# Why is Child Labor Illegal? (Preliminary Version) 

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#### Abstract

This paper develops a theory linking income inequality to the emergence of laws restricting child labor, via the political process. If parents are unable to commit to educating their children, child-labor laws can increase welfare in an ex ante sense if the wages of parents fall within an intermediate interval. On the basis of an empirical analysis of Latin-American household surveys, we demonstrate that median income in the country of residence does indeed have large and significant effects on child labor decisions, even after controlling for other household characteristics.


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## 1. Introduction

Empirical studies of inequality and GDP growth rates across countries seem to agree that there is a strong relationship, but that the relation is complicated and not satisfactorily explained by existing theories. For instance, ? finds higher inequality tends to retard growth in poor countries, encourage it in rich ones. Political explanations of this relationship are quite popular; ? show that under majority voting over tax rates, higher inequality leads to higher rates of redistribution. Standard theory suggests this will retard growth rates by discouraging investment, as in ?. Empirical studies however, summarized in ? show that redistribution is actually positively related to growth rates, refuting this simple explanation.

Nevertheless, it is plausible that the political mechanism is important for other reasons, perhaps because it creates an environment favorable to human capital accumulation; for instance, schools and laws favoring investment in skills. Clearly subsidized education can benefit poor people if they are borrowing constrained, and lead to higher growth rates, as in ? and ?. This type of mechanism has been explored by ? who argues that the effect of income inequality on growth rates will depend on the level of income, and ?, who find that public provision of education reduces growth rates.

This paper explores another connection between politics and human capital: child- labor legislation, or what turns out to be almost equivalent, legislation compelling education for children. Until a little more than 150 years ago, child labor was a common practice in most countries, including the US and Great Britain. As today in poor countries, the children of poor parents were likely to spend little time in education and instead work in paid employment outside the home, or in a family business, such as agriculture or a cottage industry. Equivalently, children were also likely to devote their time to domestic work, enabling parents to spend more time in labor outside the home. In India today, ? has estimated that children's contributions to the household often constitute as much as $25 \%$ of the household's income, per child.
? show that only after the incidence of child labor had already begun to decline, in 1833, a time when 36.6 \% of boys aged 10-14 were working, did Britain pass legislation
restricting child labor. This, as well as the observation by ? that higher wages for fathers in Philadelphia in the late 19th century reduced the probability of child labor, suggest that the forces driving child labor in poor countries today are fundamentally similar to those experienced by the US and England in the 19th century.

Today, countries with relatively high incomes all have laws banning or restricting child labor. The ILO convention C138 against child labor has been ratified by 89 countries, indicating opposition to child labor generally among these countries. In Figure 1, we present the results of a regression for 54 countries for which the UN has reported positive child-labor rates: we see that child labor around the world is negatively related to GDP per capita. In fact, variation in GDP explains $68 \%$ of the variance in child-labor rates among these countries.

Yet it is not clear from the current state of economic theory why full-time education of children should be compulsory. Indeed, given standard versions of the economic theory of the household, as in ? and ?, in which altruistic parents only send their children to work when this enhances the welfare of the family, laws against child labor can only reduce the welfare of households, particularly those so poor that children's income is essential for survival. Of course it is always possible to explain such laws by appealing to inter-dependent preferences, such that the welfare of other people's children enter the utility of all adults, but the point of the theory developed here is that more direct routes are possible, with clear empirical implications.

The hypothesis of this paper is that parents have time-inconsistent preferences, of the type familiar from ?, described as 'quasi-geometric' by ?. As in ? and ?, parents face a trade-off between education of their children and household income. The proposed theory differs from the existing literature on parental investment in that parents are unable to commit to educating their children, because they are more impatient between today and tomorrow than they are between adjacent periods further in the future. Hence parents suffer from a "self-control" problem, and do not generally invest as much in the education of their children as they would were they able to commit to an education plan at the time that their
children are born. In such an environment, child-labor laws may increase the welfare of poor households in an ex ante sense by allowing parents to achieve a higher level of education for their children than they would be able to achieve with an unconstrained choice set. A related argument is made by ? regarding time limits on welfare in the U.S.

The assumptions of the model imply that only when parents have wage levels in an intermediate interval will child-labor restrictions make them better off; low-wage parents are worse off and high-wage parents are indifferent. This suggests a simple model of child-labor laws in which a country is composed of parents who differ by their education and hence skill levels. Initially, most parents are too poor to even desire a full-time education for their child. Over time, skill levels and hence parental wages may increase; at the moment when the parent with the median skill level enters the wage interval defined above, a majority of the adult population would favor legislation compelling full-time education of all children, or other restrictions on child labor.

Recent theories of child labor in the literature include ? and ?, but these models do not imply a theory of the emergence of child-labor laws. Other approaches to analysing child labor however could also yield a theory of child-labor laws. For instance ?, rely on the hypothesis of multiple equilibria in the market for unskilled labor to explain why in some countries banning child-labor could be welfare-enhancing. To the extent that child labor and adult labor are substitutes, a poverty-induced massive participation of children in the labor force may contribute to a decline in adult wages, thus maintaining in place the forces that perpetuate poverty and child labor. It is not clear however what the empirical implications for child labor laws would be of such an approach; poor countries would seem to benefit equally from banning child-labor, so an explanation of the tolerance of child labor in these countries would be required.

An alternative type of justification of child labor laws could rely on society-wide externalities in human capital accumulation, of the type suggested by?. If parents do not capture the full benefit of educating their children, perhaps because the average education level of the workforce raises the returns to education or capital, then households gain from legislation
compelling the education of the children of all other households. The optimal minimum level of education is then likely to be increasing in the country's per capita GDP and hence this explanation is consistent with educational standards increasing as countries become richer. As we show below, a problem with this type of explanation is it would imply a strong negative correlation between the return to skill and the rate of child labor, a correlation that does not hold in our Latin American data.

In the sections that follow, we present first a formal development of the model, then a simple parameterisation that yields an empirically verifiable condition for the adoption of labor laws under the assumption of a decisive median voter. We then apply the theory to the analysis of Latin-American household data.

