A Theory of Exploitative Child Labor

by

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Abstract: Child labor laws should aim to protect children who work, instead of trying to remove children from work. In this paper, we identify an instance when the risk of exploitation lowers the expected benefit of child labor to the child, and therefore suppresses child labor force participation. Targeted legal intervention that lowers or removes the risk of exploitation *raises* child participation in the labor market, child welfare, and overall societal welfare. Targeting on child labor more broadly may reduce child labor force participation, child welfare, and overall societal welfare. Our key assumptions for generating these results are that parents decide for each child based on their child's best interest, that parents face imperfect information about the risks their children confront upon entering the labor market, and that firms may choose to exploit this information imperfection by employing children under forced-labor-type conditions.

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1 Introduction

The purpose of this paper is to construct a model of child labor in which choosing to enter the labor force can make a child worse off than she otherwise would have been. There is a large literature in economics that models why children work but does not distinguish explicitly between work that is "exploitative" and work that is not.[1] The policy discussion, however, is largely concerned with exploitation. A model of exploitative child labor is essential for understanding both how to target policies as well as what their likely effects will be. In this paper, we show that if parents are not fully informed about the working opportunities that their children face and firms take advantage of this imperfect information, then some children who enter the labor market may be exploited. In this context, carefully targeted legal intervention to end "exploitative" child labor is welfare improving, and an indicator of the welfare improvement is an *increase* in the labor force participation rate of children.

In early policy discussions, 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" has generally come to distinguish certain work that is somehow 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).[2] 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 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

[1] Two interesting reviews of this literature are Kaushik Basu (1999) and Eric V. Edmonds and Nina Pavcnik (2005).

[2] An ILO Convention has the status of an international treaty. After it is passed, each country decides whether or not to ratify it. As of this writing, 156 countries had ratified Convention 182. (http://www.ilo.org/ilolex/english/docs/declworld.htm)

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. These practices are proscribed because of a belief that if children are engaged in the worst forms, exploitation necessarily occurs, because they 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 the children or their parents do not figure into what happens to the children. Other explanations start from the observation that in most instances, parents decide what their children will do. One of two assumptions can then 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. 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. In this event, it is still possible for children to end up being exploited 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 lead them into exploitative situations.

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

We give just a few anecdotes.[3] 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

[3] There is no well documented statistically representative information on the incidence of the worst forms of child labor.

of the trafficking of Nepali girls and women to brothels in Bombay, Human Rights Watch/Asia (1995) suggests 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.

Only a few researchers have sought to apply economic theory to exploitative or worst-forms child labor *per se*.[4] Arnab K. Basu and Nancy H. Chau (2003, 2004) develop a model in which the only way for rural parents to smooth consumption across lean and harvest seasons is through an interlinked credit-labor contract (bonded labor). They show that if bonded child labor occurs in equilibrium, then households would have been better off had parents made a commitment to keep their children out of work. An effective commitment would have led to much higher parental wages. On this basis of this implication for household welfare, Basu and Chau classify bonded child labor as exploitative.[5]

Sylvain Dessy and Stéphane Pallage (2005) suggest that some children enter worst-forms jobs because they pay better than other jobs available to children. In the context of extreme poverty and full information that Dessy and Pallage envision, the compensating differential for the "harm" done by a worst-form of child labor is enough to make it privately and socially preferable to the harm that might be done by forcing children to accept a lower paid job and suffering a dismally low material standard of living. This accords with the long-standing warning that has emanated from economists' discussion of child labor: if the work is the best opportunity available to a child according to her preferences, then the individual child is not made better off by taking the opportunity to work away.

We believe that the policy interest in exploitative or worst forms of child labor

[4]There is also an emerging empirical literature that may be viewed as trying to assess what kinds of child labor should qualify as a worst form under Article 3(d) of Convention 182. Sarah Gormly and Amy Ritualo (2005) identify a number of other relevant references.

[5]The possible negative impact of child labor on adult wage is a theme in the more general applied theory literature on child labor. The best known example is Kaushik Basu and Pham Hoang Van (1998). The general effect of credit market imperfections on child labor has also been explored, most famously by Jean-Marie Baland and James Robinson (2000). A. Basu and Chau bring the two themes together and apply them to the specifc context of a worst form of child labor.

emanates from a concern that these types of labor are *not* the best opportunities available to children.[6] In our model, parents must decide whether to keep a child at home or to send her out to the market to work. If the child stays home, the parents contribute to the child's consumption. If the child goes to the market to work, then she leaves behind her home and her parents' contribution. Her utility is determined by the wage she earns in the market. At the point when a child leaves home to go to the market, neither she nor her parents knows for certain whether the job she will find will pay a "good" wage. If she does, then she is better off than if she had stayed home. But if she does not, she may be worse off. So the promise of a good wage may induce the parents to send their child to the market to work, but the possibility of a bad wage may mean that *ex post* the promise is not fulfilled and the parents may feel "tricked."

The uncertainty facing families provides an opportunity that may be exploited by firms that employ child labor. A firm may decide to imprison children who come to it looking for work, and force them to work just for subsistence. Keeping these imprisoned children from escaping is not costless: it gets harder and more expensive the more prisoners a firm has. Imprisonment is the "exploitative recruitment strategy." Alternatively, a firm may offer a wage and allow the children who apply to decide whether to accept work at the firm. We refer to this as the "competitive recruitment strategy." Each firm chooses its recruitment strategy based on which is more profitable.

In equilibrium, firms sort into exploitative and competitive *sectors*. Associated with this sorting is an endogenously determined competitive sector wage, and an endogenously determined probability of exploitation. The probability of exploitation and the competitive wage lead households collectively to supply just enough children to the market so as to support the equilibrium sorting of firms.

The next section describes the firm side of the model. We take the child labor supply as given, and analyze the sorting that occurs. We model household behavior in Section 3. In Section 4, we bring the two sides of the model together to examine characteristics of equilibrium. There may be multiple equilibria. Under some circumstances, all firms would have higher profits if no firms exploited child workers, so that an equilibrium with exploitation can be seen as the result of failure of firms to coordinate recruitment strategies. Under other circumstances, there is no such coordination failure; however, even in these instances, regulation may be used to create a unique equilibrium with no exploitative child labor. Section 5 uses the model

[6] At least one other paper (Dessy and Pallage, 2003) has picked up on the concern we highlight. We discuss their adaptation of the household side of our model at appropriate points later in the paper.

to analyze the effects of legal interventions that aim to reduce exploitative child labor. Our main findings are that regulations targeted specifically on exploitative practices can be Pareto-improving, while mistakes in targeting that lead to broader attempts to remove children from the labor force can leave children worse off. Regulations that lead to a decline in child labor force participation are bad for children. Section 6 concludes.

2 Firms

Suppose L children are available to be employed by K *ex ante* identical firms. Every firm uses one unit of capital[7] and employs only child labor to produce a single consumption good, which is the numeraire. A firm's production function is given by $f(\ell)$, with $f' > 0$, $f'' < 0$, $\lim_{\ell \to 0} f(\ell) = \infty$, and where ℓ is its input of child labor. A firm can decide to recruit children by capturing them, or instead by purchasing their services on the competitive market. A firm's staffing level (ℓ) depends on its recruitment strategy.

