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Child Labor and Minimum Wage Law

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Abstract

The purpose of the paper is to examine the short run and medium run implications of a minimum wage law, which applies to both adult and child workers. It shows that a suitably designed minimum wage law not only reduces child labour in the short run, it will go on reducing it over time in the medium run and thereby tend to eliminate it. This happens under a set of assumptions, which are quite standard in the recent literature on child labour and investment in human capital.

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1 Introduction

Child labor is present only in developing nations and it disappears once a nation achieves a certain degree of development (see Basu(1999)). Child labor is obviously undesirable. Every child should get the opportunity to develop all her/his faculties to the fullest possible extent. Since the problem disappears automatically in the course of economic development in the long run, one should look for policy measures that would remove or at least mitigate it in the short and the medium run. Many policy makers have thought of imposing a ban on child labour and some countries, including India, have actually done so, but such a measure may be extremely costly politically as it reduces the welfare of those parents or households who want to send the children to work – see Ranjan (1999). A complete ban is inadvisable for another important reason also. It may subject the very poor households to whom child labour is a matter of compulsion and not of choice to starvation, see, for e.g., Basu (1999). Under these circumstances it may be advisable to search for an alternative policy measure. This paper takes such a course and examines in the short and the medium run the impact on child labor of a minimum wage law that applies to both adult and child labor. It is true that the minimum wage law by creating unemployment will also hurt the very poor households. However, its harmful effect is likely to be much less than that of a complete ban. In the face of unemployment the poorest households, whose marginal utility of income relative to that of leisure is likely to be much higher than that of the others, will be much keener to find jobs for their adult as well as child members than those for whom child labour is a matter of choice. Hence the brunt of unemployment is likely to be borne mainly by the latter.

We shall carry out the analysis under a set of assumptions that are considered to be true by a number of influential studies in the recent theoretical literature on child labour and investment in human capital. These assumptions are now stated below. There is an important strand of thought that regards child labour as a matter of choice for the parents and identifies parents' altruism as a major determinant of child labour – see, for example, Basu and Van (1998), Basu (1999), Ranjan (1999) and others. The literature also recognizes reduction in households' income due to withdrawal of children's labour from current production as an important component of the cost of sending children to schools (Lucas (1988)). In fact, in LDCs, unlike the assumptions made, for e.g., in Galor and Zeira (1993), education is highly subsidized and divisible to a considerable extent. Hence the cost mentioned above is the only major component of cost of educating the child. Moreover, credit is usually not available to finance children's education. Many influential studies also assume, see, for e.g., Lucas (1988), that the parents or individuals do not need loans for the purpose of investing in human capital since withdrawal of child labour from current production does not reduce households' or individuals' income below the subsistence level and hence child labour remains a choice-theoretic problem and not a matter of compulsion despite non-availability of credit. In the literature cited above, analysis is usually carried out in terms of a representative household consisting only of a parent and a child. Moreover, parents usually do not live long enough to enjoy the future income of the children when they grow up. Their utility depends only on the households' income and the amount of education they are able to give their children during the period they live as parents– see, for e.g., Glomm (1997).

Following these lines of thought, this paper carries out its analysis in terms of a representative household consisting of a parent and a child within the framework of an overlapping generations model. The other assumptions that it makes are that the parent is the decision-making unit; she decides whether to send her child to school or not, she is altruistic towards her child and derives utility from the household's income during her lifetime and also from her child's education. Education is perfectly divisible, parents do not require credit to finance their children's education and the only cost of educating the child consists in the reduction in household's income due to withdrawal of child labour from current production. Every individual in the model lives for two periods. In the first period she is a child. In the second period she is a parent. Finally, following the tradition set forth by the so-called disequilibrium macroeconomics as developed by such writers as Clower (1967), Barro and Grossman (1976), Benassy (1982) et al., the paper assumes that the representative decision-making economic agents, parents in this case, perceive that they are quantity-constrained in the labour market following the imposition of the minimum wage law and the consequent emergence of unemployment and they factor it in in their decision-making. If these assumptions are true, then the paper shows that a suitably designed minimum wage law that applies to both adult and child labour will go on reducing child labour over time in the short and the medium run. The paper obviously does not explicitly consider the households for whom child labour is a matter of compulsion.

Basu (2000) has also examined the implications of a minimum wage on child labour in the short run in a model where parents are altruistic towards their children. However, in his paper the law applies to adult labour only. He has found the impact of the law to be ambiguous. In his model, incidence of child labor is a decreasing function of parents' income. Minimum wage law for adult workers tends to make parents better off by raising the wage rate. At the same time it creates unemployment among adult workers. Therefore parents' income and hence the incidence of child labour may change either way. This explains the result. The present paper develops for its purpose a simple overlapping generations model where parents are altruistic towards their children and seeks to explore within this framework the implications of a minimum wage law that applies to both adult and child labour. Hence the results of this paper are different from Basu's.

This paper is arranged as follows. Section 2 develops the model. Section3 examines the implications of the minimum wage law in the short and the medium run, while the final section contains the concluding remarks.

2 The Model

The model consists of a large number of identical households and firms. Firms produce a single good with only one input, labor. Households use the good only for purposes of consumption. There is no physical capital in the model. Markets for both this consumption good and labor are perfectly competitive. The focus of the paper is on the short and the medium run. Hence the number of firms existing in the economy is fixed and firms as well as households are price-takers in both the markets.

Household

As we have already mentioned, there are a large number of identical households. Each household consists only of two members, one parent and one child. Each member lives for two periods. In the first period of an individidual's life, she is a child. In the second period, she is a parent. An individual spends a part of the first period of her life, if her parent so chooses, in schools, works in the remaining part and utilizes the whole of the second period working. In any given period in a representative household, the parent is the decision-making unit. She is assumed to be altruistic. She supplies inelastically the whole of her labor endowment. Education is perfectly divisible and the parent decides on how much time or labor the child will devote to current production and how much to schooling. In this model, it is assumed for simplicity and without any loss of generality that there is no child labor if the child is allowed to spend the whole of the first period of her life in schools. Accordingly, we measure the incidence of child labor in terms of how much time or labor endowment the child devotes to schooling. The greater the proportion of time or labor endowment the child devotes to schooling, the less is the incidence of child labor.

Here we also assume for simplicity that there is no cost of schooling other than the amount of current production foregone. There is no population growth. Households do not save and the single consumption good the economy produces is treated as the numeraire. We also postulate that both the parent and the child supply labor of the same quality.

In any period, t, the parent in the representative household maximizes the following utility function, which, for simplicity, is assumed to be separable and additive:

$$\log C_t + \phi \log h_{t+1}; \quad \phi > 0 \tag{1}$$

where $C_t \equiv$ consumption of the household in period t, $h_{t+1} \equiv$ human capital of the child of period t in period t+1, and $\phi \equiv$ a shift parameter, which measures the parent's attitude or the degree of altruism towards the child.

$$C_t = W_t L_t + \Pi_t \tag{2}$$

where $W_t \equiv$ wage rate in period t, $L_t \equiv$ amount of labor supplied by the household in period t and $\Pi_t \equiv$ profit income of the household in period t. Value of h_{t+1} is given by the following human capital formation function:

$$h_{t+1} = (1+\delta)\,\alpha_t + 1; \quad 0 \leq \alpha_t \leq 1 \ \text{ and } \ \delta > 0 \tag{3}$$

Let us explain eq. (3). Labor endowment of the child is assumed to be unity. α_t denotes the proportion of labor endowment devoted by the child in period t to schooling and δ, which measures the efficiency of schooling, is a constant. From eq. (3) it follows that, when $\alpha_t = 0$, the human capital of the child in the next period, i.e., in the period she becomes a parent, remains equal to the labour endowment she was born with. Actually an unskilled adult supplies more labour than an unskilled child. However, for simplicity, we have ignored it here. For the same reason we have not introduced either the parent's human capital or the aggregate stock of human capital in period t as an argument in the human capital formation function. Equation (3) does not contain any mechanism to generate externality or endogenous growth either. Given these assumptions, measures aimed at reducing child labour from its free market equilibrium level involve interference with individuals' choice and hence are welfare-reducing. Still such measures are justified as child labour may be regarded as a 'demerit good'. Thus reduction or elimination of child labour represents a want, "which individuals feel obliged to support as members of the community. These obligations may be accepted as falling outside the freedom of individual choice which ordinarily applies"

(Musgrave and Musgrave (1989, pp. 57-58)). From eq. (3) it follows

$$L_t = LF_t + (1 - \alpha_t) \tag{4}$$

where $LF_t \equiv$ labor endowment of the parent in period t and $(1 - \alpha_t)$ gives the proportion of labor endowment or amount of labor devoted by the child to current production in period t .