## 2. The Parental Decision Model

Consider an economy where agents live for $2 T+1$ periods, the first $T$ as children, and then $T+1$ periods as parents with one child born when the parent is aged $T$. Children may become workers from the age of one period, i.e. when the parent is aged $T+1$, with an endowment of human capital $h_{0}^{1}$. Their human capital on attaining adulthood at period $T$ is given by $h_{T}^{1}$, which depends on the fraction $e_{t}$ of their time they have allocated to their education at each age. This allocation is decided by the parent. The child's human capital variable $h_{t}^{1}$ evolves deterministically according to the function:

$$
\begin{equation*}
h_{t+1}^{1}=\phi\left(h_{t}^{1}, e_{t}\right) \tag{2.1}
\end{equation*}
$$

Parents get utility $u\left(c_{\tau}\right)$ from their own consumption in each period $\tau$ of their own finite lives and utility $\nu\left(h_{T}^{1}\right)$ in the final period of life from the final level $h_{T}^{1}$ of their children's education. Parent's discount factors for future utility are quasi-geometric; the discount factor between adjacent future periods is $\beta \in(0,1)$, but between the present and the immediate future, the discount factor is $\beta \delta \in(0, \beta)$. Preferences take the following time-separable form:

$$
U_{0}=u\left(c_{0}\right)+\delta\left[\beta^{T} \nu\left(h_{T}^{1}\right)+\sum_{\tau=1}^{T} \beta^{\tau} u\left(c_{\tau}\right)\right]
$$

Parent's earnings depend on their own human capital $h_{p}$ and on the adult wage $w_{a}$, which is the same for all households. Children's labor income depends on the child wage $w_{t}^{c}$, which is not a function of the child's human capital ${ }^{1}$, and on the fraction of time $\left(1-e_{t}\right)$ the child works in period $t$. In accordance with previous literature, such as ?, it is assumed that the child's wage converges from below to that of the unskilled adult. The child's wage evolves according to:

$$
w_{t}^{c}=(1+\gamma) w_{t-1}^{c}=(1+\gamma)^{t-1} w_{1}^{c}
$$

where the wage for a child aged one is given by $w_{1}^{c}=\lambda_{1} w_{a}, 0<\gamma<1$ and $0<\lambda_{1}<1$.
In each period $t \leq T$, parental consumption is constrained by the total household labor income, which is equal to the sum of parental labor income and that of the child:

$$
\begin{equation*}
c_{t} \leq w_{a} h_{0}+w_{t}^{c}\left(1-e_{t}\right) \tag{2.2}
\end{equation*}
$$

This parental budget constraint implies that the only cost of educating children in this environment is the household income foregone from child labor sources, $w_{t}^{c} e_{t}$. This is not strictly true in the real world, but the essential point, that child labor significantly reduces both educational time and eventual attainment, is well supported by empirical studies, such as ? and?.

In their first period, children are physically incapable of working, so parental consumption equals $w_{a} h_{0}$. Since parents make no time-allocation decisions this period, when their child has age $t=1$, it will be ignored below, except to consider voting over labor laws.

It will be assumed below that the above functions obey the following standard conditions:

1. $u^{\prime}>0, u^{\prime \prime}<0, u(0)=\infty$
2. $\nu^{\prime}>0, v^{\prime \prime}<0, v(0)=\infty$
3. $\phi_{e}>0, \phi_{h}>0, \phi_{e e}<0, \phi_{h h}<0, \phi_{e, h}>0$.
[^1]Note that assumption 3 implies that education time and previous attainment are complements in the production of next period's attainment. Furthermore the second-derivative assumptions create sufficient concavity that sufficient conditions for optima can be ignored below.

### 2.1. Optimal Education Decisions

It is straight-forward to solve this problem by backwards induction. In the last period of life, the parent's payoff is given by $\nu\left(\phi\left(h_{T-1}^{1}, e_{T-1}\right)\right)$. Therefore when allocating the child's time between education and labor in the penultimate period, the parent faces the following dynamic programming problem:

$$
V_{T-1}^{0}\left(h_{T-1}^{1}, h_{p}\right)=\max _{e_{T-1}}\left\{u\left(w_{a} h_{0}+w_{T-1}^{c}\left(1-e_{T}\right)\right)+\beta \delta \nu\left(\phi\left(h_{T-1}^{1}, e_{T-1}\right)\right)\right\}
$$

, subject to (2.2) and (2.1).
An interior solution satisfies the following first-order condition:

$$
u^{\prime}\left(c_{T-1}\right) w_{T-1}^{c}=\beta \delta \nu^{\prime}\left(h_{T}^{1}\right) \phi_{e}\left(h_{T-1}^{1}, e_{T-1}\right)
$$

Note diminishing marginal utility implies that if the optimal $e_{T-1}$ is interior, then the child's education will be increasing in the parent's human capital, $h^{0}$. Furthermore, the presence of $\delta$ on the right hand side implies that the education choice, if interior, will be strictly less than what the parent would have chosen could he have committed to $e_{T-1}$ at some earlier time.

Given the above assumptions, it is straight-forward to show that, on the interior of the choice set, parents whose children have higher level of human capital will tend to invest less in their children at time $T-1$ :

$$
\frac{\partial e_{T-1}}{\partial h_{T-1}^{1}}=\frac{\beta \delta \nu^{\prime} \phi_{e, h}}{\beta \delta \nu^{\prime \prime} \phi_{e}+\nu^{\prime \prime}\left(w_{T-1}^{c}\right)^{2}+\beta \delta \nu^{\prime} \phi_{e e}}<0
$$

To define the solutions for the preceding periods, it is convenient to analyze the parental decision as the outcome of a 2-stage dynamic-programming problem, as in? and ?. Suppose
that future education decisions are given by $e_{t}=g^{e}\left(h_{t}^{1} ; h_{p}\right)$ so that the resulting children's human capital is given by:

$$
\begin{equation*}
h_{t+1}^{1}=\phi\left[h_{t}^{1}, g^{e}\left(h_{t}^{1} ; h_{p}\right)\right] . \tag{2.3}
\end{equation*}
$$

At time $T-2$, the parental problem is to maximize:

$$
V_{T-2}^{0}\left(h_{T-2}^{1}, h_{p}\right)=\max _{e_{T-2}}\left\{u\left(w_{a} h_{0}+w_{T-2}^{c}\left(1-e_{T-2}\right)\right)+\beta \delta W_{T-1}^{0}\left(\phi\left[h_{T-2}^{1}, e_{T-2}\right], h_{p}\right)\right\}
$$

subject to

$$
\begin{align*}
W_{T-1}^{0}\left(h_{T-1}^{1}, h_{p}\right)= & u\left(w_{a} h_{0}+w_{T-1}^{c}\left(1-g^{e}\left(h_{T-1}^{1} ; h_{p}\right)\right)\right)  \tag{2.4}\\
& +\beta\left[\nu\left(\phi\left[h_{T-1}^{1}, g^{e}\left(h_{T-1}^{1} ; h_{p}\right)\right]\right)\right]
\end{align*}
$$

where (2.4) denotes the continuation value at $T-1$.
It is important to notice that from the point of view of period $T-2$, the discount factor between periods $T-1$ and $T$ is given by $\beta$, but the parent knows that when the time comes to choose $e_{T-1}$, the discount factor between periods $T-1$ and $T$ will be $\beta \delta$.