If a firm chooses to recruit children by capturing them, then it provides each child with a level of consumption, s, that is just sufficient to ensure the child's survival and usefulness to the firm. Since imprisoned children may try to escape, we assume that the firm bears an imprisonment cost of $c(\ell)$ to prevent them from doing so. It is natural to assume that group insurrection, rebellion and escape are increasingly likely with larger numbers of prisoners; therefore, $c'(\ell) > 0$ and $c''(\ell) > 0$. The firm chooses the number of children it wants to capture to maximize profit, π_e:

$$\pi_e = f(\ell) - s\ell - c(\ell). \tag{1}$$

The first order condition associated with this problem,

$$f'(\widehat{\ell}_e) = s + c'(\widehat{\ell}_e), \tag{2}$$

implicitly defines $\widehat{\ell}_e$, the firm's desired staffing level. We note for future reference that $\widehat{\ell}_e$ is determined by s and by parameters of the production and cost functions, all of which are exogenous variables. Note that the "wage" that the captured children receive (s) is less than the marginal product of labor ($f'(\widehat{\ell}_e)$).

In equilibrium, it may turn out that an exploitative firm is unable to achieve its desired staffing level. In this event, the firm's *actual* staffing level, will be less than $\widehat{\ell}_e$, and the marginal product of labor will exceed the marginal cost ($s + c'(\ell_e)$).

[7] The economy has an endowment of K units of capital.

To allow for this possibility, we denote by ℓ_e the *actual* staffing level of exploitative firms, where $\ell_e \leq \widehat{\ell}_e$. We denote exploitative-firm profits as a function of its staffing level by $\pi_e(\ell_e)$.

Instead of capturing and exploiting children, a firm may follow a competitive recruitment strategy. In this strategy, the firm offers a wage, w, and lets children decide whether to take employment with the firm. The wage w is a competitive wage determined by competition among firms who do not exploit child workers, and for child workers who are not absorbed by firms following the exploitative strategy.

If a firm chooses the competitive strategy, it takes the wage as given and chooses employment to maximize its profit, π_c:

$$\pi_c = f(\ell) - w\ell. \tag{3}$$

The firm's optimal staffing level, ℓ_c, satisfies the first order condition

$$f'(\ell_c) = w. \tag{4}$$

The demand for labor implied by expression (4) is a decreasing function of the wage. We denote this function by $\ell_c(w)$. Expressions (3) and (4) imply that a competitive firm's profit decreases as the competitive wage increases. We denote competitive-firm profit as a function of the wage by $\pi_c(w)$.

Each firm chooses a recruitment strategy that yields the highest possible profit. A firm's profit, π, is therefore given by

$$\pi = \max[\pi_e(\ell_e), \pi_c(w)]. \tag{5}$$

Firms may be found in both sectors only if $\pi_e(\ell_e) = \pi_c(w)$. Otherwise, they will move to the sector that offers the higher profit.

Having described each individual firm's decision problem, we now determine how firm-level decisions aggregate up to an allocation of firms and workers into the exploitative and competitive sectors. Let $N \in [0, K]$ be the number of firms that choose the exploitative strategy, so that $N\ell_e$ children are employed in the exploitative sector. We assume that each child in the market is as likely as any other to be captured; therefore, each of the L children faces an individual probability of exploitation, p:

$$p \equiv \frac{N\ell_e}{L}. \tag{6}$$

Children who are not captured are left to be employed in the competitive market. There are $K - N$ firms in this market, each demanding $\ell_c(w)$ workers. Since the exploitative sector demands $N\ell_e$ workers, the market-clearing condition for the competitive sector is

$$(K - N)\ell_c(w) = L - N\ell_e.$$

We can use expression (6) to substitute for N in this market-clearing condition; with some rearranging this yields:

$$pL + (K - \frac{pL}{\ell_e})\ell_c(w) = L. \tag{7}$$

The left-hand side of expression (7) is the aggregate demand for labor by both sectors. The right-hand side is the aggregate supply of child labor.

Expressions (7) and (5) pin down the endogenous variables p and w. To get some intuition for how these variables are determined, we first define:

$$\overline{\ell} \equiv \frac{L}{K}.$$

Because there are L workers and K firms in this market, and the labor market clears, $\overline{\ell}$ is the average staffing level per firm. The two cases we want to consider separately are: (i) when $\overline{\ell} > \widehat{\ell}_e$; and, (ii) when $\overline{\ell} \leq \widehat{\ell}_e$. Either of these cases is possible for different parameter values for the model.

2.1 $\overline{\ell} > \widehat{\ell}_e$: Competitive Firms Exist

Proposition 1 *If $\overline{\ell} > \widehat{\ell}_e$, then it cannot be the case that all firms choose to exploit.*

Proof. If all firms exploit, then desired employment per firm equals $\widehat{\ell}_e$. But if $\overline{\ell} > \widehat{\ell}_e$, this means some available workers must not be employed, so the labor market will not clear. Therefore, if $\overline{\ell} > \widehat{\ell}_e$ it cannot be a market-clearing outcome for all firms to exploit. ■

This Proposition ensures that if the average staffing level per firm exceeds the desired exploitative staffing level, then any sorting consistent with market clearing must contain at least some competitive firms. In any such sorting, every exploitative firm staffs at level $\widehat{\ell}_e$, so that when there are N exploitative firms, the probability of exploitation, p, equals $\frac{N\widehat{\ell}_e}{L}$. Finally, if every exploitative firm uses $\widehat{\ell}_e$ children, then competitive firms must be larger than exploitative firms ($\ell_c > \widehat{\ell}_e$); otherwise, the average staffing level per-firm would be less than $\overline{\ell}$ and the labor market would not clear.

Figures 1a and 1b illustrate how expressions (5) and (7) determine p and w, for given L. Figure 1a graphs competitive and exploitative profits against the wage

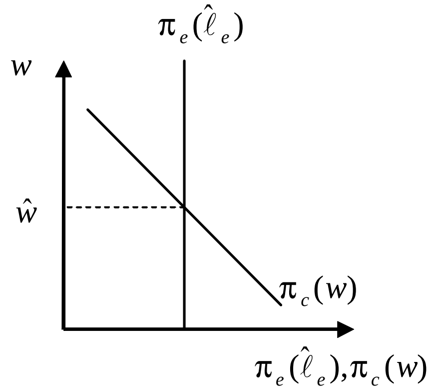

Figure 1a

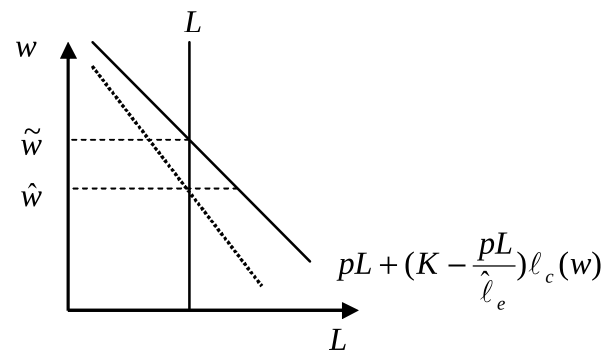

Figure 1b

rate, given the staffing level $\widehat{\ell_e}$ at exploitative firms. There is one wage where profits are equal in both sectors. We denote this wage by $\widehat{w}$, and note that it satisfies:

$$f(\widehat{\ell_e}) - s\widehat{\ell_e} - c(\widehat{\ell_e}) = f(\ell_c(w)) - w\ell_c(w). \tag{8}$$

If both types of firm exist, then profit maximization implies that w must equal $\widehat{w}$; otherwise, profits would be higher in one sector or the other.