Again, from eq. (3) it follows that

$$LF_t = \alpha_{t-1}\,(1 + \delta) + 1; 0 \leq \alpha_{t-1} \leq 1 \tag{5}$$

where α_{t-1} gives the amount of labor devoted by the child in period $(t-1)$ to schooling. Using equations (2), (3), (4) and (5), the parent's maximisation exercise in period t may be rewritten as

$$\max_{\alpha_t}[\log(W_t.\{\alpha_{t-1}(1+\delta)+1+(1-\alpha_t)\}+\Pi_t)+\phi\log(1+\alpha_t(1+\delta))];$$

$$0 \leq \alpha_{t-1} \leq 1$$

s.t.

$$0 \leq \alpha_t \leq 1$$

First order condition for maximisation, when there is an interior solution, is given by

$$(W_t.\{\alpha_{t-1}(1+\delta)+1+(1-\alpha_t)\}+\Pi_t)^{-1}.W_t = \phi(\alpha_t(1+\delta)+1)^{-1}.(1+\delta) \tag{6}$$

If, however, the solution of α_t as yielded by eq. (6) for the given value of α_{t-1} exceeds 1 (falls short of 0), we have a corner solution and the solution is 1 (the solution is 0). Given (1), the second order condition for maximisation is satisfied. When there is an interior solution, we can solve eq. (6) for the optimum value of α_t as a function of W_t, given α_{t-1}, δ, ϕ and Π_t.

$$\alpha_t = \tilde{\alpha}(W_t; \alpha_{t-1}, \Pi_t, \delta, \phi) \tag{7}$$

From equations (4), (5) and (7) we get the labor supply function of the household in period t. Thus

$$L_t = [1 + \alpha_{t-1}(1+\delta)] + \{1 - \tilde{\alpha}(.)\} \tag{8}$$

Firm

There are a large number of identical firms. Each firm produces the same good with only labour. The production function of the representative firm is given by

$$Q = L^{\beta}; \quad \beta \in (0,1) \tag{9}$$

where $Q \equiv$ amount of the good produced and $L \equiv$ amount of labour employed by the firm. The firm maximizes profit as shown below:

$$\max_{L_{dt}} \Pi_t = L_{dt}^{\beta} - W_t L_{dt} \tag{10}$$

where $L_{dt} \equiv$ demand for labour in period t.

First order condition for profit maximization is given by

$$\beta L_{dt}^{\beta-1} = W_t \tag{11}$$

From eq. (11) we get the labor demand function as shown below:

$$L_{dt} = g\left(W_t, \beta\right) \equiv \left[\frac{1}{W_t}\beta\right]^{\frac{1}{1-\beta}}; \quad g_1 < 0 \text{ and } g_2 > 0 \text{ (see eq. (9))} \tag{12}$$

Substituting eqs. (10) and (12) into eq. (8) and using eqs. (12), (4) and (5), we can write the labor market equilibrium condition as

$$1+\alpha_{t-1}.(1+\delta)+\{1-\tilde{\alpha}(W_t;[g\,(W_t,\beta)]^{\beta}-W_t.g(W_t,\beta),\alpha_{t-1},\delta,\phi)\}=g(W_t,\beta)$$

Note that in the above equation instead of equating aggregate demand for labour to aggregate supply of labour we have equated labour supply of a single representative household to the labour demand of a single representative firm. The reason may be stated as follows. Our paper presents a representative agent model where all households are identical and so are all firms. There is no growth. Numbers of firms and households are fixed and so are their sizes. Under these conditions the system consisting of one representative household and one representative firm may be taken as a replica of the economy and the analysis can be carried out in terms of this system without any loss of generality. One can easily verify that all our results will remain unchanged even if we drop this assumption.

Walras' law holds in our model. Substituting eq. (10) into eq. (2), we get

$$C_t=W_tL_t+Q_t-L_{dt}W_t\Rightarrow(C_t-Q_t)+W_t\,(L_{dt}-L_t)=0$$

The above equation gives the Walras' law. Hence labor market equilibrium implies goods market equilibrium and conversely. Therefore the labor market equilibrium condition gives the short run equilibrium condition, i.e., equilibrium condition in any given period, in our model. Alternatively, the short run equilibrium condition may be derived as follows. Substituting into eq. (6) equilibrium values of W_t and Π_t as given respectively by equations (11) and (10), L_t for L_{dt} and for L_t its value as given by equations (4) and (5), we get

$$[\{1+(1+\delta)\alpha_{t-1}+(1-\alpha_t)\}^{\beta}]^{-1}\beta\{1+(1+\delta)\alpha_{t-1}+(1-\alpha_t)\}^{\beta-1}$$
$$=\{1+(1+\delta)\alpha_t\}^{-1}(1+\delta)\phi \Rightarrow$$

$$\beta\{1+(1+\delta)\alpha_{t-1}+(1-\alpha_t)\}^{-1}=\{1+(1+\delta)\alpha_t\}^{-1}(1+\delta)\phi \tag{13}$$

The above equation gives the short run equilibrium condition of our model, i.e., the equilibrium condition in any given period. We can solve eq. (13) for the equilibrium value of α_t as a function of α_{t-1}, δ, β and ϕ. From eq. (13) we get

$$\frac{1+(1+\delta)\alpha_t}{1+(1+\delta)\alpha_{t-1}+(1-\alpha_t)}=\frac{(1+\delta)\phi}{\beta}$$

or,

$$\alpha_t=\frac{\phi}{\phi+\beta}(1+\delta)\,\alpha_{t-1}+\frac{\phi}{\phi+\beta}\left[2-\frac{\beta}{(1+\delta)\,\phi}\right]\equiv\alpha\left(\alpha_{t-1}\right) \tag{14}$$

Eq. (14) is a linear first-order difference equation. The conditions under which it will have a unique and stable steady state is given by the following remark.

Remark 1: If $[\beta/2\,(1+\delta)]<\phi<[\beta/\,(1+\delta)]$**,** $\alpha\,(.)$ **will have a unique and globally stable interior fixed point in the domain,** $\alpha_{t-1}\in[0,1]$**.**
Proof of Remark 1 is given in the appendix.

We shall therefore work under the assumption $\phi\in\left(\frac{\beta}{2(1+\delta)},\frac{\beta}{(1+\delta)}\right)$. Let us now derive the steady state value of α that prevails in the medium run. Denoting it by $\overline{\alpha}$ and substituting it in eq. (14), we get

$$\overline{\alpha}=\frac{\phi}{\beta-\phi\delta}\left[2-\frac{\beta}{(1+\delta)\,\phi}\right] \tag{15}$$

The steady state value of α is unique and globally stable.

We shall now incorporate in this basic model a minimum wage law that is applicable to both the adult and child labour.

3 Wage Policies and Child Labor

When a ban on child labor is inadvisable, the government can extend the scope of the minimum wage law to include child labor as well to protect them from exploitation. Here we examine the implications of such a law for child labor, as we have already mentioned, under the tradition set forth by the so-called "disequilibrium" macroeconomics. Under this tradition, following the imposition of the minimum wage law and the consequent emergence of unemployment, the parents perceive that they are quantity-constrained in the labour market and take it into account while deciding on their children's education. We have modeled the optimization exercise of the parents in this situation, as we have mentioned more than once, following the line suggested by studies belonging to the so-called "disequilibrium" or "fixed price" macroeconomics such as Clower (1967), Barro and Grossman (1976), Malinvoud (1977), Benassy (1982) and others.