The first-order condition at time $T-2$ is:

$$
u^{\prime}\left(c_{T-2}\right) w_{T-2}^{c}=\beta \delta \frac{\partial W_{T-2}^{0}\left(h_{T-1}^{1}, h_{p}\right)}{\partial h_{T-1}^{1}} \phi_{e}\left(h_{T-2}^{1}, e_{T-2}\right)
$$

Given that the parent will act impatiently in the future, the parent at $T-2$ perceives the marginal benefit of education as:

$$
\begin{align*}
\frac{\partial W_{T-2}^{0}\left(h_{T-1}^{1}, h_{p}\right)}{\partial h_{T-1}^{1}}= & \frac{\partial g_{T-1}^{e}}{\partial h_{T-1}^{1}} \cdot\left[-u^{\prime}\left(c_{T-1}\right) w_{T-1}^{c}+\beta \nu^{\prime}\left(h_{T}^{1}\right) \phi_{e}\left(h_{T-1}^{1}, g_{T-1}^{e}\right)\right] \\
& +\beta \nu^{\prime}\left(h_{T}^{1}\right) \phi_{h}\left(h_{T-1}^{1}, g_{T-1}^{e}\right) \tag{2.5}
\end{align*}
$$

where $g_{T-1}^{e} \equiv g_{T-1}^{e}\left(h_{T-1}^{1}, h^{0}\right)$.
The second term on the right hand side is perfectly standard; the first term however represents the time-inconsistency of the parental policy. If the parent were able to commit to a plan, then the envelope theorem tells us that the term multiplying the policy function
derivative would be zero at the optimum. However without commitment, the condition (2.5) implies that this term evaluated at $g_{T-1}^{e}\left(h_{T-1}^{1}, h^{0}\right)$ is negative, which in turn, implies that the policy function $g_{T-1}^{e}\left(h_{T-1}^{1}, h^{0}\right)$ is sub-optimal from the point of view of time $T-2$. In other terms, time inconsistency in this model leads to parental under-investment in children's education.

To solve for the complete sequence of education investments is obviously a matter of continuing the procedure of backwards induction described here all the way back to the first period of the child's life. In general the choice of education at time $T-j$ will deviate for two reasons from the choice of a parent who can commit at $t=0$. First is the direct effect of impatience, i.e. the change in discount factor between $T-j$ and $T-j+1$. Second is the gains to choosing $e_{T-j}$ strategically, so as to influence the choice that will be made at $T-j+1$.

## 3. Laws Governing Time Spent in Education

On becoming adults, agents vote on a specific one-dimensional education policy, such as whether to require full-time education of children, or what should be the minimum fraction of time per period that children should spend in school. Since the level of education investment in each period is increasing in parental human capital, it is clear that, if the decision is by majority rule, that the equilibrium rule will reflect the preferences of the median voter ${ }^{2}$.

For the policy analysis to be conducted here, we need the answer to two questions: (1) Who benefits from banning child labor? and (2) How does the optimal level of compulsory education depend on the parental state? To keep the exposition simple, assume that $T=2$, so that parents choose children's activities over two periods only.

[^2]Note that if child labor is banned, then the opportunity cost of education is zero, so children will be educated full-time. Define parents value under a child-labor ban as:

$$
V^{B}\left(h^{0}\right)=u\left(w_{a} h^{0}\right)+\beta\left[u\left(w_{a} h^{0}\right)+v\left(\phi\left(\phi\left(h_{1}, 1\right), 1\right)\right)\right]
$$

And the value without the ban as:

$$
\begin{aligned}
V\left(h^{0}, t\right)= & u\left(w_{a} h^{0}+w_{1}^{c}\left(1-e_{1}^{*}\right)\right) \\
& +\beta\left\{u\left(w_{a} h^{0}+w_{2}^{c}\left(1-e_{2}^{*}\right)\right)+v\left[\phi\left(\phi\left(h_{1}, e_{1}^{*}\right), e_{2}^{*}\right)\right]\right\}
\end{aligned}
$$

The set of parents who would favor a child-labor ban is equal to those with $h^{0}>\underline{h}$, where $\underline{h}$ is defined such that $V^{B}(\underline{h})=V(\underline{h})$.

If parents instead vote on a minimum compulsory level of education, then the optimal level will be increasing in parent's human capital. Suppose that the minimum, $\underline{e}$, binds in both periods. The median voter has human capital $\widetilde{h}^{0}$ and chooses $\underline{e}$ to solve:

$$
\max _{\underline{e}} u\left(w_{a} \widetilde{h}^{0}+w_{1}^{c}(1-\underline{e})(2+\gamma)\right)(1+\beta)+\beta v\left[\phi\left(\phi\left(h_{1}, \underline{e}\right), \underline{e}\right)\right]
$$

If $\underline{e}<1$, then this implies that

$$
(1+\beta) u^{\prime} w_{c}(2+\gamma)=\beta v^{\prime}\left[\phi_{e}\left(\phi_{h}+1\right)\right]
$$

Little more information on the optimal policy choices can be gleaned at this level of generality, so further discussion must rely on specific functional forms, as in the previous section. For simplicity, assume that the minimum education level $\bar{e}=0$ and that children's wages are invariant over age $(\gamma=0)$; let the child's wage be denoted $w_{c}$. Then the child's human capital on attaining adulthood is:

$$
h^{1}=\left(h_{1}^{\eta}\left(e_{1}^{*}\right)^{1-\eta}\right)^{\eta}\left(e_{2}^{*}\right)^{1-\eta}=\left(h_{0}^{1}\right)^{2 \eta} f(D) \widetilde{w}_{1}^{(1+\eta)(1-\eta)}
$$

where $f(D)$ is a function of $D(\delta)$. Suppose that parents vote on a minimum compulsory level of education, $\underline{e}$,that binds in both periods. The optimal level will be increasing in parent's human capital. There are three possible cases; in the first the minimum binds in both periods, in the others the minimum binds only in one of the periods ${ }^{3}$.

[^3]
## 4. Parametric Example

For the policy analysis to be conducted here, we need the answer to two questions: (1) Who benefits from banning child labor? and (2) How does the optimal level of compulsory education depend on the parental state? Some analytical results are possible for a sufficiently simple choice of time structure and functional forms. Since the data we have on children's education and labor time is available only for two periods (primary and secondary education), we restrict the analysis to education decisions over two periods of childhood.

Suppose that $T=3$, so that parents choose their children's activities for two periods. Let $u(c)=\ln c$ and $\nu\left(h_{T}^{1}\right)=A \ln h_{T}^{1}$. Let $\phi\left(h_{t}^{1}, e_{t}\right)=\theta\left(h_{t-1}^{1}\right)^{\eta}\left(\underline{e}+e_{t}\right)^{1-\eta}$, where $\theta>1$ and $\underline{e} \geq \beta(1-\eta)$. Suppose that the child wage evolves with age according to:

$$
\begin{equation*}
w_{t}^{c}=(1+\gamma)^{t} \lambda_{1} . \tag{4.1}
\end{equation*}
$$

Notice that as long as $\underline{e}>0$, the functional form for the human capital accumulation technology allows for children to have positive human capital even in the absence of parental investment in schooling.