Figure 1b graphs labor market demand and supply. Consider first the solid pair of lines in the Figure, which imply that, given p, expression (7) is satisfied when the competitive wage is $\widetilde{w}$. As drawn $\widetilde{w} > \widehat{w}$, so that at the wage that clears the labor market, exploitative profits exceed competitive profits. In this event, firms migrate to the exploitative sector, thereby causing p to rise. The rise in p reduces the aggregate demand for labor, since exploitative firms demand less labor than competitive firms.[8]

As labor demand decreases, so does the market-clearing wage. Migration toward the exploitative sector continues until the market clearing wage is low enough to eliminate excess profits in the exploitative sector, that is, until $\widetilde{w} = \widehat{w}$. See the dotted line in Figure 1b. Thus, p may be found as the solution to:

$$pL + (K - \frac{pL}{\widehat{\ell_e}})\ell_c(\widehat{w}) = L \tag{9}$$

[8] Since the difference between $\ell_c(w)$ and $\widehat{\ell_e}$ is larger the lower is w, the new labor demand curve is also steeper than the old one.

Denote by $\widetilde{p}$ the p that satisfies expression (9):

$$\widetilde{p} = \frac{\frac{\ell_c(\hat{w})}{\bar{\ell}} - 1}{\frac{\ell_c(\hat{w})}{\hat{\ell}_x} - 1} \tag{10}$$

Because $\ell_c(\hat{w}) > \bar{\ell} > \widehat{\ell}_e$, it is straightforward to show that $\tilde{p} < 1$.

Suppose we had started from a situation where the market-clearing wage, $\widetilde{w}$, was below $\widehat{w}$. In this instance, $\pi_c(\widetilde{w}) > \pi_e(\hat{\ell}_e)$, so firms would exit the exploitative sector for the competitive one. This would lower the probability of exploitation and cause labor demand to increase, causing $\widetilde{w}$ to rise. This migration would continue either until profit was equalized across sectors, or until all firms had migrated to the competitive sector. In the former event, $\widetilde{w} = \widehat{w}$ and $p = \tilde{p}$. In the latter, $p = 0$ and $\widetilde{w} \leq \widehat{w}$ is the solution to

$$\ell_c(\widetilde{w}) = \bar{\ell}.$$

From expression (8), we see that $\widehat{w}$ is determined completely by exogenous parameters of the model. This allows us to identify when there will be *no* exploitation.

Proposition 2 *If $\bar{\ell} > \ell_c(\widehat{w})$, then no firms exploit ($p = 0$) and $\widetilde{w} < \widehat{w}$.*

Proof. $\bar{\ell} > \ell_c(\widehat{w})$ implies $L > K\ell_c(\widehat{w})$ so that the market clearing wage, $\tilde{w}$, if all firms compete is less than $\widehat{w}$. But then $\pi_c(\tilde{w}) > \pi_e(\hat{\ell}_e)$. Since each firm's profit in the competitive sector is greater than the highest profit it can earn in exploitative sector, no firm exploits. ■

2.2 $\bar{\ell} \leq \widehat{\ell}_e$: All Firms Exploit

Proposition 3 *If $\bar{\ell} \leq \widehat{\ell}_e$, then every firm exploits its workers ($p = 1$).*

Proof. We show that if $\bar{\ell} \leq \widehat{\ell}_e$, then any firm that chose the competitive recruitment strategy over the exploitative one would fail to maximize profit.

If $\bar{\ell} \leq \widehat{\ell}_e$, then employment per exploitative firm, ℓ_e, will satisfy $\bar{\ell} \leq \ell_e \leq \widehat{\ell}_e$. We note that $\pi(\ell_e)$ increases over this range.

As noted in equation (4), $w = f'(\ell)$ for a competitive firm. A competitive firm's profit can therefore be written as

$$f(\ell) - f'(\ell)\ell,$$

which is increasing in ℓ. Given market-clearing and $\bar{\ell} \leq \widehat{\ell}_e$, any competitive firm must staff so that $\ell_c \leq \bar{\ell}$, and competitive-firm profit is highest if the exploitative sector leaves over enough workers so that $\ell_c = \bar{\ell}$ at each competitive firm. But exploitative-firm profit is higher, as can be seen by subtracting competitive-firm profit from exploitative-firm profit for the staffing level $\bar{\ell}$:

$$\left[f(\bar{\ell}) - s\bar{\ell} - c(\bar{\ell})\right] - \left[f(\bar{\ell}) - f'(\bar{\ell})\bar{\ell}\right] = -s\bar{\ell} - c(\bar{\ell}) + f'(\bar{\ell})\bar{\ell}.$$

Now since $\bar{\ell} \leq \widehat{\ell}_e$, $f'(\bar{\ell}) \geq s + c'(\bar{\ell})$. Therefore,

$$-s\bar{\ell} - c(\bar{\ell}) + f'(\bar{\ell})\bar{\ell} \geq -c(\bar{\ell}) + c'(\bar{\ell})\bar{\ell} > 0; \tag{11}$$

where the final inequality follows from the fact that

$$-c(\bar{\ell}) + c'(\bar{\ell})\bar{\ell} = \bar{\ell}\left[\frac{-c(\bar{\ell})}{\bar{\ell}} + c'(\bar{\ell})\right]. \tag{12}$$

The bracketed expression in expression (12) is the difference between marginal and average imprisonment cost, and is unambiguously positive because $c(\ell)$ is monotonically increasing in ℓ. Thus, if $\bar{\ell} \leq \widehat{\ell}_e$ it is always more profitable for any firm to exploit, all firms do, and the probability of exploitation faced by a child in the labor market is unity. ■

Proposition 3 says that if average labor supply per firm falls short of the desired employment of firms should they all choose to exploit, then all firms will exploit. Since average per-firm employment is $\bar{\ell}$ and all firms choose the same recruitment strategy, $\ell_e = \bar{\ell}$. Since $p = 1$, there is no supply of labor left over for the competitive sector, no competitive sector, and therefore, no well-defined competitive-sector wage.

For the sake of completeness, it is of some interest to ask what wage would cause a firm to consider switching to the competitive recruitment strategy. The answer to this question is the shadow competitive wage, w_s, and it satisfies $\pi_e(\bar{\ell}) = \pi_c(w_s)$, i.e.,

$$f(\bar{\ell}) - s\bar{\ell} - c(\bar{\ell}) = f(\ell_c(w_s)) - w_s\ell_c(w_s).$$

When exploitative firms are able to achieve their optimal staffing level, then $\widehat{w}$ is the highest wage consistent with the existence of any competitive firms. If $\ell_e = \bar{\ell} \leq \hat{\ell}_e$, then exploitative profits are no higher than at this optimal staffing level. The shadow competitive wage must therefore be higher than $\widehat{w}$. Thus, when all firms choose the exploitative strategy, it is because w_s is too high.

2.3 Summary

We summarize the results of our discussion of the firm side of the model with reference to the exogenously determined values $\hat{\ell}_e$ and $\hat{w}$. In expression (13), below, p and w (or w_s) are probability of exploitation and wage (or shadow wage) *outcomes* that clear the market and ensure that each firm is maximizing profit.

$$\begin{array}{lll} \text{Condition} & p \text{ is} & w \text{ (or } w_s\text{) satisfies} \\ \text{If } \bar{\ell} < \hat{\ell}_e & 1 & w_s > \hat{w} \\ \text{If } \hat{\ell}_e \leq \bar{\ell} \leq \ell_c(\widehat{w}) & \frac{\frac{\ell_c(\hat{w})}{\bar{\ell}}-1}{\frac{\ell_c(\hat{w})}{\hat{\ell}_x}-1} & w = \widehat{w} \\ \text{If } \bar{\ell} > \ell_c(\widehat{w}) & 0 & w = f'(\bar{\ell}) < \widehat{w} \end{array} \tag{13}$$

In developing the analysis of firm behavior, we have treated L, and therefore $\bar{\ell}$, as exogenous. These values are determined by household decisions. We turn to these decisions now.

