-equation system reduces to

$$f(\ell_c(\mu(p))) - \mu(p)\ell_c(\mu(p)) = f(p/K) - sp/K,$$

which implies that $\lim_{p\to 1} \mu(p)$ is finite.

Finally, from Assumption 2 it follows that $\mu(0) > \eta(0)$. Thus, $\mu(p)$ and $\eta(p)$ must intersect at least once.

Proof of Proposition 3: Denote as w_e the equilibrium real wage before the ban on exploitation. The aggregate supply of hours to the competitive sector equals $(1-p)\ell^*(w_e)$. At w_e, the ban on exploitation increases labor supply by $\ell^*(w_e)-(1-p)\ell^*(w_e)=p\ell^*(w_e)$; labor demand also increases from $N\ell_c(w_e)$ to $K\ell_c(w_e)$. The increase in labor demand is greater than the increase in labor supply: $(K-N)\ell_c > p\ell^*(w_e)$, since $\ell_c > \frac{p}{K-N} > \frac{p}{K-N}\ell^*(w_e)$, where the first part of the inequality follows from Proposition 1, and the second from the fact that $\ell^*(w_e)\leq 1$. Therefore, the equilibrium real wage must rise when *p* is set equal to zero.

Proof of Proposition 4: $w = f'(\ell_c)$. Since $f''(\ell_c)<0$, if the real wage is higher, then ℓ_c must be lower.

The return to capital is $\pi_c = f(\ell_c(w)) - w\ell_c(w)$. Since $\frac{\partial \pi_c}{\partial w} = -\ell_c(w)$, the rise in competitive-sector wages reduces profits (the return to capital).

Proof of Proposition 5: The change in aggregate employment equals $K\hat{\ell}_c - N\ell_c - p = \Delta L_c - p$, where $\Delta L_c > 0$ is the change in hours of labor in the competitive sector. If the aggregate supply curve for labor is upward-sloping, then ΔL_c is bounded below by $p\ell^*(w_e)$ and above by $(K-N)\ell_c$. Suppose $\Delta L_c = p\ell^*(w_e)$. Then the change in aggregate hours worked equals $p\ell^*(w_e) - p = p[\ell^*(w) - 1] < 0$. Suppose $\Delta L_c = (K-N)\ell_c$. Then the change in aggregate hours worked equals $(K-N)\ell_c - p > 0$, since $\ell_c > p/(K-N)$. Total hours worked could rise or fall depending on the elasticities of the labor demand and labor supply curves.

Since child labor is the only input into production, the implied change in output is ambiguous as well.

Proof of Proposition 6: There are two sets of firms to consider: the *N* "always competitive" (AC) firms, and the *K*-*N* "formerly exploitative" (FE) firms. From Proposition 4 we know that employment at each AC firm and so across all AC firms must fall as a result of the ban. It follows that employment at the FE firms must rise. Suppose that aggregate employment stays the same, so that the increase in FE employment equals exactly the decrease in AC employment, i.e., each hour released from the AC sector is picked up by the FE sector. For every hour released by the AC sector, the following must be true:

$$w_e < \mathrm{MP}_{\mathrm{AC}} < w_A .$$

where MP_{AC} is the marginal product that hour would yield in the AC sector and w_a is the wage in the post-ban competitive equilibrium. Since that hour is picked up by the FE sector, the following must also be true:

$$w_A \leq MP_{FE}.$$

Thus, every hour reallocated from the AC to the FE sector has a higher marginal product after the reallocation. So if total employment stays the same, output must go up (there is no change in the marginal product of each hour that was already employed in each sector and stays in the sector where it started). If aggregate hours go up, output obviously rises even more, because any additional hour employed would have a positive marginal product.