Once again, the analysis proceeds by backwards induction from the final period. In the last period, the parent simply enjoys his child's human capital, so that $V_{3}^{0}=\nu\left(h_{3}^{1}\right)$. Note that terminal human capital $h_{3}^{1}$ is given by:

$$
h_{3}^{1}=\left(h_{2}^{1}\right)^{\eta}\left(\underline{e}+g_{2}^{e}\left(h_{2}^{1} ; h_{p}\right)\right)^{1-\eta}
$$

Let parental human capital be given by $h_{p}$. In the penultimate period, the parent solves:

$$
V_{2}^{0}\left(h_{2}^{1}, h_{p}\right)=\max _{e_{2}}\left\{\ln \left(w_{p} h_{p}+w_{2}^{c}\left(1-e_{2}\right)\right)+\beta \delta A \ln \left(\left(h_{2}^{1}\right)^{\eta}\left(\underline{e}+g_{2}^{e}\left(h_{2}^{1} ; h_{p}\right)\right)^{1-\eta}\right)\right\}
$$

. It is straight-forward to verify that the policy $g_{2}^{e}\left(h_{2}^{1} ; h_{p}\right)$ followed by a parent with human is where the constraint only binds at age $1 .>$ From the point of view of the median voter, this case is the same as the optimal choice of $e_{1}$ when $\delta=1$.In the next section we extend the model to the empirically important case where education is decreasing in the child's previous education, so that compulsory education binds only in the 2 nd period.
capital $h_{p}$ is given by:

$$
g_{2}^{e}\left(h_{2}^{1} ; h_{p}\right)=\left\{\begin{array}{cc}
0 & \text { for all } h_{p} \leq \underline{H}_{2}(\delta)  \tag{4.2}\\
\frac{\widetilde{w}\left(h_{p}\right) D(\delta)-e}{1+D(\delta)} & \underline{H}_{2}(\delta)<h_{p}<\bar{H}_{2}(\delta) \\
1 & \text { for all } h_{p} \geq \bar{H}_{2}(\delta)
\end{array}\right.
$$

where:

$$
\begin{aligned}
\widetilde{w}\left(h_{p}\right) & \equiv \frac{w_{p} h_{p}+w_{2}^{c}}{w_{2}^{c}} \\
\underline{H}_{2}(\delta) & \equiv\left[\frac{\underline{e}}{D(\delta)}-1\right] \frac{w_{2}^{c}}{w_{p}} \\
\bar{H}_{2}(\delta) & =\frac{1+\underline{e}}{D(\delta)} \frac{w_{2}^{c}}{w_{p}} \\
D(\delta) & =\beta \delta A(1-\eta)
\end{aligned}
$$

. Note that all parents with human capital in the interval $\left[\underline{H}_{2}(\delta), \bar{H}_{2}(\delta)\right]$ will choose both work and school for their children, and therefore they will choose more work for their children than they would have liked from the period-0 point of view. Since $D^{\prime}(\delta)>0$, and by assumption $\underline{e} \geq \beta(1-\eta)$, therefore $\underline{H}_{2}(\delta)>0$ for all $\delta$. In other words, the greater the time-inconsistency of the parents, the less likely they are to educate their children, provided that $\underline{e}$ is sufficiently large.

In the preceding period (the primary school period), the parent solves:

$$
\begin{aligned}
V^{(1)}\left(h_{1}^{1}, h_{p}\right)= & \max _{e_{1}}\left\{\ln \left(w_{a} h^{0}+w_{1}^{c}\left(1-e_{1}\right)\right)\right. \\
& \left.+\beta \delta\left[\ln \left(w_{a} h^{0}+w_{2}^{c}\left(1-e_{2}\right)\right)+\beta A \ln \left(\left(h_{2}^{1}\right)^{\eta}\left(\underline{e}+e_{2}\right)^{1-\eta}\right)\right]\right\}
\end{aligned}
$$

subject to

$$
h_{2}^{1}=\theta\left(h_{1}^{1}\right)^{\eta}\left(\underline{e}+e_{1}\right)^{1-\eta}
$$

. Note that since the policy in the second period does not depend on the child's attainment of human capital, the effect of education in the first period on the future value is limited to
the change in the terminal human capital:

$$
\frac{\partial V^{(2)}\left(h_{2}\left(e_{1}\right) ; h_{p}\right)}{\partial e_{1}}=\beta \frac{\partial \nu\left(h_{3}\left(h_{2}, e_{2}\right) ; h_{p}\right)}{\partial h_{2}} \frac{\partial h_{2}}{\partial e_{1}}=\frac{\beta A(1-\eta) \eta}{\underline{e}+e_{1}}
$$

Using (2.1), the policy $g_{1}^{e}\left(h_{1}^{1} ; h_{p}\right)$ followed by a parent with human capital $h_{p}$ is given by:

$$
g_{1}^{e}\left(h_{1}^{1} ; h_{p}\right)=\left\{\begin{array}{cc}
0 & \text { for all } h_{p} \leq \underline{H}_{1}(\delta)  \tag{4.3}\\
\frac{\beta \eta D(\delta) w_{1}\left(h_{p}\right)-e}{1+\beta \eta D(\delta)} & \underline{H}_{1}(\delta)<h_{p}<\bar{H}_{1}(\delta) \\
1 & h_{p} \geq \bar{H}_{1}(\delta)
\end{array}\right.
$$

where

$$
\begin{aligned}
w_{1}\left(h_{p}\right) & =\frac{w_{p} h_{p}+w_{1}^{c}}{w_{1}^{c}}=1+\frac{w_{p}}{w_{1}^{c}} h_{p}>w_{2}\left(h_{p}\right) \\
\underline{H}_{1}(\delta) & \equiv\left[\frac{\underline{e}}{\beta \eta D(\delta)}-1\right] \frac{w_{1}^{c}}{w_{p}} \\
\bar{H}_{1}(\delta) & =\left[\frac{1+\underline{e}}{\beta \eta D(\delta)}\right] \frac{w_{1}^{c}}{w_{p}}
\end{aligned}
$$

. Obviously $\underline{H}_{1}(\delta)>0$ since $\underline{e} \geq \beta(1-\eta)$ and $\beta \eta<1$.
Note that the policy functions $g_{1}^{e}\left(h_{1}^{1} ; h_{p}\right)$ and $g_{2}^{e}\left(h_{2}^{1} ; h_{p}\right)$ are both independent of the child's state due to logarithmic preferences.

Proposition 1. Let $\bar{e} \geq \beta(1-\eta)$ and suppose $\gamma>(\beta \eta)^{-1}-1$. Then (i) children who did not attend school in period 1 (i.e., $g_{1}^{e}\left(h_{1}^{1} ; h^{0}\right)=0$ ) will not be able to attend school in period 2 as well (i.e., $g_{2}^{e}\left(h_{2}^{1} ; h^{0}\right)=0$ ); (ii) At least some of the children who attended school full-time in period 1 (i.e., $g_{1}^{e}\left(h_{1}^{1} ; h^{0}\right)=1$ ) will be pulled out school to work in the second period (i.e., $\left.g_{2}^{e}\left(h_{2}^{1} ; h^{0}\right)<1\right)$.
$\mathbf{P}$ roof. Both results simply follow from the fact that $\underline{H}_{1}(\delta)<\underline{H}_{2}(\delta)$ and $\bar{H}_{1}(\delta)<\bar{H}_{2}(\delta)$ whenever $\underline{e} \geq \beta(1-\eta)$ and $\gamma>(\beta \eta)^{-1}-1$.