3 Households

The key results of our model hold with any household preference structure where: (i) each household's utility is increasing in each of its children's utility; and, (ii) each child's utility is increasing in her consumption. The results we derive are not altered by considerations of an individual child's labor-leisure trade-off, or trade-offs that parents may make among their children; therefore, we can proceed most simply by analyzing the household's decision problem as if it sought simply to maximize the utility of an individual child, and as if that child only enjoys utility from the consumption of the single physical good.

Letting c be a child's consumption, s the amount she needs to consume to survive, and $0 \leq G < s$ the disutility from being gone from home, we write utility as:

$$U(c) = \begin{cases} 0 & if \quad c < s \\ c & if \quad c \geq s \\ c - G & if \quad c \geq s \text{ and gone.} \end{cases} \tag{14}$$

From their own income or wealth, parents provide Y toward the support of their child. The child is also endowed with one unit of time. If the child stays home, then her time can be converted into γ units of the consumption good. If she is sent into the market to work, then with probability p she will be captured into an exploitative job that pays s; with probability $1-p$, she finds a job that pays w. Parents take p and w as given.

In light of their constraints, parents choose either to keep their child at home, or to send her to the market to work, by evaluating

$$\max\{Y+\gamma, ps+(1-p)w-G\}. \tag{15}$$

If $ps+(1-p)w-G > Y+\gamma$, then the child goes to the market to work.

Assume that the number of households is normalized to one and that there is a non-degenerate distribution of non-child-related wealth across households, perhaps due to differences across household in parental human or physical capital ownership.[9] So long as parents' altruism toward their children is uncorrelated with their wealth, and because of our assumption on the household's preference structure, we know that parental contributions to child consumption will increase with non-child-related wealth. Households with greater wealth will make larger contributions. Let $A(Y)$ be the resulting continuous distribution of parental contributions.

It is easy to see from expression (15) that for given values of p and w there exists a unique value of Y, call it $\widetilde{Y}$, such that parents who can afford a contribution of $\widetilde{Y}$ will be indifferent between keeping their children at home or sending them into the market to work:

$$\widetilde{Y} = ps+(1-p)w-G-\gamma. \tag{16}$$

It is also easy to see that wealthier parents who can afford contributions larger than $\widetilde{Y}$ will keep their children at home, while poorer parents will send their children to out to the market to work.

Wealth allows parents to shield children from the risk of exploitation, but the poorest parents can never provide such a shield. If $Y < s-\gamma$, then it is impossible to provide home-based subsistence for a child, and even if exploitation is certain, the child will go into the market to work. This situation may arise in a household if (i) $s > \gamma$ by enough that a child's home production cannot make up the difference between a very small parental contribution and her subsistence needs; (ii) a household

[9] In earlier versions of this paper, we assumed no heterogeneity in contributions made by parents. The flavor of our results came instead from allowing non-exploited children to make labor-leisure trade-offs. In an adaptation of the household side of our model, Dessy and Pallage (2003) made the heterogeneity assumption we now make here. It turns out to make for a cleaner and more intuitive way to establish our points, and it was recommended by a referee. Unlike us either in earlier versions or now, Dessy and Pallage (2003) did not model the endogenous sorting of firms into exploitative and competitive sectors.

has a sufficiently high level of debt (negative wealth) so that the child ends up contributing to the household rather than vice versa; or (iii) some combination of the two. In our discussion going forward, we would like to allow for some segment of households who cannot provide for their children without sending the children out to work; however, it does not matter analytically which of the three situations just described causes this. For convenience, we rule out indebtedness and proceed by assuming that $A(Y)$ has a lower support of zero and that a child working at home is incapable of producing her own subsistence consumption bundle, i.e. $\gamma < s$.

We also assume that $A(s-\gamma) < K\ell_c(\hat{w})$. This parameterization ensures that all children in the labor market consume at least s. So while the poorest households must assume the risk of exploitation, they do not suffer the death of their children. From a technical standpoint, this parameterization also ensures that $A(Y)$ is stable. If we allowed poor children to die, we would have to update the distribution of parental contributions.

Since children are sent to work by every household with $Y < \widetilde{Y}$, the supply of children to the market is $A(\widetilde{Y})$; because the population of children is normalized to one, this is also the *market* labor force participation rate. The number of children per firm in the market is $A(\widetilde{Y})/K$. When the child-labor market clears, this is the same as the average staffing level per firm, so that

$$\bar{\ell} = \frac{A(ps + (1-p)w - G - \gamma)}{K}. \tag{17}$$

We emphasize that expression (17) was derived on the assumption of market clearing, and that it ensures that all households maximize utility given their constraints. It also shows that $\bar{\ell}$ is a function of only two endogenous variables: p and w.

4 Equilibrium

Expression (13) shows, for given aggregate labor supply, the probability of exploitation and the wage when profit maximization for all firms accompanies labor market clearing. Expression (17) shows for given p and w what aggregate labor supply is consistent with household utility maximization. Each expression contains three endogenous variables: p, w and $\bar{\ell}$. Equilibrium values of these variables, p^*, w^* and $\bar{\ell}^*$, satisfy each simultaneously. The equilibrium number of exploitative firms N^* may be recovered from the identity (6).

Because of the relationship of the wage to the conditions in expression (13), it is convenient to graph our equilibrium conditions in $(\bar{\ell}, p)$ space, in the plane $w = \widehat{w}$.

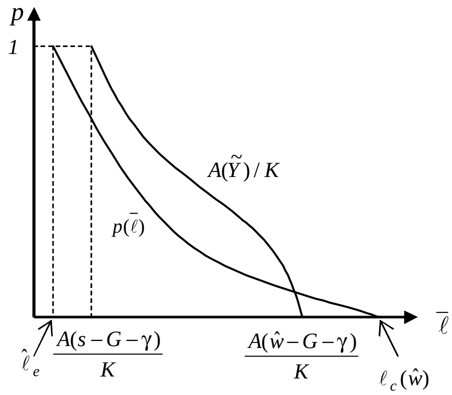

Figure 2

From expression (13), we cull the following function to graph

$$p(\bar{\ell}) = \begin{cases} 1, & \bar{\ell} < \widehat{\ell}_e \\ \frac{\frac{\ell_c(\hat{w})}{\bar{\ell}}-1}{\frac{\ell_c(\hat{w})}{\hat{\ell}_x}-1}, & \widehat{\ell}_e \leq \bar{\ell} \leq \ell_c(\widehat{w}) \\ 0, & \ell_c(\widehat{w}) < \bar{\ell} \end{cases} \tag{18}$$

The graph of this function is shown in Figure 2. The downward sloping portion of $p(\bar{\ell})$ follows because in the range where it occurs, increasing $\bar{\ell}$ leads to proportionally more children ending up employed in competitive firms. This is because exploitative firms are already staffed to their optimal levels and are earning their highest possible profits. Any extra children that show up at their doors are returned to the competitive labor market, putting downward pressure on the competitive wage and driving up competitive profits. Some exploitative firms then migrate to the competitive sector, and therefore the probability of exploitation falls.

Since we have assumed parameter values of the model such that $\widehat{w} > s$, expression (17) also implies an inverse relationship between $\bar{\ell}$ and p. As the risk of exploitation falls, some subset of the wealthier families who had formerly kept their children out of the market because of the risk of exploitation, now send their children into the market. The shape of the graph is governed by the shape of $A(.)$. For convenience, we will refer to this curve as the "household curve," in what follows.