In the absence of the minimum wage law, i.e., in the free market situation, eq. (13) yields the equilibrium value of α_t, given α_{t-1}, ϕ, δ and other exogenous variables, when there is an interior solution. This equilibrium value of α_t is given by $\alpha\left(\alpha_{t-1}\right)$ - see eq. (14). Accordingly, equilibrium values of L_t and W_t that prevail in the absence of the minimum wage law are given by (see eq. (14))

$$L_t = [1 + \alpha_{t-1}(1+\delta) + (1 - \alpha\left(\alpha_{t-1}\right))](\equiv L(\alpha_{t-1}))\ (\text{Ł}' > 0 \because \alpha' < 1) \quad (16)$$

and

$$W_t = \beta(1 + \alpha_{t-1}(1+\delta) + (1 - \alpha(\alpha_{t-1})))^{\beta-1} = \beta(L(\alpha_{t-1}))^{\beta-1}$$
$$(\equiv W^*(\alpha_{t-1}); W^{*'} < 0) \qquad (17)$$

respectively (see eq. (11), eq. (4) and eq. (5). Suppose that the minimum wage stipulated by the government is denoted by $\overline{W}$. Under the minimum wage law, given the assumptions, the parent's maximization exercise in the short run, i.e., in any given period, reduces to

$$\max_{\alpha_t}[\log(W_t.\{\alpha_{t-1}(1+\delta) + 1 + (1-\alpha_t)\} + \Pi_t) + \phi\log(1 + \alpha_t(1+\delta))] \quad (18)$$

s.t.

$$[(1 + \alpha_{t-1}(1+\delta) + (1-\alpha_t)] \leq g(\overline{W}, \beta) \ - \ \text{see eq. (14)} \qquad (19)$$

and

$$0 \leq \alpha_t \leq 1 \qquad (20)$$

The implication of the constraint (19) is the following. Under the tradition of the so-called disequilibrium macroeconomics, which we are following here, parents perceive that they are quantity-constrained in the labour market, i.e., they know that they cannot sell more than $g\left(\overline{W}, \beta\right)$ amount of labour, given the minimum wage law.

First order condition for the above maximization exercise, in case there is an interior solution, is given by eq. (6). In such a situation in equilibrium the above first order condition reduces to eq. (13). We know that the value of α_t that satisfies eq. (13) is $\alpha(\alpha_{t-1})$ - see eq. (14). Therefore the equilibrium amount of labour supply and the real wage rate under the minimum wage law when there exists an interior solution to the above optimization exercise will be the same as those under the free market equilibrium and will be given by eqs. (16) and (17) respectively. If, however, the stipulated minimum wage rate, $\overline{W} > W^*(\alpha_{t-1})$, the amount of labour supply as given by (16) at the given α_{t-1} will exceed the labour demand forthcoming at $\overline{W}$, since $g_1 < 0$ - see eq. (12), i.e., at the given α_{t-1}

$$[(1 + \alpha_{t-1}(1 + \delta) + (1 - \alpha(\alpha_{t-1}))] > g(\overline{W}, \beta) \tag{21}$$

Therefore in equilibrium the above optimization exercise as given by (18), (19) and (20) will not have an interior solution and by Kuhn-Tucker condition the value of α_t that will satisfy the parent's optimization exercise will be given by

$$[1 + \alpha_{t-1}(1 + \delta) + (1 - \alpha_t)] = g(\overline{W}, \beta) \tag{22}$$

It is clear from eqs. (21) and (22) that the value of α_t that satisfies (22) is greater than $\alpha(\alpha_{t-1})$ as shown below:

$$\alpha_t = 2 + \alpha_{t-1}(1 + \delta) - g(\overline{W}, \beta) \equiv \bar{\alpha}\left(\alpha_{t-1}, \bar{W}\right) > \alpha(\alpha_{t-1}) \tag{23}$$

Eq. (23) gives the optimum value of α_t as long as the value of α_t that satisfies (22) is less than or equal to unity. If the value of α_t that satisfies eq. (22) is greater than unity, then by Kuhn-Tucker condition the optimum value of α_t, vide (20), is unity. From (12) and (23) it also follows that the higher the $\overline{W}$, the less is $g\left(\overline{W}, \beta\right)$ and therefore the greater is α_t and if $\overline{W}$ is set at such a high level that $g\left(\overline{W}, \beta\right)$ is less than or equal to the parent's labour endowment, $\{1 + \alpha_{t-1}(1 + \delta)\}$, the optimum value of α_t will be unity eliminating child labour even in the short run, i.e., even within the span of a given period. Thus we get the following proposition:

Proposition 1: If $\overline{W} > W^*(\alpha_{t-1})$, $\bar{\alpha}\left(\alpha_{t-1}, \bar{W}\right) > \alpha(\alpha_{t-1})$. The higher the $\overline{W}$, the less is $g\left(\overline{W}, \beta\right)$ and therefore the greater is $\bar{\alpha}\left(\alpha_{t-1}, \bar{W}\right)$

relative to $\alpha(\alpha_{t-1})$ and if $\overline{W}$ is set at such a high level that $g\left(\overline{W},\beta\right)$ is less than or equal to the parent's labour endowment, $\{1+\alpha_{t-1}(1+\delta)\}$, the optimum value of α_t will be unity eliminating child labour even in the short run, i.e., even within the span of a given period.

The intuition behind proposition 1 is quite simple. The minimum wage law raises the wage rate above the free market equilibrium wage rate and creates unemployment. Parents find that they are unable to sell all the labour that they plan to and they take into account this quantity-constraint in the labour market in their optimizing decision. Since parents are altruistic in this model, they first supply the whole of their labour endowment and then decide whether to send the children to work or not. Hence as long as labour demand exceeds the labour endowment of the parents, unemployment remains confined to child labour only. As the only cost of sending the child to school consists in the withdrawal of child labour from current production, marginal cost of investing the excess supply of child labour to human capital formation falls to zero, while marginal benefit from the children's human capital formation remains unaffected. Hence it is optimal for the parents to allow the children to devote the whole of their labour that is in excess supply to human capital formation. Clearly, if the minimum wage rate is set at such a high level that the amount of labour demand equals or falls short of the parents' labour endowment, the marginal cost of devoting the whole of the children's labour endowment to education falls to zero, while the marginal benefit from children's education remains unaffected and positive. Hence the parents will devote the whole of their children's labour endowments to human capital formation eliminating child labour.

Other Costs of Schooling

The result will not be affected qualitatively if other costs of sending the children to school are taken into account. One can always conceive of the marginal benefit from sending the children to school as being net of these other costs and the minimum wage law does not affect this net marginal benefit. However, the marginal cost, due to withdrawal of child labour from current production, of devoting the excess labour supply of the children to human capital formation falls to zero following the imposition of the minimum wage law and this will induce the parents to devote the whole of it to human capital formation even when other costs of sending the children to school are present.

From the above it follows that, if the minimum wage rate is set at such a high level that labour demand corresponding to it equals or falls short of the labour endowment of the parents, the law will eliminate child labour altogether. However, the political cost of fixing the minimum wage rate at such a high level or the administrative cost of enforcing such a high minimum wage rate may be prohibitive and hence infeasible. This induces us to examine the medium run implications of the minimum wage law.

Medium Run Implications of the Minimum Wage Law

Let us now focus on the medium run implications of the minimum wage law. Consider the schedule $\alpha\alpha$ in Figure 1. This represents eq. (14). As the slope of $\alpha\alpha$, α', is less than unity, see eq. (14), equilibrium value of L_t as given by (16) rises as α_{t-1} and α_t increase along $\alpha\alpha$. Since there is diminishing marginal productivity of labor, equilibrium value of W_t, as given by (17), falls as we move upward along $\alpha\alpha$.