The condition $\gamma>(\beta \eta)^{-1}-1$ is likely to hold whenever differences in children's age lead to sufficiently high differences in child labor productivity. It implies that older children are
significantly more productive than younger children, which is a feature of most existing data on children labor force participation (Cain, 1977). The above results therefore are consistent with the empirical observation, noted in ?, that the likelihood of being pulled out of school for work is higher among older children than younger children

It remains to demonstrate conditions under which restrictions on child labor will benefit parents. Recall the policy function in (4.3) and (4.2). Assume that the conditions $\underline{e} \geq \beta(1-\eta)$ and $\gamma>(\beta \eta)^{-1}-1$ hold simultaneously. Since $D^{\prime}(\delta)>0$ so that $\underline{H}_{1}(\delta)$ and $\underline{H}_{2}(\delta)$ both decrease as $\delta$ increase, children born of parents whose human capital satisfies $h_{p} \leq \underline{H}_{1}(1)$ will not attend school at all whether or not $\delta<1$. These are children from the poorest families, those for which the marginal utility of consumption, and hence the opportunity cost of child schooling, is highest. Likewise, children whose parents have human capital $h_{p} \geq \bar{H}_{2}(1)$ will not work at all both in the first and the second periods, whether or not $\delta<1$. These are children from the richest families, those for which the opportunity cost of child schooling is relatively low. Note that as shown above, $\underline{e} \geq \beta(1-\eta)$ and $\gamma>(\beta \eta)^{-1}-1$ imply that $\underline{H}_{1}(1) \leq \underline{H}_{1}(\delta)<\underline{H}_{2}(\delta)$ and $\bar{H}_{2}(1) \geq \bar{H}_{2}(\delta)>\bar{H}_{1}(\delta)$. Hence the following proposition:

Proposition 2. Let $\bar{e} \geq \beta(1-\eta)$ and suppose $\gamma>(\beta \eta)^{-1}-1$. Then time-inconsistency is not an issue for parents with human capital $h^{0} \leq \underline{H}_{1}(1)$ or $h^{0} \geq \bar{H}_{2}(1)$.

The above result shows that if the parental human capital is not in the interval $\left[\underline{H}_{1}(\delta), \underline{H}_{2}(\delta)\right]$, then we would not expect parents to benefit from education/child-labor laws; furthermore, such laws would be irrelevant for parents whose human capital is no lower than $\bar{H}_{2}(\delta)$. These laws will be welfare-enhancing however, for parents whose human capital is in this intermediate range, because realized education lower than desired due to the time-inconsistency of the parental preferences.

### 4.1. Laws governing time in school

There are 3 cases, one where the minimum binds in both periods, the others where it binds in one only. The latter cases are trivial because they are equivalent to the median voter making
the optimal education choice ex ante. In the first case, where the minimum schooling binds in both periods, the median voter chooses $\underline{e}$ to solve:

$$
\max _{\underline{e}}\left\{(1+\beta) \ln \left(w_{a} h^{0}+w_{c}(1-\underline{e})\right)+\beta^{2} A \ln \left[\left(h_{1}\right)^{\eta}(\underline{e})^{(1+\eta)(1-\eta)}\right]\right\}
$$

The first-order condition is:

$$
\frac{(1+\beta) w_{c}}{w_{a} h+w_{c}(1-\underline{e})}=\beta^{2} \frac{A}{\underline{e}}(1+\eta)(1-\eta) \equiv C_{0}
$$

So if interior, the preferred choice of education law is given by:

$$
\begin{align*}
\underline{e} & =\frac{C_{0}}{\left(1+\beta+C_{0}\right)} \frac{\left(w_{a} h+w_{c}\right)}{w_{c}}  \tag{4.4}\\
\ln \underline{e} & =C_{1}+\ln \left(w_{a} h+w_{c}\right) \tag{4.5}
\end{align*}
$$

The dependence of the preferred school law on the parent's human capital is given by:

$$
\begin{align*}
\frac{\partial \underline{e}}{\partial h} & =\frac{C_{0}}{\left(1+\beta+C_{0}\right)} \frac{w_{a}}{w_{c}}>0,  \tag{4.6}\\
\frac{\partial \ln \underline{e}}{\partial h} & =\frac{w_{a}}{w_{a} h+w_{c}} \tag{4.7}
\end{align*}
$$

which says that the length of the school day is increasing in parental human capital. Notice that this choice is independent, for the reasons discussed earlier, of the time-inconsistency parameter $\delta$, and increasing in the ratio of the parental wage to the child's, $\frac{w_{a}}{w_{c}}$. Empirically, the implication of this equation is unusually direct: if countries all share the same parameter values, then compulsory education should be a linear function of the wage ratio of the median voter. This behavior should hold over the range for which human capital makes a difference for education laws.

Countries may however differ in the values of some of these parameters. Variations across country in the quality of available education, for instance, affect the parental decision via the return to education, here represented by the parameter $A$, and by the parameter $\eta$, which is the share of school time in the human capital of the child.

Note that it is straight-forward to adapt this theory to explaining laws that govern the minimum age at which children leave school: this will simply be the first age-interval for
which a majority of the parents are not in favor of laws bounding school-hours strictly above zero for children in that age-interval. Suppose that we take the time in school, $\underline{e}$, as given. Parents will favor a law restricting children to remain in school at age $t$ if they find that the value of sending their children to school for time $\underline{e}$ is at least as great as the value of the education choice they would have made if unrestricted. For children in the last period, which we interpret as high school, the condition for restricting these children to stay in school would be:

$$
\begin{aligned}
V_{2}^{0}\left(h_{2}^{1}, h_{p}\right) & =\max _{e_{2}}\left\{\ln \left(w_{a} h^{0}+w_{2}^{c}\left(1-e_{2}\right)\right)+\beta \delta \nu\left(\phi\left(h_{2}^{1}, e_{2}\right)\right)\right\} \\
& <\ln \left(w_{a} h^{0}+w_{2}^{c}(1-\underline{e})\right)+\beta \delta \nu\left(\phi\left(h_{2}^{1}, \underline{e}\right)\right)
\end{aligned}
$$

## 5. Empirical Study: Child Labor and Wage Inequality

The model presented above delivers some clear empirical implications about the timing of the adoption of child-labor or compulsory-education laws. In the simple parametric examples worked out above, for instance, it turns out that restrictions on child labor become politically viable when the median wage, the skill premium and the wage for child labor satisfy a simple condition, such as (4.4). The condition is that the median income or wage must exceed a specific threshold level, so that all voters above the threshold favor legislation restricting child labor. This implies that, controlling for household income, a country's median income will have no effect on child labor participation for sufficiently low levels of income, then a significant negative effect for higher levels, and, then eventually as child-labor rates approach zero, the effect of median income on child employment will fade away.