The next three Propositions establish that an equilibrium always exists. The first two identify necessary and sufficient conditions for a "one-sector equilibrium," i.e., one in which either all firms exploit or all firms compete. The third shows that if no one-sector equilibrium exists, then there must be a "two-sector equilibrium" in which there are some of each type of firm.

Proposition 4 *An equilibrium exists in which $p^* = 1$ if and only if $\frac{A(s-G-\gamma)}{K} \leq \widehat{\ell}_e$.*

Proof. First we show that if $\frac{A(s-G-\gamma)}{K} \leq \widehat{\ell}_e$, then there is an equilibrium with $p = 1$. From expression (17), $p = 1$ implies $\bar{\ell} = \frac{A(s-G-\gamma)}{K}$. From expression (13), $\bar{\ell} = \frac{A(s-G-\gamma)}{K} \leq \widehat{\ell}_e$ implies $p(\bar{\ell}) = 1$.

On the other hand, if $\frac{A(s-G-\gamma)}{K} > \widehat{\ell}_e$, then since $p = 1$ implies $\bar{\ell} = \frac{A(s+G-\gamma)}{K}$, we know that $\bar{\ell} > \widehat{\ell}_e$, which by expression (13) implies p cannot be equal to unity. ■

Proposition 5 *An equilibrium exists in which $p^* = 0$, if and only if $\ell_c(\widehat{w}) \leq \frac{A(\widehat{w}-G-\gamma)}{K}$.*

Proof. If $\ell_c(\widehat{w}) \leq \frac{A(\widehat{w}-G-\gamma)}{K}$, then an equilibrium exists in which $p^* = 0$. To establish this, first we find the equilibrium wage when all firms are competitive; then, we show that at this wage and at $p = 0$, both the household and firm equilibrium conditions (expressions (17) and (13)) are satisfied.

Define $z(w) = \frac{A(w-G-\gamma)}{K} - \ell_c(w)$. $z(w)$ is continuous. $z(G+\gamma) < 0$, since $A(0) = 0$. $z(\widehat{w}) \geq 0$ by the condition of the proposition. By the continuity of $z(w)$, there exists a $G + \gamma < w' \leq \widehat{w}$ for which $z(w') = 0$, i.e., at which the labor market clears when all firms are competitive. Now we show that there is an equilibrium for the model in which $(p^*, w^*) = (0, w')$. For households: by expression (17), $(p, w) = (0, w')$ implies $\bar{\ell} = \frac{A(w'-G-\gamma)}{K}$. For firms: since $w' \leq \widehat{w}$, and $\frac{d\ell_c(w)}{dw} < 0$, it follows that $\ell_c(w') \geq \ell_c(\widehat{w})$. Since $\ell_c(w') = \bar{\ell}$, we have $\ell_c(\widehat{w}) \leq \bar{\ell}$. By expression (13), this implies $p^* = 0$.

On the other hand, if $\ell_c(\widehat{w}) > \frac{A(\widehat{w}-G-\gamma)}{K}$, then an equilibrium does not exist in which $p^* = 0$. If $p = 0$, then $\bar{\ell} = \frac{A(w'-G-\gamma)}{K} < \ell_c(\widehat{w})$. Expression (13) implies that in this event, p must be greater than zero. ■

Proposition 6 *If a one-sector equilibrium does not exist, then a two-sector equilibrium* must *exist.*

Proof. We start by using expression (18) to substitute out for p in expression (17); then, we define

$$h(\bar{\ell}, w) = \begin{cases} \bar{\ell} - \frac{A(s-G-\gamma)}{K}, & \bar{\ell} < \hat{\ell}_e \\ \bar{\ell} - \frac{A\left(\frac{\frac{\ell_c(\hat{w})}{\bar{\ell}}-1}{\frac{\ell_c(\hat{w})}{\hat{\ell}_x}-1}[s-w]+w-G-\gamma\right)}{K}, & \hat{\ell}_e \leq \bar{\ell} \leq \ell_c(\hat{w}) \\ \bar{\ell} - \frac{A(w-G-\gamma)}{K}, & \ell_c(\hat{w}) < \bar{\ell} \end{cases}$$

Assume that a one-sector equilibrium does not exist. Any remaining candidate for $\bar{\ell}^*$ must satisfy $\hat{\ell}_e \leq \bar{\ell}^* \leq \ell_c(\hat{w})$. In that range, expression (13) tells us that firm-side equilibrium behavior *requires* that $w = \hat{w}$. We note that $h(\bar{\ell}, \hat{w})$ varies in $\bar{\ell}$ only and is continuous. We now show that it has a fixed point somewhere in the range of candidate values for $\bar{\ell}^*$. First, note that

$$h(\hat{\ell}_e, \hat{w}) = \hat{\ell}_e - \frac{A(s-G-\gamma)}{K} < 0; \tag{19}$$

because, $\hat{\ell}_e \geq \frac{A(s-G-\gamma)}{K}$ would be the case in an equilibrium where all firms exploit, and we have assumed that equilibrium does not exist. Now note that

$$h(\ell_c(\hat{w}), \hat{w}) = \ell_c(\hat{w}) - \frac{A(\hat{w}-G-\gamma)}{K} > 0; \tag{20}$$

because, $\ell_c(\hat{w}) \leq \frac{A(\hat{w}-G-\gamma)}{K}$ would be the case in an equilibrium when all firms compete, and we have assumed that equilibrium does not exist. Because of expressions (19), (20) and continuity, $h(\bar{\ell}, \hat{w})$ *must* have a fixed point in the interval $(\hat{\ell}_e, \ell_c(\hat{w}))$. ■

Although Figure 2 shows a unique equilibrium, the model may exhibit multiple equilibria. Such a possibility is shown in Figure 3. This Figure shows a pair of two-sector equilibria (A and B).[10] The values of p^* and of $\bar{\ell}^*$ associated with the two-sector equilibria can be read directly off the Figure. In addition, since in the Figure, $\ell_c(\hat{w}) < \frac{A(\hat{w}-G-\gamma)}{K}$, we know by Proposition 5 that there is also a third equilibrium in

[10] Only the equilibrium "A" is stable. Starting from "B," suppose some firms decide to switch to the competitive sector. This decrease in p would cause a larger increase in labor force participation than needed by the new competitive firms because the curve that shows labor force participation lies to the right of the $p(\bar{\ell})$ curve. Competitive profits would rise relative to exploitative profits, and more firms would exit the exploitative sector. Since the labor force participation curve is still to the right of the $p(\bar{\ell})$ curve, this process would continue until $p = 0$.

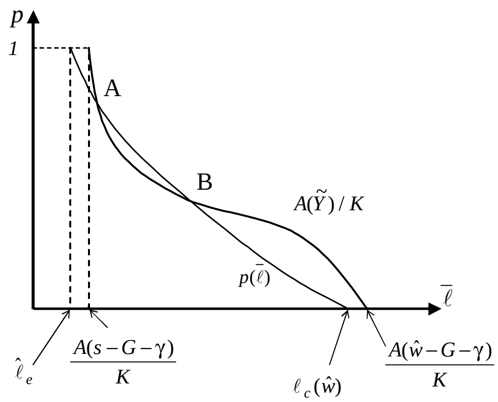

Figure 3

which $p^* = 0$. We cannot label this equilibrium on the Figure, because this Figure graphs p and $\bar{\ell}$ in the plane $w = \widehat{w}$. However, by expression (13), we know that the wage (w^*) associated with the $p^* = 0$ equilibrium will be lower than $\widehat{w}$.

Figure 3 shows a situation in which a coordination failure could be responsible for an equilibrium in which children are exploited in the labor market. If a sufficiently large number of firms could be persuaded to adopt the competitive recruitment strategy, an economy that started out in equilibrium "A" could move to the $p^* = 0$ equilibrium. However, there is no incentive for any individual firm to make the move on its own. In the absence of any coordinating mechanism, an economy that starts out at equilibrium "A" remains there.