Case 1: The Minimum Wage Rate Set Above the Free Market Steady State Wage Rate

Let us first focus on the case where the minimum wage rate as fixed by the government, which we denote by $\overline{W}$, exceeds the free market steady state wage rate denoted by W^s. For expositional reasons we assume that $\overline{W} \leq W^*(0)$, the free market equilibrium wage rate corresponding to $\alpha_{t-1} = 0$ - see eq. (22). $W^*(0)$ is the maximum value that the free market equilibrium wage rate can assume in this model. However, the results of this section will go through even if $\overline{W}$ is set above the maximum level specified here. Let us denote the equilibrium combination of α_{t-1} and α_t on $\alpha\alpha$ corresponding to which the free market equilibrium value of W_t equals $\overline{W}$ by $\left(\alpha_{t-1}^0, \alpha_t^0\right)$. Clearly, $\left(\alpha_{t-1}^0, \alpha_t^0\right)$ will be to the left of the steady state $\left(\alpha_{t-1}, \alpha_t\right)$, $(\overline{\alpha}, \overline{\alpha})$, on $\alpha\alpha$ as shown in Figure 1, i.e., $\left(\alpha_{t-1}^0, \alpha_t^0\right) < (\overline{\alpha}, \overline{\alpha})$. The ceiling on $\overline{W}$ that we have imposed above ensures that $\alpha_{t-1}^0 \geq 0$.

Under the minimum wage law the optimization exercise of the parent is given by (18), (19) and (20). When the optimization exercise has an interior solution, the first order condition for maximization in equilibrium, as we have already pointed out, is given by eq. (13). Given our assumption about $\overline{W}$, we know that, for all $\alpha_{t-1} < \alpha_{t-1}^0$, the maximization exercise has an interior solution since for every such α_{t-1} the equilibrium value of W_t in the absence of the minimum wage law exceeds $\overline{W}$. Thus for all $\alpha_{t-1} < \alpha_{t-1}^0$, the solution of the unconstrained maximization of (18) automatically satisfies the constraints, (19) and (20). Hence for $\alpha_{t-1} \leq \alpha^0_{t-1}$, equilibrium combinations of α_t and α_{t-1} even under the minimum wage law are given by the $\alpha\alpha$ schedule in Figure 1.

However, for $\alpha_{t-1} > \alpha^0_{t-1}$, the optimization exercise given by (18), (19) and (20) does not have an interior solution as the free market equilibrium wage rate corresponding to every such α_{t-1} is less than $\overline{W}$ and therefore free market equilibrium labour demand/labour supply corresponding to every such α_{t-1} is larger than $g\left(\overline{W}, \beta\right)$ - see (12). Therefore for $\alpha_{t-1} > \alpha^0_{t-1}$, as we have already shown, equilibrium combinations of α_t and α_{t-1} under the minimum wage law are given by the equation (see eq. (22))

$$[1 + \alpha_{t-1}(1 + \delta) + 1 + (1 - \alpha_t)] = g(\overline{W}, \beta)$$

or by the equation (as follows from eq. (11) or eq. (17))

$$\beta(1 + \alpha_{t-1}(1 + \delta) + (1 - \alpha_t))^{\beta-1} = \overline{W}$$

$= \beta(1 + \alpha^0_{t-1}(1 + \delta) + (1 - \alpha^0_t))^{\beta-1}; \alpha^0_{t-1}, \alpha^0_t < \overline{\alpha}$
i.e. by

$$[1 + \alpha_{t-1}(1 + \delta) + (1 - \alpha_t)] = (1 + \alpha^0_{t-1}(1 + \delta) + (1 - \alpha^0_t))$$

$$\Rightarrow \alpha_t = (1 + \delta)\,\alpha_{t-1} + \left[\alpha^0_t - \alpha^0_{t-1}\,(1 + \delta)\right] \tag{24}$$

for $0 \leq \alpha_{t-1} \leq 1$, $0 \leq \alpha_t \leq 1$. If for any $0 \leq \alpha_{t-1} \leq 1$, optimum value of α_t, as given by eq. (24), is greater than 1, the optimum α_t is equal to 1. These optimum combinations of α_{t-1} and α_t are represented by the line $A_5A_4A_3C$, which starts from the point $\left(\alpha^0_{t-1}, \alpha^0_t\right)$ on $\alpha\alpha$ in Figure 1. The line $A_5A_4A_3C$ shows that the equilibrium value of α_t becomes unity before α_{t-1} becomes unity. This point may be explained as follows. From eq. (24) it follows that

$(d\alpha_t/d\alpha_{t-1}) = (1+\delta) > 1$. Again, $1 > \alpha_t^0 > \alpha_{t-1}^0$. These two facts imply that α_t, according to eq. (24), will be unity at a $\alpha_{t-1} < 1$. Let us denote this α_{t-1} by $\tilde{\alpha}_{t-1}$. For all α_{t-1} such that $\tilde{\alpha}_{t-1} \leq \alpha_{t-1} \leq 1$, $\alpha_t = 1$. This explains the position of $A_5A_4A_3C$. Thus the line $A_2A_5A_4A_3C$ in Figure 1 gives the locus of all the equilibrium combinations of α_{t-1} and α_t in the present case under the minimum wage law. Therefore in this case there is only one steady state, C (see Figure 1) and this steady state is globally stable. Whatever be the initial free market equilibrium (α_{t-1}, α_t), following the imposition of the minimum wage law that fixes the minimum wage rate above the free market steady state wage rate, the value of α will steadily rise to unity over time eliminating child labour altogether. Thus we get the following proposition:

Proposition 2: **If in any given period $\overline{W}$ is set above W^s , the economy will achieve a unique and stable steady state with $\alpha = 1$. This means that the equilibrium value of α will steadily rise to unity over time eliminating child labour altogether, whatever be the initial free market equilibrium (α_{t-1}, α_t) .**

The intuition behind proposition 2 may be explained as follows. For every α_{t-1} in the present case the optimum value of α_t is greater than α_{t-1} - see Figure 1, i.e., children's investment in human capital is greater than their parents' in the initial period in which the minimum wage law is introduced. Parents' human capital in the next period will therefore be larger, while labour demand corresponding to the stipulated minimum wage rate will remain the same. Hence a larger part of the labour endowment of the children will be in excess of labour demand in the next period and the whole of this excess labour endowment will be devoted to human capital formation. Thus in the next period also the children's investment in human capital will exceed that of their parents. Thus children's investment in human capital in the present case will go on rising over time and steadily approach unity.

The medium run analysis is important since, as we have pointed out already, it may not be possible to set the minimum wage rate at such a high level that the law eliminates child labour in the short run itself. We see from Remark 2 below that there indeed exists many cases where the minimum wage rate that eliminates child labour in the short run itself is much higher than the free market medium run steady state wage rate.

Remark 2: There exists a unique α_{t-1} denoted by α_{t-1}^{A} such that $\overline{\alpha} < \alpha_{t-1}^{A} < 1$ and for every $\alpha_{t-1} < \alpha_{t-1}^{A}$ the free market steady state wage rate is less than the minimum value of the minimum wage rate that will eliminate child labour in the short run itself. However, for every $\alpha_{t-1} \geq \alpha_{t-1}^{A}$ the minimum value of the minimum wage rate that will eliminate child labour in the short run itself is less than the free market steady state wage rate. The smaller the value of δ the closer is α_{t-1}^{A} to unity. There are thus quite a large number of cases where the free market steady state wage rate is much less than the minimum value of the minimum wage rate that eliminates child labour in the short run itself.

Derivation of Remark 2 is given in the appendix.