The objective of this section is see whether child labor participation rates vary across countries in the way predicted by the model. We assemble and analyze a cross-country dataset with information on wage inequality, the returns to education, child-labor participation rates and an index of the permissiveness of each country towards child labor. We first ask whether there are indeed significant country effects, after controlling for parental income.

Next we ask whether a country's median income has a negative effect on child labor, again controlling for household characteristics. Then we check whether measures of the skill wage premium by country help to explain differences in child labor participation, as predicted by the model.

The data set in question is a compendium of representative household surveys of 10 countries in Latin America. The surveys are designed to be representative of the population of their respective countries, and the population of the survey countries constitutes $94 \%$ of the total population of the region. ? show that these surveys indicate a wide variation in the degree of income inequality across the different countries, while ? use this data to analyse social mobility and income inequality. The data include education and labor earnings variables for all members of sample families. Earlier versions of these surveys have been used previously to analyse similar issues, as in ?, who examined the relationship between child labor and educational attainment in Bolivia and Venezuela, and by ?, whoanalyses fertility and human-capital investment in Peru.

Child labor is inherently difficult to measure; much of it is unpaid work, often for family members around the house or the farm. It is also possible that parents suppress information on their children's work, and for some countries, children's labor variables are automatically set to zero for children younger than 12. Even though the dataset in question includes direct measures of child labor, such as hours worked, labor income, and an indicator of the child's employment, it is likely that these variables understate significantly the prevalence of child labor. Therefore we also use indirect measures, such as whether children are attending school, and the gap between potential and reported years of education.

### 5.1. The Data

Table 1 shows some basic descriptive statistics for the data. Income and wages have been converted to U.S.\$, by equating purchasing power parity across countries to the U.S. level, using measures published by the OECD. The sample consists of all families with children in the age range 10-17 that reported family income. The table shows the averages for several
key variables: number of children per family, hours that employed children spend in paid employment, the income of employed children, the age of the child, and the total income of the family, excluding children's earnings. These are reported by the age-group of children: the interval 10-14 years, and the interval 15-17 years. Child labor is also reported at younger ages in some of the surveys, but the number of observations by country is too small to allow reliable statistical estimates.

Table 1: Children's Characteristics

| Country | Age Group | Statistic | Attends |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Ychool | Education | Education | Gap | Employment <br> Rate of Kids | Child's <br> earnings* | Child's |
| Hours* |  |  |  |  |  |  |  |  |

It is important to note that the number of observations for the child labor variables, apart from employment, is much lower than for the other child variables. Hence the current analysis focuses on the child employment variable. However the income and hours variables will be used to examine the age-wage patterns for children. Alternative estimates of childlabor prevalence, from the ILO, are presented in the appendix.

### 5.2. Country Effects on Child Employment

To see how child-labor patterns vary across countries, we report results for a regression of child labor-participation on parental income, parental education and the age of the child, as well as a set of dummy variables for each country. The table shows that child labor is more likely among the older age group of children, and that the cross-country patterns are otherwise similar across age groups. Parental income reduces the probability of child employment, as does education of the parents, with mother's education having a slightly larger effect than father's education.

The main message of the table is that child labor participation is significantly higher in Bolivia, Brasil, Paraguay and Peru than in the other countries, even after controlling for parental income. Therefore child labor is not merely a matter of parental poverty: there is a significant social effect as well. It turns out that Bolivia, Peru and Paraguay are the poorest countries in the sample, on a per-capita basis, while Brasil has the most unequal distribution of income ${ }^{4}$. Hence it is likely that the common denominator across countries with high child labor is indeed a low median income. Countries where child labor is least likely, controlling for parental income are Argentina, Panama and Chile; hence the fact that two of these are the most prosperous countries in the sample supports the idea that there is an income-based explanation of the country-effects on child labor.

[^4]Table 2a: Country Effects in Child-Employment Probit Regression

|  | Children Aged 10-14 |  |  | Children Aged 15-17 |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Variable | Parameter | Standard | Std. | Parameter | Standard | Std. <br> Ertimate |
| Error | Estimate | Estimate | Estimate |  |  |  |
| AGEKID | 0.4977 | 0.0050 | 0.7074 | 0.1147 | 0.0236 | 0.0934 |
| AGEKID2 | -0.0109 | 0.0002 | -0.3732 | 0.0034 | 0.0007 | 0.0894 |
| LGINCOUP | -0.4222 | 0.0021 | -0.4546 | -0.3837 | 0.0023 | -0.4191 |
| LGINCUP2 | 0.0179 | 0.0002 | 0.2432 | 0.0212 | 0.0002 | 0.2980 |
| EDUCHUB | -0.0355 | 0.0001 | -0.1667 | -0.0416 | 0.0001 | -0.1968 |
| EDUCWIF | -0.0460 | 0.0001 | -0.1978 | -0.0534 | 0.0001 | -0.2310 |
| Argentina | -4.1814 | 0.0308 | -0.8628 | -1.7603 | 0.1885 | -0.3832 |
| Bolivia | -3.0080 | 0.0306 | -0.4570 | -1.1134 | 0.1885 | -0.1652 |
| Brasil | -3.2898 | 0.0306 | -1.6291 | -1.0358 | 0.1885 | -0.5133 |
| Chile | -4.2321 | 0.0309 | -0.7508 | -1.8281 | 0.1885 | -0.3395 |
| Colombia | -3.8372 | 0.0306 | -1.1043 | -1.5353 | 0.1885 | -0.4494 |
| Costa Rica | -3.6107 | 0.0309 | -0.3331 | -1.1666 | 0.1885 | -0.1057 |
| Mexico | -3.6292 | 0.0306 | -1.6515 | -1.2461 | 0.1885 | -0.5600 |
| Panama | -4.0243 | 0.0314 | -0.3042 | -1.6679 | 0.1886 | -0.1186 |
| Paraguay | -3.1389 | 0.0322 | -0.0946 | -0.9261 | 0.1890 | -0.0227 |
| Peru | -2.5230 | 0.0306 | -0.6401 | -0.7666 | 0.1885 | -0.1946 |

All coefficients significant at 0.0001 level

Table 2 b shows the country effects on two other indicators of child labor: hours and the education gap. The country effects are again estimated as fixed in an OLS regression that conditions on the age of the children, the parental income and the parent's education. Hours are estimated on the sample of children who are working. The educational gap is estimated on all children.