5 Policy Analysis

A regulatory system of inspections and fines is a common strategy for addressing child labor. In this section we explore the effects of such a system, and some issues related to its enforcement. From this point onwards, we assume the economy is at an equilibrium in which $1 > p^* > 0$, so that $\ell_e = \widehat{\ell_e}$ and some of the children in the labor market are exploited.[11]

[11] Our results generalize to the case where $p^* = 1$, but require additional explanations.

5.1 Legal Intervention Targeted on Exploitative Child Labor

Suppose firms are randomly inspected, and if exploitative child labor is detected, then a fine per-child exploited is levied on the guilty firm. We do not model the process determining inspections and fines explicitly, but instead assume that in tandem the two lead to an *expected* fine of x per child. The revised profit function for an exploitative firm is

$$\pi_e(x) = \max_{\ell_e} f(\ell_e) - (s + x)\ell_e - c(\ell_e), \tag{21}$$

while profit if the firm chooses to compete is still given by

$$\pi_c(w) = \max_{\ell_c} f(\ell_c) - w\ell_c.$$

5.1.1 Eliminating Exploitative Child Labor

It is straightforward to show that the optimal employment level for an exploitative firm, $\hat{\ell}_e$, is a decreasing function of x. The legal intervention raises the expected costs of capturing a worker, so an exploitative firm does not want to capture as many of them. The profits of exploitative firms also are decreasing in x. When the expected fine, x, is imposed, firms will therefore begin to exit that sector and move to the competitive sector. As more firms join the competitive sector, the aggregate demand for labor will increase, because competitive firms demand more labor than exploitative firms. As a result, the competitive wage will rise, until profits are again equalized across sectors.

Figure 4 shows how an increase in x affects the probability of exploitation and labor force participation. In this Figure, the dashed lines show the pre-regulatory equilibrium, and the solid lines show the effects of regulation. Through its effect on the competitive wage, the regulatory system has the immediate impact of raising the expected value of market work, and thereby bringing more workers into the market labor force (increasing $\bar{\ell}$). In terms of Figure 4, there is a rightward rotation of the household curve around the point $p = 1$. For firms, an increase in x causes exit from the exploitative sector. For given $\bar{\ell}$, there is a downward shift of the $p(\bar{\ell})$ curve. As a result of both shifts, the new equilibrium point is to the southeast of the original equilibrium: $\bar{\ell}$ rises, and p falls.

It is clear from Figure 4 that it is possible to find an expected fine, x, that is large enough that the household curve is everywhere to the right of the $p(\bar{\ell})$ curve. In this event, the only possible equilibrium will be the one in which $p^* = 0$. We denote by x_0 the minimum fine necessary to eliminate all equilibria in which children are exploited.

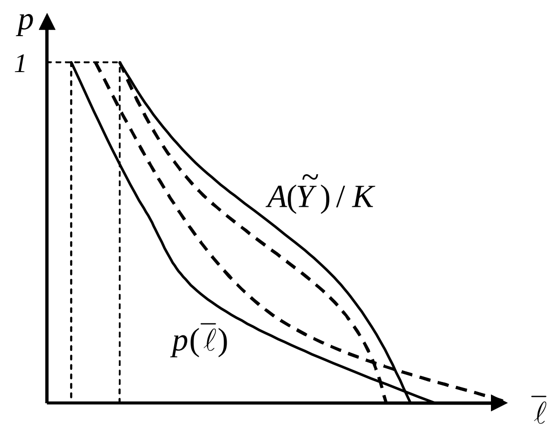

Figure 4

5.1.2 Welfare Impacts

A regulatory system that leads to the expected fine x_0 is potentially Pareto improving, because it leaves a competitive (efficient) equilibrium as the only possible one. However, absent an additional program of redistribution, the system may not benefit all agents in the economy. We now examine the effects on firm profits and on child welfare of moving from $x = 0$ to $x = x_0$.

Because competitive profits are inversely related to the competitive wage, we know that imposing x_0 will make firms better off if the resulting equilibrium competitive wage, which we denote by $w^*(x_0)$, is lower than the pre-regulatory competitive wage, $w^* = \widehat{w}$. Firms that were competitive before regulation will be better off because their profits will have risen, and firms that join the competitive sector as a result of regulation will be better off, since in the pre-regulatory equilibrium they had the same profits as the competitive firms.

We now see whether $w^*(x_0)$, is greater than or less than w^*. If all firms were competitive, then the aggregate supply of labor would, for any wage w, be equal to $A(w - G - \gamma)$. The aggregate demand for labor would equal $K\ell_c(w)$. $w^*(x_0)$ is therefore defined implicitly by the market-clearing expression $A(w^*(x_0) - G - \gamma) =$

$K\ell_c(w^*(x_0))$. It is straightforward to show that a unique $w^*(x_0)$ exists that satisfies this expression. Such a demonstration was in the proof of Proposition 5.

Suppose that the pre-regulation equilibrium was one of multiple equilibria, and that another equilibrium existed in which $p^* = 0$. By Proposition 5, a $p^* = 0$ equilibrium exists when $A(\widehat{w} - G - \gamma) \geq K\ell_c(\widehat{w})$. In this equilibrium, the wage would be equal to $w^*(x_0)$. Furthermore, $w^*(x_0) \leq \widehat{w} = w^*$. Thus, although some coordination failure may have led the economy to the two-sector equilibrium, the $p^* = 0$ equilibrium would have led to higher profits. In this case, legal intervention accomplishes the coordination that was impossible before.

Now suppose that the pre-regulatory competitive equilibrium did not exist: $A(\widehat{w} - G - \gamma) < K\ell_c(\widehat{w})$. When regulation causes firms to exit the exploitative sector, there is a chronic excess demand for labor at wage $\widehat{w} = w^*$, so that the wage must rise to clear the labor market. If regulation forces a competitive equilibrium that was not possible without government intervention, it causes firm profits to fall.

Next, let us consider how the welfare of children would be affected by imposing the expected fine x_0. The children who stayed out of the market labor force would be no worse off, because nothing would have changed about the returns to remaining out of the labor force. Among the children who were in the labor force before regulation, those who had been exploited would clearly be made no worse off, because they would be released from exploitation (and their wage cannot fall lower than subsistence). The children who were working in the competitive sector could either gain or lose, depending on what happens to the wage. These children would lose when the post-regulatory competitive wage is lower than before the regulation, and would gain when it is higher.

We now consider what happens to child welfare *on average*. The value of staying out of the market, $U(Y+\gamma) = Y+\gamma$, is clearly unaffected by x. However, x does affect the expected value of market entry, $ps+(1-p)w - G$. Average child welfare increases with increases in this expected value. Since $\tilde{Y}+\gamma = ps+(1-p)w - G$, this expected value rises if and only if child labor force participation, $A(ps + (1 - p)w - G - \gamma)$, also rises. Therefore, we can show that the regulatory system *enhances* overall child welfare by establishing the following Proposition.

Proposition 7 *A legal intervention that eliminates exploitative child labor increases the market labor force participation rate of children.*

Proof. $A(p^*s+(1-p^*)w-G-\gamma)$ is the aggregate supply of labor, for any competitive wage and for $p = p^*$. The legal intervention drives p to zero. When this happens, then the supply of labor, at every w, becomes $A(w - G - \gamma)$. For any $w > s$,

$A(w-G-\gamma) > A(p^*s+(1-p^*)w-G-\gamma)$: the supply of labor increases following the legal intervention.