Case 2: The Minimum Wage Rate Set Below the Free market Steady State Wage Rate

Let us now consider the case where the minimum wage rate, $\overline{W}$, is set below the steady state wage rate, W^s. We of course assume that $W^s > \overline{W} > W^*(1)$ - see eq. (17). $W^*(1)$ is the minimum value the free market equilibrium wage rate can assume. If $\overline{W}$ is set at or below $W^*(1)$, it will obviously fail to produce any impact on the incidence of child labour. First consider the equilibrium pair, $\left(\alpha_{t-1}^{1}, \alpha_{t}^{1}\right)$, on $\alpha\alpha$ corresponding to which the free market equilibrium $W = \overline{W}$, i.e., $\beta(1+\alpha_{t-1}^{1}(1+\delta)+(1-\alpha_{t}^{1}))^{\beta-1} = \overline{W}$ (see eq. (17)). We have already shown that, since $\alpha' < 1$ along $\alpha\alpha$ in Figure 1(see eq. (14)), equilibrium value of L_t rises and therefore that of W_t falls as α_{t-1} and α_t increase along $\alpha\alpha$ - see (16) and (17). Therefore, since $\overline{W}$ $< W^s$, $\left(\alpha_{t-1}^{1}, \alpha_{t}^{1}\right) > (\overline{\alpha}, \overline{\alpha})$ and for every $\alpha_{t-1} \leq \alpha_{t-1}^{1}$ optimization exercise as given by (18), (19) and (20) has an interior solution in equilibrium. This is because corresponding to every such α_{t-1} the free market equilibrium wage rate exceeds the minimum wage rate and the free market equilibrium labour demand and labour supply fall short of the labour demand that corresponds to the government-stipulated minimum wage rate. Therefore for $\alpha_{t-1} < \alpha_{t-1}^{1}$, equilibrium value of α_t continues to be given by $\alpha\alpha$ despite the minimum wage law.

However, for $\alpha_{t-1} > \alpha_{t-1}^{1}$, there does not exist any interior solution in equilibrium. Therefore for $\alpha_{t-1} > \alpha_{t-1}^{1}$, equilibrium combinations of α_{t-1} and α_t under the minimum wage law, by Kuhn-Tucker condition, are given by, see (24),

$$\beta(1+\alpha_{t-1}(1+\delta)+(1-\alpha_t))^{\beta-1} = \overline{W} \Rightarrow$$

$$\beta(1+\alpha_{t-1}(1+\delta)+(1-\alpha_t))^{\beta-1} = \beta(1+\alpha_{t-1}^{1}(1+\delta)+(1-\alpha_t^{1}))^{\beta-1}; \alpha_{t-1}^{1}, \alpha_t^{1} > \overline{\alpha}$$

i.e., by

$$1+\alpha_{t-1}(1+\delta)+(1-\alpha_t) = 1+\alpha_{t-1}^{1}(1+\delta)+(1-\alpha_t^{1});\ \ \alpha_{t-1}^{1},\ \alpha_t^{1} > \overline{\alpha}$$

From the above equation we get

$$\alpha_t = \left[\alpha_t^{1} - \alpha_{t-1}^{1}(1+\delta)\right] + (1+\delta)\,\alpha_{t-1} \equiv \alpha^{0}(\alpha_{t-1})\,; \alpha_{t-1}^{1}, \alpha_t^{1} > \overline{\alpha} \qquad (25)$$

Eq. (25) gives the optimum value of α_t corresponding to every given value of α_{t-1} in the domain $1 \geq \alpha_{t-1} \geq \alpha_{t-1}^1$, if and only if $\alpha^0(\alpha_{t-1}) \leq 1$. If for any such value of α_{t-1} , the value of α_t satisfying eq. (25) is greater than unity, the optimum value of α_t, as follows from (20) by Kuhn-Tucker condition, is 1. Now, $\left(\alpha_{t-1}^1, \alpha_t^1\right)$ may be represented in Figure 1 by a point such as A_1 or by a point such as A_6. Therefore, for $1 \geq \alpha_{t-1} \geq \alpha_{t-1}^1$, the short run equilibrium value of α_t corresponding to every such α_{t-1} is given by the line $A_1B_1A_3C$ or by the line A_6B in Figure 1. Thus in the present case the locus of all short run equilibrium combinations of α_{t-1} and α_t under the minimum wage law are given either by the line $A_2A_5A_1B_1A_3C$ or by the line $A_2A_5A_1A_6B$ in Figure 1. Let us now derive the conditions under which we have these two curves. Note first that eq. (25) will definitely have a unique fixed point over the domain $\left(\alpha_{t-1}^1, \infty\right)$ since $\alpha_{t-1}^1 > \alpha_t^1$, $\left(\alpha_{t-1}^1 - \alpha_t^1\right)$ is finite and $\alpha^{0'} = (1+\delta) > 1$. Let the value of this fixed point be α_m. We can get the value of α_m by solving eq. (25) after substituting α_m for α_{t-1} and α_t. Obviously, if $\alpha_m < 1$, α_t as given by eq. (25) will equal unity at $\alpha_{t-1} < 1$ since $\alpha^{0'} = (1+\delta) > 1$. Therefore, if $\left(\alpha_{t-1}^1, \alpha_t^1\right)$ is such that $\alpha_m < 1$, we have the situation depicted by $A_2A_5A_1B_1A_3C$ in Figure 1. If on the other hand $\left(\alpha_{t-1}^1, \alpha_t^1\right)$ is such that $\alpha_m > 1$, we have the situation as depicted by $A_2A_5A_1A_6B$ in Figure 1. The value of α_m as derived from eq. (25) by substituting α_m for α_t and α_{t-1} is given by

$$\alpha_m = \alpha_{t-1}^1 + \frac{\alpha_{t-1}^1 - \alpha_t^1}{\delta} \tag{26}$$

Recall that $\left(\alpha_{t-1}^1, \alpha_t^1\right)$ is a point on the line $\alpha\alpha$ in Figure 1. $\left(\alpha_{t-1}^1, \alpha_t^1\right)$ is therefore a short run free market equilibrium combination of α_{t-1} and α_t and therefore it satisfies (14). Substituting the value of α_t^1 in terms of α_{t-1}^1 as given by (14) into (26) and rearranging terms, we have

$$\alpha_m = \left[1 + \frac{1-A}{\delta}\right]\alpha^1_{t-1} - \frac{B}{\delta} \quad \text{(see eq.(14))} \tag{27}$$

where $A \equiv \frac{\phi}{\phi+\beta}(1+\delta)$ and $B \equiv \frac{\phi}{\phi+\beta}\left[2 - \frac{\beta}{(1+\delta)\phi}\right]$. Note that the coefficient of α^1_{t-1} in (27) is positive, since $A < (1+\delta)$. Thus α_m is an increasing function of α^1_{t-1}. We shall now compute the value of α^1_{t-1} corresponding to which $\alpha_m = 1$. Substituting 1 for α_m in (27), solving for α^1_{t-1}, and denoting the solution by α^* we have

$$\alpha^* = \frac{\delta + B}{\delta + 1 - A} < 1 \tag{28}$$

Let us explain why $\alpha^* < 1$. To ensure that (14) contains a unique and stable steady state we assumed that $0 < \alpha(1) < 1 \Rightarrow 0 < A + B < 1 \Rightarrow B < 1 - A$ (see (14). Hence $\alpha^* < 1$. We have already pointed out that α_m, as given by (27), is an increasing function of α^1_{t-1}. Hence for all $\alpha^1_{t-1} \leq \alpha^*$ optimum combinations of α_{t-1} and α_t are given by $A_2A_5A_1B_1A_3C$ in Figure 1 and there are multiple equilibria. As shown in Figure 1, there are two other steady states besides $A(\ \overline{\alpha}, \overline{\alpha}\ )$: one at B_1 and the other at C. Steady states at A and C are stable, but that at B_1 is unstable. The steady state value of α_{t-1} and α_t at B_1 is α_m and its value is given by (27). However, this steady state is unstable. If initial $\alpha_{t-1} > \alpha_m$, then α_{t-1} and α_t will go on rising and thereby move farther and farther away from α_m and will eventually converge to C, with $\alpha_t = \alpha_{t-1} = 1$. On the other hand, if $\overline{\alpha} < \alpha_{t-1} < \alpha_m$, α_{t-1} and α_t will go on falling over time and converge to the steady state value, $\overline{\alpha}$.

