Child labour ban versus Education subsidy in a model with learning by doing effect in unskilled work

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27 April 2016

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Abstract

This paper builds an overlapping generations household economy model with learning by doing effect in unskilled work. We study the relative effectiveness of child labour ban and education subsidy on schooling. We find some interesting results- the time path of schooling is oscillating but convergent in nature; a fall in child wage does not necessarily increase steady state schooling; if unskilled adult wage is sufficiently small, education subsidy is more effective in enhancing schooling than banning child labour and a child labour ban that increases steady state schooling may not be accompanied by increase in utility level of the household.

Keywords: child labour, schooling, human capital, oscillation, child labour ban, education subsidy

JEL Classification Numbers: O10, J22, J24, I210, E24

1. Introduction

This paper builds a theoretical model with learning by doing effect in unskilled work. This paper examines the relative effectiveness of two types of domestic policies to combat child labour-a child labour ban and an education subsidy. Although the incidence of child labour has steadily declined over the last decade the ILO estimates show that the number of child workers across the globe is still quite high. According to the ILO estimates, in 2012, there were about 168 million child labourers in the world, of whom more than two thirds (120 million) were in the age group 5 to 14 years old. In 2012, the largest child labourers was in Asia and the Pacific (77.7 million), followed by Sub-Saharan Africa with 59.0 million, Latin America and the Caribbean with 12.5 million and MENA with 9.2 million. In relative terms, Sub-Saharan Africa ranks highest. About 1 in 5 children was in child labour in the region.

Thus tackling the problem of child labour remains a challenging issue for the developing countries across the world. Both domestic as well as international policies may be undertaken to reduce the incidence of child labour. However in this paper we restrict our analysis only to domestic policies. A number of theoretical papers have dealt with the effectiveness of domestic policies to reduce child labour. The pioneer work on child labour by Basu and Van (1998) shows that in case of multiple equilibria in the labour market, a total ban on child labour can take the economy from bad equilibrium to good equilibrium. All working class households will be better off. But if there is only one equilibrium, a total ban could harm worker households and also benefit them. A partial ban may not always reduce child labour but may reduce only child wage. However utility of the worker household may or may not increase. According to Baland and Robinson (2000), small ban on child labour can be Pareto improving. A ban on child labour reduces the supply of child labour while increasing the supply of adult labour in the future. As a result, current wages of both adults and children are likely to rise and future wages are likely to fall. Thus while children's utility is likely to rise in most cases, parental welfare will increase only when the effect on current wages dominates. The paper by Dessy and Pallage (2001) states that compulsory bans on child labour will help sending signals to investors that investment in human capital will be made in the near future and thus skilled labour is likely to be available. Ban or compulsory education will be counterproductive if the cost of investment is very high. Instead a policy that subsidizes technology and imposes compulsory education can help to move the economy from bad equilibrium to a good one. Emerson and Knabb (2006) shows that ban on child labour and/or compulsory education can actually reduce dynastic welfare, increase poverty and further accentuate income inequality within society. Banning child labour may not bring about positive outcomes for a poor household. According to P.Ranjan (1999), banning child labour, even if perfectly enforceable, reduces welfare of the poor households who want their children to work. Another paper by the same author-P.Ranjan (2001) states that if sending a child to work is an optimal decision for a poor household, a legislative ban reduces the welfare of the households as it imposes a constraint on the choices of the household. Few papers have dealt with the policy issues on harmful forms of child labour. According to Rogers and Swinnerton (2002), a ban on exploitative child labour leads to increase in the

wages of children working in the competitive sector and firm profits, even for firms that do not exploit child workers, fall. At the macroeconomic level, a ban has ambiguous effects i.e. child employment and aggregate output may rise or fall. Dessy and Pallage (2005) states that a ban on worst forms of child labour in poor countries is likely to be welfare reducing as these forms of labour have important economic role to play. The wages earned by the children by working in these jobs help in human capital accumulation. So by denying them work, they are being relegated to an even worse situation. Dinopoulos and Zhao (2007), in their paper on globalisation, shows that a ban on child labour benefits adult unskilled workers but hurts adult skilled workers.

There are relatively less works done to study the impact of education subsidy on child labour. According to Chaudhuri and Mukhopadhyay (2003), a rise in the education subsidy may produce counterproductive results on the supply of child labour in the urban area. Moreover it may raise the level of urban unemployment of adults even when adult labour and child labour are not substitutes to each other. The average income of the urban poor families may also decrease as a consequence. Chaudhuri (2004) states that the effects of increase in education subsidy on child labour depends on relative strength of two effects-namely labour re-allocation effect and the contradictory effect which exerts a downward pressure on the incidence of child labour. Mukherjee and Sinha (2006) argue in favour of education subsidy in improving school attendance. According to Estevez (2011), an education subsidy will reduce the incidence of child labour. The education subsidy will not only increase the household income but will also indirectly increase the unskilled wage.