The aggregate demand for labor, as a function of w, is equal to $N^*\ell_e + (K - N^*)\ell_c(w)$. When N is driven to zero by regulatory policy, aggregate labor demand, as a function of w, becomes $K\ell_c(w)$. So long as $\ell_c(w) > \ell_e$, $K\ell_c(w) > N^*\ell_e + (K - N^*)\ell_c(w)$. We know that starting from an equilibrium with exploitation, $\ell_c(w) > \ell_e$.

Since for any competitive wage, both the demand and the supply of labor rise, a regulatory policy that eliminates exploitation must raise equilibrium labor force participation. ■

5.2 Enforcement Issues

We now address four issues related to the enforcement of the regulatory intervention just described. The first is whether a permanent institutional structure is needed. The second is whether capital flight can undermine the effectiveness of the legal intervention. The third is whether regulation is counterproductive if enforcement is imperfect, that is, in the event that $x \geq x_0$ cannot be achieved. Finally, we show what happens if, due to problems in distinguishing exploitative child labor from other child labor, regulatory policy also targets some child labor that is not truly exploitative.

5.2.1 On the Need for a Permanent Regulatory Institution

We have seen that it is possible for an equilibrium with $p^* = 0$ to exist in the absence of regulation. If an enforcement institution manages to move the economy to that equilibrium, then it will become unnecessary for the enforcement institution to continue to exist. Profits are higher when $p^* = 0$ than in the two-sector equilibrium, so there is no incentive for any firm to exploit its workers. Hence, firms will be happy to remain competitive. A temporary regulatory system thus reproduces the solution firms would reach if they could coordinate in choosing their recruitment strategies.

If the $p^* = 0$ equilibrium does not exist in the absence of regulation, then a permanent enforcement institution will be necessary. In this instance, firms have an incentive to try to find ways to lower their expected costs of punishment from exploitation. It is likely to be the case that maintaining a credible threat of punishment for exploitative practices will involve the actual punishment of some violator from time to time, and this will likely require a permanent institutional enforcement infrastructure.

5.2.2 Capital Flight

An assumption that has been implicit in our analysis thus far is that capital is internationally immobile. Imperfect capital mobility is a fact in poor countries, where concerns about exploitative child labor are also raised.[12] However, the leap from capital being imperfectly mobile to our assumption that it is completely immobile may seem heroic, and so we now discuss how capital mobility affects our conclusions. It turns out that capital flows (inflows or flight) will not undermine our main results.

We begin by assuming that a pre-regulatory $p^* = 0$ equilibrium exists, but that the equilibrium observed had both exploitative and competitive firms. One of the outcomes of legal intervention in that case is to increase profits. Starting, before the intervention, with an initial equilibrium allocation of firms worldwide, an increase in profits for firms in the country that imposes x_0 would be likely to attract capital from the rest of the world, so that K would increase. The increase in K would raise the demand for labor, increasing the market-clearing wage, and reducing the gain in profits. Should capital arrive in sufficient quantity to drive profits to their pre-regulation levels,[13] there would be no further incentive for capital inflows. But in this event, competitive-sector profits would still exceed profits from becoming exploitative, since x_0 reduced exploitative profits relative to their pre-regulatory levels. Owners of capital would be no worse off than before x_0 was imposed, and the wage would be the same as before. Children who had been exploited would be better off. The new equilibrium would thus be one with an even higher labor force participation (than if capital flows were not allowed) and in which welfare did not decline for any group within the country.

Now let us consider the case where a pre-regulatory $p^* = 0$ equilibrium does not exist. We have already established that in this case, setting $x = x_0$ would reduce competitive profits as a side effect of driving exploitative firms out of existence. If profits were higher in the rest of the world, capital would then have an incentive to flee. A decline in the demand for labor would be the immediate consequence of capital flight, and as a result the wage would fall. The decline in the wage would reduce the decline in competitive profits. Should capital flee to the point where profits climbed back to their pre-regulatory level, the $p^* = 0$ equilibrium would become sustainable: although the $p^* = 0$, $x = 0$ equilibrium did not exist before the capital flight occurred, if enough firms depart, the equilibrium will exist. In terms

[12] In a survey of the literature on capital controls, Barry Eichengreen (2001) notes that there is a robust negative relation between restrictions on capital flows and per-capita income. R. Barry Johnston and Natalia T. Tamirisa (1998) document the pervasiveness of these controls in developing countries.

[13] This could occur if the economy was small and capital mobility was perfect.

of the model's notation, prior to regulation, the $p^* = 0$ equilibrium did not exist because (by assumption) $K\ell_c(\widehat{w}) > A(\widehat{w} - G - \gamma)$ so that $K > A(\widehat{w} - G - \gamma)/\ell_c(\widehat{w})$. Following regulation, if K falls to the point where it equals $A(\widehat{w} - G - \gamma)/\ell_c(\widehat{w})$, then $p^* = 0$ will be an equilibrium. The country that imposes the fine eliminates the need for a permanent regulatory institution. The overall welfare effects of regulation are positive: capital owners do not suffer; and since w^* has not changed, the reduction in p^* leads to an increase in market labor force participation of children.

5.2.3 Incomplete Elimination of the Risk of Exploitation

Because it is not always the case that firms benefit from regulation, behaviors such as trying to "hide" exploited children, bribing inspectors to "look the other way," or the exertion by employers of political pressure to under finance enforcement institutions, are plausible concerns. Suppose that some of these behaviors make it impossible for the regulatory system to sustain x_0. Might it be better for the enforcement institution not to try at all if it can only maintain $x \in (0, x_0)$?

Dessy and Pallage (2003) ask a very similar question. To answer it, they consider basically the same modelling of households we use here, but do not model the sorting of firms into the two sectors, and so neither the number of exploitative firms nor the probability of exploitation are equilibrium outcomes. Instead, the probability of exploitation is a government policy instrument, which traffickers in children accept as a constraint on their activities. Dessy and Pallage show that a decrease of the probability that fails to prevent all exploitation (that is, to achieve $p^* = 0$) could increase the number of children exploited. This is because lowering the probability of exploitation draws more children into the market labor force. In our notation, even though p falls, $pA(\tilde{Y})$ may go up. If the basic objective is to remove children from exploitation, "imperfectly enforced" regulation could therefore be undesirable.

In our model, in which the optimal employment and sectoral decisions of firms determine of p^* and N^* endogenously, the concern Dessy and Pallage raise does not arise. The enforcement action that reduces p is an increase in x. When x is increased, both $\hat{\ell}_e$ and exploitative-sector profits decrease. Firms exit the exploitative sector, so N falls. A rise in p is thus associated, in equilibrium, with a fall in both N and in $\hat{\ell}_e$. Therefore, $pA(\tilde{Y}) = N\hat{\ell}_e$ has to fall.

We conclude that any efforts at enforcement that raise above zero the expected fine exploitative firms expect to pay can do no harm to exploited children. The less "imperfect" the enforcement is, the better; but there is no harm in any level of enforcement effort, or in any increase in enforcement effort.

5.2.4 Imperfect Targeting

Finally, we consider the effects of enforcement efforts that are not limited to child labor that is truly exploitative. One motivation for this exercise is the possibility that the regulatory authorities make mistakes in distinguishing child labor that is exploitative from child labor that is not. Another, probably more pertinent, is that a mistake is made in the way exploitative child labor is defined. For example, ILO Convention 182 (Article 4) allows individual countries considerable leeway in determining what child labor qualifies as harmful to "the health, safety, or morals of children." If that work which a country deems harmful is treated as exploitative when it truly is not, then a legal approach targeted on exploitative child labor will, because of a definitional error, also impose penalties on some non-exploitative employers of child workers. It is the impact of imposing these penalties on non-exploitative employers that we consider now.