The reason for this is quite simple. Corresponding to any $\overline{\alpha} < \alpha_{t-1} < \alpha_m$ the optimum value of α_t under the minimum wage law is less than the given α_{t-1}. Therefore in the next period, i.e., in period $t+1$ parents' labour endowment $\alpha_t\ (1+\delta)$ will be less than that in the previous period. Since labour demand corresponding to the minimum wage rate remains unchanged, the value of α_{t+1} that will equate this labour demand to labour supply, i.e., the optimum α_{t+1} as given by (30) will be even less than α_t. Thus investment in human capital will go on falling over time and eventually become equal to $\overline{\alpha}$. On the other hand, if in the initial period, i.e., in period t, $\alpha_{t-1} > \alpha_m$, the optimum value of α_t under the minimum wage law will exceed the given α_{t-1} and, therefore, as explained earlier, investment in human capital will go on rising and therefore the incidence of child labour will go on falling over time and will eventually get eliminated. Note that the free market equilibrium wage rate corresponding to α^* is given by

$$W^*(\alpha^*) = \beta\left[1+\alpha^*(1+\delta)+\{1-\alpha(\alpha^*)\}\right]^{\beta-1} \tag{29}$$

From (29) it follows that, if $W^s > \overline{W} \geq W^*(\alpha^*)$, i.e., if the minimum wage rate is set above or at $W^*(\alpha^*) < W^s$, the value of α_{t-1}^1 will be less than or equal to α^*.

If, however, $\overline{W} < W^*(\alpha^*)$, $\alpha_{t-1}^1 > \alpha^*$. In this scenario we have the second case where the short run equilibrium combinations of α_{t-1} and α_t are given by $A_2A_5A_1A_6B$ in Figure 1. In this case for every $1 \geq \alpha_{t-1} > \overline{\alpha}$ the optimum α_t under the minimum wage law is less than the given α_{t-1}. Hence, for reasons we have already explained, investment in human capital will decrease continuously over time and eventually converge to the free market steady state value of α, $\overline{\alpha}$.

From the above it follows that for every initial $\alpha_{t-1} > \bar{\alpha}$ there is a minimum $\overline{W}$ that will eliminate child labour in the medium run. Let us derive its value in steps. We have found above that if $\overline{W}$ is set at such a level that α_m is less than the given α_{t-1}, child labour will tend to disappear in the medium run. Substituting α_{t-1} for α_m in (27), we can derive the value of α^1_{t-1} that will make α_m equal to α_{t-1}. Denoting this value of α^1_{t-1} by $\alpha^1_{t-1}(\alpha_{t-1})$, we get

$$\alpha^1_{t-1}(\alpha_{t-1}) = \left[\alpha_{t-1} + \frac{B}{\delta}\right]\left[\frac{\delta}{1+\delta-A}\right] \tag{30}$$

Free market equilibrium value of W corresponding to $\alpha^1_{t-1}(\alpha_{t-1})$, denoted by $W(\alpha_{t-1})$ is given by

$$W(\alpha_{t-1}) = W^*\left(\alpha^1_{t-1}(\alpha_{t-1})\right) = \beta(1+\alpha^1_{t-1}(\alpha_{t-1})(1+\delta)+(1-\alpha\left(\alpha^1_{t-1}(\alpha_{t-1})\right)))^{\beta-1} \tag{31}$$

Clearly, if corresponding to any initial $\alpha_{t-1} > \bar{\alpha}$, $\overline{W}$ is set above $W(\alpha_{t-1})$, it will tend to eliminate child labour in the medium run.

The other point to note is that for every $\alpha_{t-1} > \bar{\alpha}$, $W(\alpha_{t-1}) \leq W^s$. Let us establish this point below. When $\overline{W} = W^s$, $\alpha^1_{t-1} = \alpha^1_t = \bar{\alpha}$. Substituting $\bar{\alpha}$ for α^1_{t-1} and α^1_t in (25), we get

$$\alpha_t = \delta\left[\alpha_{t-1} - \bar{\alpha}\right] + \alpha_{t-1} > \alpha_{t-1} \text{ for } \alpha_{t-1} > \bar{\alpha} \tag{32}$$

From (32) it follows that, for every initial $\alpha_{t-1} > \bar{\alpha}$ if $\overline{W}$ is set equal to W^s, the equilibrium value of α_t will exceed the given α_{t-1}. Hence the minimum wage rate will tend to eliminate child labour in the medium run. From the above it follows that $W(\alpha_{t-1}) < W^s$ for every $\alpha_{t-1} > \bar{\alpha}$. It follows from (30) and (31) that $\alpha^1_{t-1}(\alpha_{t-1})$ increases and therefore $W(\alpha_{t-1})$ falls with an increase in α_{t-1}. From the above we get the following proposition

Proposition 3: For every $\alpha_{t-1} \in (\bar{\alpha}, 1)$ there exists a minimum value of $\overline{W}$, $W(\alpha_{t-1})$, such that if $\overline{W}$ is set above it, child labour will go on falling over time. $W(\alpha_{t-1})$ is a decreasing function of α_{t-1}. Moreover, $W(\alpha_{t-1}) < W^s$ for every $\alpha_{t-1} \in (\bar{\alpha}, 1)$.

We have seen above that if the minimum wage rate is set at such a level that children's investment in human capital exceeds their parents, incidence of child labour will go on falling over time and thereby tend to disappear in the medium run. Consider now the case where $\alpha_{t-1} < \bar{\alpha}$. For such α_{t-1}, we know, $\alpha(\alpha_{t-1}) > \alpha_{t-1}$. In such a scenario, if $\overline{W}$ is set above the free market wage rate, the equilibrium value of α_t, as given by (23), $\bar{\alpha}\left(\alpha_{t-1}, \overline{W}\right) > \alpha(\alpha_{t-1})$. Hence incidence in child labour will go on falling over time. This yields the following proposition

Proposition 4: If in the initial free market equilibrium $\alpha_{t-1} < \bar{\alpha}$, then $\overline{W}$ set anywhere above the free market equilibrium wage rate will tend to eliminate child labour over time in the medium run.
From Propositions 3 and 4 it follows that a minimum wage rate set at a suitably high level can eliminate child labour in the medium run, whatever be the initial value of α_{t-1}. The minimum value of this minimum wage rate, corresponding to any initial value of α_{t-1}, is less than the minimum value of the minimum wage rate that eliminates child labour in the short run itself.

4 Robustness of the Results: Scrutiny of the Crucial Assumptions

4.1 Inelastic Supply of Labour by the Parents

It is assumed in our paper that parents supply the whole of their labour endowment completely inelastically and it plays a critical role in yielding the results of the paper. It is therefore worthwhile to examine how our results are likely to change if we drop this assumption and incorporate labour-leisure choice on the part of the parents. Our results seem to be quite robust and will go through even when we allow for this change. The reason is elaborated below. Let us suppose that parents optimally allocate their own labour endowment between work and leisure. They also optimally allocate their children's labour endowment over leisure, work and schooling. They do these allocations in such a manner that households' utilities are maximized. Parents are the decision-making units. In this scenario, under free market equilibrium, marginal utility from every way of utilizing labour endowment of the household should be equal[4]. Thus, for every household marginal utilities of the parent's leisure, child's leisure, child's labour devoted to schooling and parent's and child's labour devoted to work are all equal in equilibrium under free market conditions. Consider now the minimum wage regime. Suppose that the minimum wage is set above the free market equilibrium wage rate. Corresponding to the initial free market equilibrium allocation of the labour endowments of the parent and the child, marginal utility of labour devoted to work will be larger at this minimum wage rate. This is because an extra unit of labour devoted to work at the minimum wage rate fetches higher wage income. Marginal utilities of other uses of labour remain unaffected for both the parent and the child. Hence it becomes optimal for the parent to divert labour from all other uses to work so that marginal utilities of all the different uses of labour become equal again. Hence at the minimum wage rate supply of labour will be larger. However, demand for labour will be less giving rise to unemployment. Therefore the wage rate under the

[4]Here of course we assume that the parents view their children's utility the same way as their own.