There are some empirical papers that study the impact of domestic policies on child labour. Fabre and Pallage (2011) works within a dynamic, general equilibrium model calibrated to South Africa in the 1990s. It shows that in an economy with idiosyncratic shocks to adult employment, child labour ban deprives the households of an important way of smoothing consumption. Schultz (2004) evaluates the performance of Progresa (provides education grants to poor mothers) program in rural Mexico and has concluded that there has been significant reduction in child work for those families who have been induced by the program to enrol their child in school. However the magnitude of the response cannot offset more than a fifth of the total consumption gains associated with the program grants. The paper by Ravallion and Wodon (2000) studies the effects of a targeted enrolment subsidy on children's labour force participation and school enrolment in rural Bangladesh. Results suggest that the enrolment subsidy reduced the incidence of child labour but this effect accounts for a small proportion of the increase in school enrolment. So reduction of child labour not necessarily implies increase in schooling. Krueger and Donohue (2005) calibrate their model to USA data circa 1880 and conclude that introducing free education results in substantial welfare gains, whereas a child labour ban induces small welfare losses.

However none of the theoretical papers so far have studied the effects of ban and education subsidy on schooling of child labour in the presence of learning by doing effect in unskilled work. This paper attempts to fill this gap.

It is well known that workers are able to improve their productivity by repetition of the same work done. Dessy and Pallage (2005), in their paper on worst forms of child labour, have considered the learning by doing effect but in the human capital accumulation function. There are many other papers which have emphasized on the learning by doing effect. However these papers do not deal with the issue of child labour[1]. In the present paper individuals earn an extra income as adult in the unskilled sector if they had worked as child labour in their young age. This is how learning by doing effect works in our paper. Learning by doing often occurs through apprenticeship and in real life apprenticeship is found mostly in informal or unskilled sector. Apprenticeship provides vocational education in many fields e.g. carpentry, farming, masonry, fishing, poultry where knowledge is transmitted through prolonged practice rather than acquiring formal knowledge base. According to World Employment Report 1998-99-"In Kenya, there are more apprentices enrolled in the informal sector than trainees in the formal sector", while "in Egypt, over 80% of craftsmen in the construction sector acquire their skills through traditional apprenticeship." According to the report, child labour is common in the field of apprenticeship. According to ILO's report on Employment Sector (2008), apprenticeship has been providing the traditional solution for developing and financing vocational skills of young people in poor societies. Today, apprenticeship in the informal economy represents the main road to skills development in most developing countries. Estimations suggest that 80% of the skills imparted in the informal economy in West Africa are transferred through apprenticeship. In Benin, in 2005, approximately 2000,000 young apprentices were trained, which represents ten times as many apprentices than students in vocational and technical education. But there are very few child labour papers that capture learning by doing effect.

The present paper builds an overlapping generations model of household economy consisting of a skilled sector and an unskilled sector. If one individual is employed in skilled sector she gets wage proportional to human capital whereas unskilled sector gives a fixed return and a positive learning by doing effect generated from working in her childhood. Expected future earning of child is included in the parental utility function and parental choice of schooling vis-a-vis child work is considered. We consider the case where parents work in unskilled sector. This paper attempts to understand the effects of child labour ban and education subsidy on steady state schooling of child labour and effects of ban on utility level of the household. Moreover this paper studies the relative effectiveness of child labour ban and education subsidy in improving schooling of the child.

We find in this model that there exists a critical level of parental human capital beyond which schooling of child becomes positive and another critical level of parental human capital beyond which schooling of child becomes equal to one i.e. there is no child labour . The time path of schooling is convergent but oscillating in nature[2].

We find that steady state schooling increases with increase in the responsiveness of skilled wage to human capital, increase in parental level of human capital, increase in the probability

[1] See e.g. Lucas (1988), Mao (2012), Parente (1994), Hippel and Tyre (1993) etc.

[2] Zhang (2015), Zhang (2014), Croix and Licandro (1999), Croix (2001) have found oscillations in human capital accumulation but in different context.

of getting employment in the skilled sector, fall in schooling cost. As child wage falls, steady state schooling increases only if unskilled adult wage exceeds the sum of subsistence consumption expenditure and schooling cost of the household. Otherwise fall in child wage may or may not increase steady state schooling of the child. While analysing the dynamics we find that in the presence of learning by doing effect on unskilled income the time path of schooling is oscillating but convergent. Comparing the effects of ban and education subsidy on steady state schooling we get the result that if unskilled adult wage is sufficiently small, education subsidy is more effective in enhancing schooling than banning child labour. A child labour ban that increases steady state schooling may not necessarily increase utility level of the household.