Table 2b: Country Effects in Education Gap and Hours Regressions

| Variable | Children Aged 10-14 |  |  |  | Children Aged 15-17 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Hours |  | Educ. Gap |  | Hours |  | Educ. Gap |  |
|  | Parameter Estimate | Standard Error | Parameter <br> Estimate | Standard Error | Parameter <br> Estimate | Standard Error | Parameter Estimate | Standard Error |
| AGEKID | 2.22 | 0.21 | 0.21 | 0.16 | 1.75 | 0.00 | 0.44 | 0.01 |
| AGEKID2 | 0.35 | 0.35 | 0.01 | 0.12 | 0.15 | 0.00 | -0.03 | 0.02 |
| LGINCOUP | 2.39 | 0.97 | -0.74 | 1.02 | -0.47 | 0.03 | -1.55 | 0.07 |
| LGINCUP2 | -0.20 | 0.08 | 0.04 | 0.09 | 0.10 | 0.00 | 0.08 | 0.01 |
| EDUCHUB | -0.41 | 0.06 | -0.05 | 0.07 | -0.62 | 0.00 | -0.11 | 0.00 |
| EDUCWIF | -0.37 | 0.07 | -0.08 | 0.08 | -0.30 | 0.00 | -0.13 | 0.00 |
| Argentina | 21.19 | 3.34 | 4.80 | 4.06 | 42.74 | 0.11 | 9.54 | 0.22 |
| Bolivia | 15.32 | 3.00 | 5.16 | 2.88 | 36.48 | 0.11 | 9.60 | 0.22 |
| Brasil | 20.32 | 2.95 | 6.52 | 2.85 | 40.10 | 0.10 | 11.67 | 0.21 |
| Chile | 19.83 | 3.50 | 5.68 | 4.96 | 39.72 | 0.11 | 10.19 | 0.22 |
| Colombia | 25.08 | 3.00 | 5.58 | 2.98 | 41.39 | 0.10 | 10.51 | 0.21 |
| Costa Rica | 27.74 | 3.52 | 5.67 | 4.13 | 44.71 | 0.12 | 10.97 | 0.24 |
| Mexico | 25.54 | 2.96 | 4.71 | 2.87 | 42.93 | 0.10 | 9.33 | 0.21 |
| Panama | 23.55 | 5.82 | 5.24 | 9.82 | 37.00 | 0.12 | 10.15 | 0.26 |
| Paraguay | 32.94 | 4.80 | 5.85 | 3.55 | 40.31 | 0.21 | 10.97 | 0.49 |
| Peru | 12.48 | 2.92 | 4.78 | 2.84 | 30.15 | 0.10 | 9.36 | 0.21 |

According to the theory developed here, the country variables that matter most for the
determination of the income threshold for child-labor laws to be favored by the median voter are the wage premium for education, and the hourly wage for child labor. Measuring the child's wage is possible in principle in this data set, by dividing the children's income by hours worked. However this procedure is notoriously unreliable even for adult wage data, and especially so for children. When applied here, this results in some countries having higher average wages for the younger children than for the old; hence for this first pass, it is assumed that wages for children are equal to the same proportion of the uneducated adult wage in each country. The estimated relation between the log of wages and education for each country is shown in Table 3. The variable "High School" is a dummy for at least 12 years of education; hence the wage premium for high-school completion is given by the coefficents on this variable. Conversely, the "Less than 3 Years" variable is a dummy for 3 or fewer years of education; this plus the intercept gives the wage for uneducated men. The age variables are differences from age 40, so that summing the other coefficients gives the predicted wage at age 40.

Table 3: Wage Premia for Men

| Country | Statistic | Intercept | High School | Less than 3 years | Age | Age <br> Squared |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Argentina | mean | 6.2400 | 0.8114 | -0.5022 | -0.0027 | -0.0027 |
|  | std | 0.0100 | 0.0138 | 0.0649 | 0.0009 | 0.0009 |
|  | t-Stat | 773.8800 | 58.9910 | -7.7430 | -3.1260 | -3.1260 |
| Bolivia | mean | 5.8400 | 0.7763 | -0.7234 | -0.0059 | -0.0059 |
|  | std | 0.0200 | 0.0395 | 0.0385 | 0.0019 | 0.0019 |
|  | t-Stat | 255.9700 | 19.6660 | -18.7700 | -3.1210 | -3.1210 |
| Brasil | mean | 6.5300 | 1.3515 | -0.9266 | 0.0009 | 0.0009 |
|  | std | 0.0100 | 0.0178 | 0.0091 | 0.0005 | 0.0005 |
|  | t-Stat | 1053.5000 | 75.7250 | -101.6000 | 1.8440 | 1.8440 |
| Chile | mean | 6.6000 | 0.8657 | -0.3430 | 0.0124 | 0.0124 |
|  | std | 0.0100 | 0.0157 | 0.0254 | 0.0010 | 0.0010 |
|  | t-Stat | 621.9400 | 54.9980 | -13.4900 | 12.9580 | 12.9580 |
| Colombia | mean | 6.4100 | 1.2259 | -0.7089 | -0.0018 | -0.0018 |
|  | std | 0.0100 | 0.0258 | 0.0163 | 0.0009 | 0.0009 |
|  | t-Stat | 634.2300 | 47.5480 | -43.5900 | -2.1410 | -2.1410 |
| Costa Rica | mean | 6.8600 | 1.0151 | -0.5526 | -0.0024 | -0.0024 |
|  | std | 0.0200 | 0.0531 | 0.0463 | 0.0021 | 0.0021 |
|  | t-Stat | 311.0800 | 19.1120 | -11.9300 | -1.1130 | -1.1130 |
| Mexico | mean | 5.9900 | 1.0213 | -0.5298 | 0.0011 | 0.0011 |
|  | std | 0.0100 | 0.0261 | 0.0203 | 0.0012 | 0.0012 |
|  | t-Stat | 472.5000 | 39.1630 | -26.0500 | 0.9379 | 0.9379 |
| Panama | mean | 6.2000 | 1.0647 | -0.6204 | 0.0046 | 0.0046 |
|  | std | 0.0200 | 0.0364 | 0.0488 | 0.0019 | 0.0019 |
|  | t-Stat | 282.9000 | 29.2240 | -12.7200 | 2.4052 | 2.4052 |
| Paraguay | mean | 6.1800 | 0.6896 | -0.9788 | 0.0158 | 0.0158 |
|  | std | 0.1200 | 0.2278 | 0.2017 | 0.0088 | 0.0088 |
|  | t-Stat | 49.9100 | 3.0278 | -4.8520 | 1.8049 | 1.8049 |
| Peru | mean | 5.5700 | 0.7156 | -0.6533 | 0.0020 | 0.0020 |
|  | std | 0.0300 | 0.0611 | 0.0682 | 0.0026 | 0.0026 |
|  | t-Stat | 202.0600 | 11.7150 | -9.5820 | 0.7467 | 0.7467 |