minimum wage law will settle down to its minimum value specified by the law. Following the tradition of 'disequilibrium macroeconomics' we have assumed in this paper that the parents perceive this unemployment. They realize that they are quantity-constrained in the labour market and factor it in in their labour allocation decision. Suppose that in the initial free market equilibrium the wage rate was W^*. Hence the total amount of labour supplied by the households was $D(W^*)$, where $D(W^*)$ denotes demand for labour at W^*. Under the minimum wage law demand for labour is $D\left(\overline{W}\right)$, where $\overline{W}$ is the minimum wage rate and $D\left(\overline{W}\right) < D(W^*)$. When parents realize that they will not be able to sell more than $D\left(\overline{W}\right)$ amount of labour, they will allocate the excess of their households' labour endowment over $D\left(\overline{W}\right)$ in such a manner that marginal utilities of parents' leisure, children's leisure and children's schooling are all equal so that households' utilities are maximized. To see why this should be the case supposes that under the minimum wage law allocation of childrens' labour endowments among leisure, work and schooling is the same as that in the initial free market equilibrium. Then parents must be taking more leisure than what they were taking in the initial free market equilibrium, as the total amount of labour supplied by the households is less under the minimum wage law. This situation, as we shall now argue, is not optimum. As children devote the same amount of labour/time to leisure, work and schooling as in the free market equilibrium, marginal utilities of children's leisure and schooling are the same as those in the free market situation. Hence they are equal. However, parents now devote more time to leisure than what they did in the initial free market equilibrium. Hence marginal utility of parents' leisure is now less than the marginal utility of each of the two uses of children's labour endowment. Clearly, the situation is not optimum. The parents will be able to raise households' welfare by reducing their own leisure and thereby allowing their children to devote more time to leisure and schooling so that marginal utility of parents' leisure becomes equal to marginal utility of each of the two above uses of their children's labour. Therefore under the minimum wage law children will devote more time to schooling compared to the free market situation. Following the line of argument chalked out above one can easily see that a rise in the minimum wage rate will lead to an increase in children's investment in human capital.

The above discussion has the following significance. In our paper we assume that parents are altruistic and hence in the face of unemployment they first supply as much labour as they can and then decide on whether they will also make their children work or not. However, if we incorporate the labour-leisure choice, we are likely to get the result that the minimum wage law will induce parents to invest more of their children's labour endowment to schooling even without the assumption mentioned above. Thus in this sense it seems that our result gets stronger, if we incorporate labour-leisure choice.

From the above it follows that in the period following the one during which the minimum wage law is imposed, parents' labour endowment will be larger than that in the earlier period, while children will be born with the same labour endowment. However, demand for labour will also remain the same as in the earlier period. In this scenario consider the hypothetical situation where children's allocation of their labour endowments among the three uses is the same as in the earlier period. Then parents must be taking more leisure, as their labour endowment is larger, while the household is supplying the same amount of labour as before. Clearly therefore marginal utility of parents' leisure will be less than the marginal utility of children's leisure and that of children's schooling. This is again not optimum. Parents here maximize utility taking into account the quantity constraint in the labour market. They will therefore reduce their leisure and thereby raise the allocation of children's time to leisure and schooling so that marginal utility of parents' leisure and marginal utility of children's leisure and that of children's schooling become equal. In this period therefore the children will devote more time to schooling than what they did in the earlier period. Thus children's investment in schooling will go on rising over time. Thus our results remain unaffected, even when we allow for work-leisure choice.

4.2 Homogeneity of Adult Labour and Child Labour

The assumption that child labour and adult labour are homogeneous is again a strong assumption that needs to be explained. In general adult unskilled labour is more productive than child labour and hence in reality the former earns higher wage rate than child labour. We can incorporate this in our model by assuming that the adult unskilled worker can supply more labour in efficiency units per unit of time than a child worker. This amounts to replacing eq. (5) by the following

$$LF_t = \alpha_{t-1}\left(1+\delta\right) + B; 0 \leq \alpha_{t-1} \leq 1 \; ; B > 1 \tag{33}$$

The above equation implies that the labour endowment of an unskilled parent, for whom $\alpha_{t-1} = 0$, is greater than that of a child worker. Incorporation of the above equation in our model will strengthen our result in the sense that in every period investment in human capital will be larger both under free market conditions and under the minimum wage law. Hence to eliminate child labour in the short run itself minimum wage need not be set at as high a level as in the case considered in the paper. Moreover, every thing else remaining the same, in the present case child labour will fall at a faster rate than in the case considered in the paper under the minimum wage law in the medium run.

4.3 Minimum Wage Law Versus Ban on Child Labour

In many countries, including India, child labour is illegal. This paper, as pointed out in p 2, is of the view that a ban on child labour might seriously threaten the survival of very poor households for whom child labour is a matter of compulsion and not of choice. Hence it recommends minimum wages for both adult and child labour as a more humane solution to the problem of child labour. Of course the unemployment due to the minimum wage policy will adversely affect the welfare also of the poorest of the poor households. But since their marginal utility of income relative to that of leisure is much more than that of the richer households, they will search more vigorously for jobs for all their members, both adult and young. Hence the incidence of unemployment is likely to fall more on the relatively better off households among the poor[5]. On this ground it regards the minimum wage law as a better policy option than a complete ban on child labour. This paper, however, ignores the problem of implementation of the policies.

[5]There is also search cost of employment and cost of access to information. This might favour the relatively better off sections of workers. If, however, such costs involve only expending labour, the poorer sections will gain over the others.

4.4 Cost of Schooling

It is assumed in this paper that the cost of schooling consists solely in the loss of households' income due to withdrawal of child labour from work. There are of course other costs of schooling such as tuition fees, stationeries, school uniform, transport cost etc. These costs might be substantial. However, as we have explained in p 15, incorporation of these costs will not affect our results qualitatively.

4.5 Parents' Satisfaction from Children's Education and Unemployment

In our paper it is assumed that parents derive satisfaction from the amount of education they are able to give to their children and not from their future income. Obviously, the presumption is that more education, parents believe, leads to higher future income for their children. When there is unemployment, as is the case under the minimum wage law, more education does not necessarily mean more future income for the children. Hence why should the parents derive satisfaction from their children's education in the face of unemployment? The justification of the assumption may be stated as follows. In this model, given the assumptions, unemployment under minimum wage law remains confined to child labour only as long as the minimum wage rate is set judiciously. Hence income of the household of an unskilled parent may be less than that of the household of a skilled parent. The former will definitely be less if unemployment is uniformly distributed among households, which is the assumption underlying this representative agent model. Hence, in the context of this model, giving a child education implies ensuring higher future income for the child's family even under the minimum wage law.

Actually, even if we abandon the narrow set up of our paper, we can justify our assumptions regarding parents' behaviour on the basis of the following considerations. What wage rate will prevail in future periods, whether the minimum wage rate will remain unchanged in future, what the level of unemployment would be in future, which children would get employment in future periods and which would not, parents of the current period do not have any clue to the answers to these questions. They do not have any reliable model by means of which they can make reasonably correct guesses regarding the issues mentioned above. Parents therefore cannot make any reasonably correct conjectures regarding the future income of their children. Moreover, the future state of the labour market is completely beyond the control of the parents. Under these circumstances the only way parents can help their children earn higher income in future is by allowing them to acquire skill so that they can make full utilization of the opportunities, if they come their way in future. These observations apply to both free market economies and economies subject to minimum wage laws. Hence it is assumed in this paper that parents derive satisfaction from the level of education they are able to give to their children and not from their future income.

5 Conclusion

This paper seeks to show that if parents are responsible heads of families and derive satisfaction from their children's education, minimum wages for both adult labour and child labour are likely to reduce child labour in the short run. They may also go on reducing child labour over time in the medium run. The reason is the following. Minimum wages will reduce demand for labour below supply of labour leading to involuntary unemployment. In this scenario, parents, as responsible and altruistic heads of families, are likely to search vigorously for jobs for themselves rather than for their children. If there is any truth in this line of thought, the incidence of unemployment due to the minimum wage law will fall mainly on the children. The paper does not consider explicitly the labour-leisure choice of the households. However, it seems that, if it brings in labour-leisure choice in households' optimization, the result that the unemployment due to minimum wage law is concentrated mainly among child workers becomes more plausible. The paper also does not recognize the fact that adult labour is more productive than child labour in most jobs. Incorporation of this factor also seems to contribute to concentration of unemployment due to minimum wage law on child labour.