Let us again assume the economy starts out in an unregulated two-sector equilibrium. We consider the impact of imposing the expected fine, x_e on exploitative firms, and x_c on competitive firms. In what follows we suppose the expected fines can be set independently for each sector, although the analysis is very easy to modify to allow for a relationship between the two expected fines. One scenario we have in mind is that conditional on being charged with exploitation, the fine is the same for all firms that are "caught" by inspectors. However, truly exploitative child labor is obvious, while there may be some uncertainty about whether other child labor is exploitative. Therefore, the probability that an inspection will lead to a fine being levied is greater when exploitative firms are visited. This means that $x_e > x_c$.

With the possibility of a fine, competitive-firm profits are equal to:

$$\pi_c(w, x_c) = \max_{\ell_c} f(\ell_c) - (w + x_c)\ell_c,$$

while exploitative-firm profits are exactly as shown in expression (21), with x_e replacing x.

Now consider the effect on the competitive and exploitative sectors of expected fines $dx_e > 0$ and $dx_c > 0$, *taking labor force participation $A(\tilde{Y})$ as given.* The fines reduce labor demand and profits in *both* sectors of the labor market, but always lead to movement of firms out of the exploitative sector and into the competitive sector. The reason is that in the absence of any such movement, the fall in aggregate labor demand would depress the competitive wage. Since the demand for labor by exploitative firms is unresponsive to this wage, the competitive sector would have to absorb all of the excess supply of labor resulting from the reduced labor demand. The competitive wage would therefore have to fall by more than x_c rose. However, if this were to happen, then competitive-firm profit would be higher than exploitative-firm profit. Firm migration from the exploitative to the competitive sector then works toward restoring labor demand and continues until profits are again the same in both sectors.[14]

As the regulatory systems leads to fewer exploitative firms and a lower staffing level at each, the probability of exploitation implied by the firms side of the model also falls. We can see explicitly that p must fall (given $A(\tilde{Y})$), by returning to the expressions that determine the two-sector market-clearing and profit-maximizing values of p and w. Those expressions are

$$\pi_c(w, x_c) = \pi_e(\ell_e(x_e)), \text{ and} \tag{22}$$

$$(K - \frac{pA(\widehat{Y})}{\ell_e(x_e)})\ell_c(w + x_c) = (1-p)A(\tilde{Y}) \tag{23}$$

Applying the implicit function theorem to these expressions , we get that imposing $dx_e > 0$, $dx_c > 0$ from a pre-regulatory two-sector equilibrium,[15]

$$\frac{dp}{p} = \left[\frac{N\ell_c \frac{\partial\ell_e/\partial x_e}{\ell_e} + (K-N)\ell_e \frac{\partial\ell_c/\partial x_c}{\ell_c}}{N(\ell_c - \ell_e)}\right] dx_e \tag{24}$$

The bracketed term in expression (24) is negative, so increases in x_e and in x_c reduce the probability of exploitation. Note that the competitive-sector fine does not affect dp directly: if x_c alone rose, the competitive wage would fall so as to completely offset any effects on competitive profits.

A straightforward way to predict whether the competitive equilibrium wage rises or falls is to recall that firms switch sectors until profits have been equalized in both sectors. Differentiating expression (22), we then have:

$$dw = \frac{1}{\ell_c}\left[\ell_e dx_e - \ell_c dx_c\right]$$

If $\ell_e dx_e < \ell_c dx_c$, then $dw < 0$. This means that the aforementioned movement of firms into the competitive sector concludes before the resulting rise in labor demand drives the wage all of the way up to its original value. When $\ell_e dx_e < \ell_c dx_c$, a competitive firm expects to pay a heftier total fine for using child labor than does

[14] Profit per firms is again the same in both sectors, but it is lower than it was before regulation.

[15] We use the fact that $\frac{\partial\ell_c}{\partial w} = \frac{\partial\ell_c}{\partial x_c}$ to derive equation (24).

an exploitative one. This would be consistent with authorities using a very broad definition of "exploitative," and fining many competitive-sector firms. This could also occur if exploitative firms were better-hidden than competitive ones, so that a random inspection procedure caught (and therefore fined) more competitive firms than exploitative firms. In the opposite case ($\ell_e dx_e > \ell_c dx_c$), there is enough entry into the competitive sector to drive the equilibrium wage higher than in the pre-regulatory equilibrium.

The preceding analysis of the effects of imperfectly-targeted enforcement held labor force participation fixed. For households, the effect of the regulations on labor force participation will depend on whether the wage rose or fell. In the event that the wage rose, the equilibrium effect of the regulations is exactly the same as in the case depicted in Figure 4, in which $dx_e = dx > 0$, and $dx_c = 0$.

The welfare effects of regulation are more nuanced when the fines cause the equilibrium wage to fall. In this event, labor force participation will fall for given p, and could well be lower in the new equilibrium. Average child welfare falls with declines in market labor force participation. Compared to when there is no enforcement, so long as firms continue to operate, formerly exploited child laborers are made better off; but not to the extent they would have been with enforcement targeted on exploitative work. But for some exploited children, even this welfare improvement disappears if the regulatory system manages to eliminate all work by children. In that case, the poorest children die.

6 Conclusion

Child labor laws should aim to protect children who work, instead of trying to remove children from work. In this paper, we show that a targeted legal intervention to eliminate work that is truly exploitative of children can benefit all children, and that this benefit is observed in the form of more children working. Our key assumptions for generating this result are that parents decide for each child based on their child's best interest, that parents face imperfect information about the risks their children face upon entering the labor market, and that firms may choose to exploit this information imperfection by employing children under forced-labor-type conditions. Because of these assumptions, the risk of exploitation lowers the expected benefit of child labor to a child, and therefore suppresses child labor force participation. Targeted legal intervention that lowers or removes this risk *raises* children's participation in the labor market, child welfare, and overall societal welfare. We also saw that legal intervention that is targeted on child labor more broadly can *reduce* child labor force participation, child welfare, and overall societal welfare.

An alternative way of viewing our results is to note that they imply that if a legal intervention is imposed to reduce exploitative child labor and it causes child participation in the market labor force to go down, the intervention needs to be narrowed in its targeting so that less child labor is included. This view contains useful guidance for policymakers and researchers because what constitutes exploitative child labor is in fact not known with certainty, and efforts are on going to define it. These efforts proceed concurrently with legal and other strategies to "combat" it, and therefore what we propose is a way to use the results of using a legal strategy to better define what exploitative child labor is.[16]

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[16] In addition to the obvious warning that care needs to be taken to disentangle the causal impact of the legal strategy from that of other efforts, it is important note that our conception of market labor force participation may require adjustment to officially reported labor force participation rates in some countries. We give two examples to illustrate why. Under some circumstances, work that a child does at home for subsistence may qualify the child as a labor force participant, particularly if the product of some of that work is sold or traded to someone outside the child's household. These children would have to be removed from the official measure of the labor force to get to the measure we propose. As another example, note that if children are stolen outright into exploitative child labor (rather than tricked) it is no longer clear that labor force participation will increase with decreased exploitative child labor. If the exploited children were also forced labor force entrants, not just forced into exploitative jobs, they may choose to leave the labor force when exploitation ceases. Meanwhile, if children in non-exploitative situations were never at risk for it, the removal of exploitation would not affect their subsequent labor force participation decisions. But if at least some exploitative child labor results from trickery, then the baseline should be measured net of the "forced" child laborers, and the insights in the text apply.

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