The final ingredient for the empirical test is a measure of median parental income. This is computed directly from the sample of households, as the residual from a regression of household income on a polynomial in the age of the household head.. This implies that households with no children at home are not included in the computation. Note that restricting the data to parents of children aged 10-17 signficantly lowers median income. In the case of Mexico, for instance, raw median income declines by $25 \%$. To ensure robustness of the results, we also include alternative measures, such as real gdp per capita. Table 4 shows these measures and other aggregate variables that may be candidates to explain the the country effects on child labor.

| Table 4: Aggregate Data by Country |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Country | Median <br> Income | Total <br> Fertility | Female \% <br> Econ. Active | Pct. Urban <br> Population | Agriculture <br> GDP Share | Depend. <br> Ratio | GDP <br> Per Capita Pct of GDP |  |
|  | 8000 | 2.62 | 24.9 | 88.6 | 7 | 61 | 10300 | 3.5 |
| Bolivia | 4753 | 4.36 | 43.6 | 84.6 | 16 | 79 | 2880 | 5.6 |
| Brasil | 6343 | 2.27 | 37 | 64.4 | 8 | 55 | 6480 | 5.2 |
| Chile | 12480 | 2.44 | 30.1 | 62.3 | 7 | 56.2 | 12730 | 3.1 |
| Colombia | 7481 | 2.8 | 32.1 | 79.6 | 11 | 62.2 | 6810 | 4.4 |
| Costa Rica | 9419 | 2.83 | 47.9 | 76.8 | 15 | 62.6 | 6650 | 5.3 |
| Mexico | 5294 | 2.75 | 25.9 | 84.2 | 5 | 63.8 | 8370 | 4.9 |
| Panama | 9000 | 4.17 | 32.1 | 73.6 | 8 | 61.1 | 7168 | 4.6 |
| Paraguay | 4357 | 2.98 | 24.1 | 50.3 | 23 | 79.8 | 3980 | 3.9 |
| Peru | 4128 | 1.55 | 51.3 | 65.7 | 7 | 65.2 | 4680 | 2.9 |

Sources. Median Income calculated by Authors from survey data, other variables from UNDP Human Development Report

Linear regression shows that the median income of a country has a strong negative effect on child labor, even after controlling for the income of the parents; this effect alone explains about $2 / 3$ of the variation in child employment. The results of plotting the child-labor country effects on median income are shown in Figure 2. The pattern observed is consistent with the countries in the data all having median income above the threshold required for child-labor restrictions to take effect. Therefore it may be necessary to expand the analysis to include lower-income countries in order to observe the transition predicted by the theory.

## [IN PROGRESS].

## 6. Conclusion

In this paper we developed a theory of child-labor laws. The theory explains why child labor participation varies significantly across countries, and why countries adopt laws restricting child labor. Since poorer parents would not choose full-time education for their children even under commitment, while sufficiently rich parents do not require commitment to educate their children full-time, those parents who benefit from such a law are those whose wages are in an intermediate range where time-inconsistency is an issue. Assuming that the law does not immediately constrain parent's choice regarding children's education, i.e. that it takes at least one period to implement a law, then parents will vote for such a law if it makes them better off in an ex ante sense by committing them to higher future education of their children. Since the time inconsistency only affects decisions with consequences for
the immediate future, even parents who send their children to work today may favor future restrictions. It is crucial to realize that the model does not require parents somehow to be able to commit to laws; a lag between the vote and the enforcement of the laws is all that is required.

We applied the insights of the theoretical model to an empirical analysis of child labor in Latin America, using household-survey data from 10 countries. Our results show that while child-labor is decreasing in the median income or the per-capita GDP of the country, that a large part of this effect is not compositional; even controlling for household income, childemployment rates vary significantly across borders. The data suggest that these country effects are not explained by cross-country variations in the return to education, not by other plausible candidates, such as the share of agriculture in GDP or the fraction of the population living in urban areas.

The empirical analysis was limited by the small number of countries in the dataset used here. We hope to add more countries to our dataset over time. There are a number of features of real life that may turn out to be of first-order importance as the dataset expands. Fortunately such dimensions as endogenous fertility and political choice of education quality can be integrated into the model; the structure presented here is a minimal framework that may yield its own family of models in the future. Another interesting issue that may affect the timing of the adoption of child labor laws is children's learning on the job; according to ? children's labor often does not yield a net revenue to the family for the first few years, suggesting that parents are investing in children's future labor income. This is also related to work in progress by ?, who incorporates fertility decisions into a growth model where parents choose whether to educate their children. However the focus of our paper is on the political economy of growth and inequality, and hence we abstract from the demographic features of the problem.

A key theoretical implication of the model is that measures that reduce the wage of children, such as a ban by foreigners on the import of goods made by child labor, will reduce the welfare of children who are sufficiently poor. From the point of view of assessing the
long-run benefits of policies restricting child labor, however, an obvious short-coming of this model is that it takes as given the distribution of human capital in the economy. However the static model is sufficiently simple that nesting it into a dynamic model of the income distribution, as in ?, is relatively straight-forward. Thus we can see the current paper as a building block towards assessing the effects of efforts to lower the demand for child labor.
7.

## Appendix

Table A1: Economically Active Population, Ages 10-14,\%

| Country | Total | Boys | Girls | Mean |
| :---: | :---: | :---: | :---: | :---: |
| Argentina | 4.53 | 5.01 | 4.04 | 4.53 |
| Bolivia | 14.36 | 15.64 | 13.05 | 14.35 |
| Brasil | 16.15 | 21.37 | 10.75 | 16.06 |
| Chile | 0.00 | 0.00 | 0.00 | 0.00 |
| Colombia | 6.62 | 7.23 | 5.98 | 6.61 |
| Costa Rica | 5.48 | 7.94 | 2.91 | 5.43 |
| Mexico | 6.73 | 8.58 | 4.83 | 6.71 |
| Panama | 3.51 | 5.04 | 1.93 | 3.49 |
| Paraguay | 7.87 | 10.82 | 4.83 | 7.83 |
| Peru | 3.16 | 2.42 | 2.54 | 2.48 |
| Uruguay | 2.08 | 3.21 | 0.90 | 2.06 |

Source: "Economically Active Population", ILO Bureau of Statistics, STAT Working
Paper 96-3

Figure 1: Child Labor: by Country, 1998


Figure 2: Child-Employment Country Effects



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[^1]:    ${ }^{1}$ I thought about making the child wage depend on the child's HC. The problem is that then the mapping from spending to human capital gets a little complicated.

[^2]:    ${ }^{2}$ It is not clear that the median voter rule would apply if voting were allowed in every period of adulthood. The reason is that the children's education attainment would also be a state variable, and we know from the previous section that the education decision is not necesarily monotonic in this variable. However the essential point is that even if parents voted every period, time-inconsistency would not be an issue so long as implementation of proposed laws take place not immediately, but at least one period after the election.

[^3]:    ${ }^{3}$ In the absence of child-wage growth, the optimal education choices increase with age, so the second case

[^4]:    ${ }^{4}$ See Facing up to Inequality in Latin America, 1998, Inter-American Development Bank, Washington, D.C.