Unemployment reduces the marginal cost of sending children to school. The loss in family income due to the withdrawal of child labour from work, which is an important component of the cost of schooling for the poor households, will fall to zero for the unemployed children. For these children therefore marginal cost of sending them to school becomes less following the adoption of the minimum wage law. However, marginal benefit of sending them to school remains unaffected[6]. Hence it is likely that they will be sent to school. In the next period therefore more parents will be educated. If educated adult workers are more productive than their uneducated counterparts, supply of labour in efficiency units will be larger. However, demand for labour remains

[6]In the face of unemployment, marginal benefit of sending children to school may also fall, if parents are concerned about children's future income. However, since future is uncertain, it may not fall as much as marginal cost.

the same. Hence number of unemployed children is likely to rise above that in the earlier period. Therefore more children will be sent to school than in the earlier period. Thus the incidence of child labour is likely to go on falling over time due to the minimum wage law.

This paper focuses only on the households' side of the problem of child labour. Child labour is present mainly in poor households where loss in family income due to withdrawal of child labour from work is an important component of the cost of sending children to school. Minimum wage policy targets this component of cost of sending children to schools. However, problem of child labour is also related to the efficiency of schools and other costs of education. Obviously, higher the efficiency of schools and lower the other costs of education the greater will be the incentive on the part of the households to send their children to school. Policies to improve efficiency of schools and reduce the other costs of schooling may therefore complement the minimum wage policy considered here. Such programmes are costly and may therefore be infeasible in countries where child labour is present on a large scale. However, a minimum level of efficiency of schooling is absolutely necessary to make it worthwhile for the poor households to invest in their children's education. Reasonably low 'other costs' of education is also essential to make child labour a choice problem to a sizeable number of poor households where child labour is present. Thus the policy recommended here will work if and only if the education system has a minimum level of efficiency and costs of schooling other than the loss in income due to withdrawal of child labour from current production are sufficiently low.

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A.1 Proof of Remark 1

$\alpha(.)$ is continuous and differentiable over the domain $\alpha_{t-1} \in [0,1]$. Therefore it will have a unique and stable interior fixed point if $0 < \alpha(0) < 1$, $0 < \alpha' < 1$ and $\alpha(1) < 1$. From eq. (14) we get

$\alpha(0) = \frac{\phi}{\phi+\beta}\left[2 - \frac{\beta}{(1+\delta)\phi}\right]$

Therefore ($\because \phi > 0, \beta > 0$ - see eqs.(1) and (9))

$$\alpha(0) > 0 \Leftrightarrow 2 > \frac{\beta}{(1+\delta)\phi} \Leftrightarrow \phi > \frac{\beta}{2(1+\delta)} \tag{A.1}$$

Again,

$$\alpha(0) < 1 \Leftrightarrow \frac{\phi}{\phi+\beta}\left[2 - \frac{\beta}{(1+\delta)\phi}\right] < 1 \Leftrightarrow \phi < \beta\left(\frac{1}{1+\delta} + 1\right) \tag{A.2}$$

From (A.1) and (A.2) it follows that

$$0 < \alpha(0) < 1 \text{ if and only if } \frac{\beta}{2(1+\delta)} < \phi < \beta\left(\frac{1}{1+\delta} + 1\right) \tag{A.3}$$

Now,

$\alpha' = [\phi/(\phi+\beta)](1+\delta) > 0$ since $\phi > 0, \beta > 0$ and $\delta > 0$ (see (1), (3) and (9). Again,

$$\alpha' < 1 \Leftrightarrow \frac{\phi}{\beta+\phi}(1+\delta) < 1 \Leftrightarrow \phi < \frac{\beta}{\delta} \tag{A.4}$$

$$\alpha(1) < 1 \Leftrightarrow \frac{\phi}{\beta+\phi}\left[\left(2 - \frac{\beta}{(1+\delta)\phi}\right) + (1+\delta)\right] < 1 \Leftrightarrow \phi < \beta\left(\frac{1}{1+\delta}\right) \tag{A.5}$$

If ϕ satisfies (A.5), it automatically satisfies (A.4) ($\because (1+\delta) > \delta$) and (A.2) ($\because [(1/1+\delta)+1] > (1/1+\delta)$). Therefore, if $[\beta/2(1+\delta)] < \phi < [\beta/(1+\delta)]$, then $0 < \alpha(0) < 1$, $0 < \alpha' < 1$ and $\alpha(1) < 1$. From the above we get Remark 1.

A.2 Proof of Remark 2

We first identify the values of α_{t-1} for which a minimum wage rate equal to the free market steady state wage rate is sufficient or more than sufficient to eliminate child labour in the short run itself. Let us, for this purpose, identify first the value of α_{t-1} corresponding to which the labour endowment of the parent is equal to the free market steady state labour supply, $[1 + \overline{\alpha}(1+\delta) + (1-\overline{\alpha})]$. This we can do by finding out the amount of increase in α_{t-1} from $\overline{\alpha}$ that will raise the parent's labour endowment by $(1-\overline{\alpha})$. Now $dLF_t = (1+\delta)\, d\alpha_{t-1} = (1-\overline{\alpha}) \Rightarrow d\alpha_{t-1} = (1-\overline{\alpha}) / (1+\delta) < (1-\overline{\alpha})$, see eq. (5). Therefore at $\alpha_{t-1} \left(\equiv \alpha_{t-1}^{A}\right) = \overline{\alpha} + [(1-\overline{\alpha}) / (1+\delta)] < 1\, (\because \delta > 0)$ the labour endowment of the parent is equal to the free market steady state labour supply. Therefore, if in the initial period, i.e., the period in which the minimum wage law is introduced, $\alpha_{t-1} \geq \alpha_{t-1}^{A}$ and the minimum wage rate is set equal to the free market steady state wage rate, the law will eliminate child labour in the short run itself. (Note that the free market equilibrium wage rate at every $\alpha_{t-1} > \bar{\alpha}$ is less than the free market steady state wage rate). However, for every $\alpha_{t-1} < \alpha_{t-1}^{A}$ labour endowment of the parent is less than the free market steady state labour supply and therefore the free market steady state wage rate is less than the minimum value of the minimum wage rate that eliminates child labour in the short run itself. The smaller the value of δ, the closer is α_{t-1}^{A} to unity. This proves Remark 2.

Derivation of the Steady State Value of α Under Minimum Wage Law

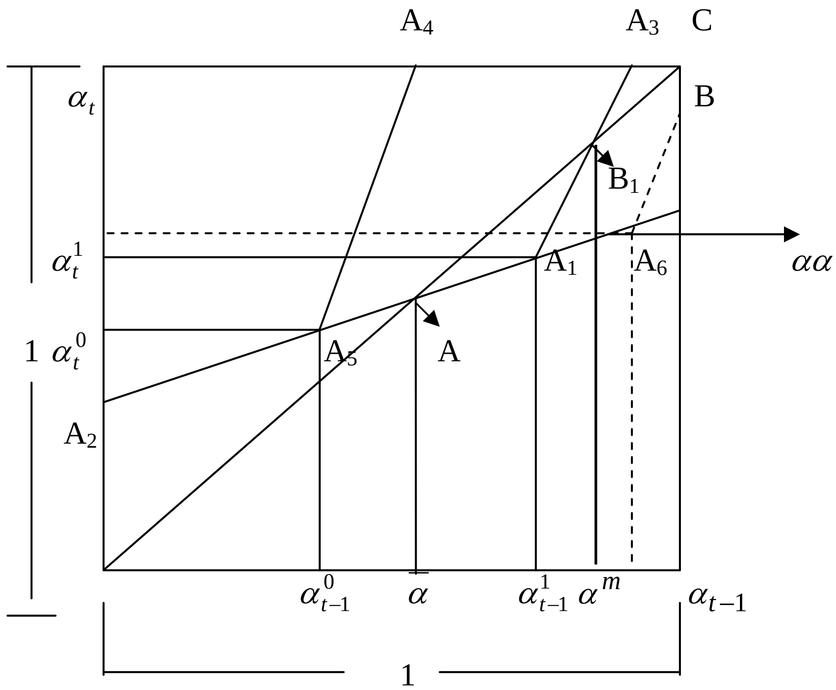

Figure 1