The rest of this paper is organized as follows. Section 2 describes the basic model. Section 3 describes the short run equilibrium when adults work in the unskilled sector. Section 4 discusses the dynamics of schooling. In section 5 comparisons between effects of ban and subsidy are being made. Section 6 analyses the impact of ban on utility level of the household. Concluding remarks are made in section 7.

2. The Model

We consider an economy that consists of identical households in overlapping generations framework[3]. Each household consists of one adult and one child. We consider two parents as one adult and two children as one child. The economy consists of two sectors- a skilled sector and an unskilled sector. In first period agents are children. They may either work in unskilled sector or go to school. In second period, the agent on reaching adulthood, even though she is educated, may not get job in the skilled sector. Job in skilled sector is subject to uncertainty. If she does not get job in skilled sector she gets absorbed in the unskilled sector. If one individual is employed in skilled sector she gets wage proportional to human capital whereas unskilled sector gives a fixed return and an extra income depending on if she had worked as child labour. The adult or the parent decides the time allocation of her child between work and schooling. Utility function of the adult depends on family consumption and expected earnings of the child in future[4]. Adult forms expectations over whether she believes that the child will get job in skilled sector on becoming adult[5]. This forecasting depends on present level of unemployment in the economy.

Following Glomm (1997), we assume parental choice of human capital investment. The adult decides how much time her child would devote to work in the unskilled sector and how much

[3] Overlapping generations framework have been adopted by Becker and Tomes (1979), Acemoglu and Pischke (2000), Glomm (1997), Glomm and Ravikumar (1998) and many

[4] In Mukherjee and Sinha (2006), aggregate current consumption and the child's future earning enter in the parent's utility function. According to Genicot and Ray (2010), people's aspirations for their future well being (or that of their children) affect their incentives to invest. Expectations of the parents from their children affect their utility.

[5] In Emerson and Knabb (2007), households form expectations over whether they believe the government will keep its promise to implement the social security program to eradicate child labour.

time for schooling by maximizing utility subject to the budget constraint. In first period, time devoted to schooling is denoted by 's_{t-1}' and that to work is '1- s_{t-1}'. Working generates positive learning by doing effects denoted by '(1- s_{t-1})$\underline{h}$'which helps her to earn a higher wage in future on joining the unskilled sector. Here $\underline{h}$ is the minimum level of human capital possessed by the child even if she does not attend school. In second period the adult sends her child to school for's_t' units of time and for the remaining '(1-s_t)' units of time, the child is employed in the unskilled sector. Wages earned by the adult and the child constitute the total income of the household. If the child joins the skilled sector, on becoming adult, she gets a wage in the skilled sector which is a fixed proportion of the human capital possessed by her (δh_t)[6]. In unskilled sector the adult gets a fixed return 'A+ (1- s_{t-1})$\underline{h}$' where'(1- s_{t-1})$\underline{h}$ ' denotes positive learning by doing effect generated from working as a child. Child, by working in the unskilled sector also get a fixed return which is less than the return obtained by the adults from unskilled sector.

Like Moav (2005), this paper assumes that human capital evolution is independent of physical capital.

Suppose human capital accumulation function of a child is assumed to take the following form[7]:

$$h_{t+1} = bs_t h_t + \underline{h}, \qquad (1)$$

Here 'h_t' represents the level of human capital possessed by the adult. So here parental human capital is one of the determinants of human capital of the child. 's_t' is the time devoted by the child to study, b>0 is a positive constant representing education technology and $\underline{h}$ represents the minimum level of human capital achieved by a child even if she does not attend school(i.e. s_t=0).Thus h_{t+1}>0 even if s_t =0.

When adults work in unskilled sector, the household income is given by:

$$Y_t = [A+ (1- s_{t-1})\underline{h}\ ]+A\varphi\ (1-s_t)\ , \qquad (2)$$

where Y_t is total income of the household, A is wage earned by the adult in unskilled sector, (1- s_{t-1})$\underline{h}$ is the positive learning by doing effect, φ is the fraction of adult wage that a child labour receives. Here 0<φ<1 is a positive constant.

The household spends its income on purchasing consumption good and schooling of the child. So, the budget constraint of the household is given by:

$$[A+ (1- s_{t-1})\underline{h}\ ]+ A\varphi\ (1-s_t) = p_c c_t + \rho\ s_t\ , \qquad (3)$$

where p_c is the price of the consumption good, $p_c c_t$ represents the total consumption expenditure and ρs_t denotes the expenditure on schooling of the child. When adults work in skilled sector, household income is given by:

[6] Hare and Ulph (1979) assume that wage rate depends on ability and amount of education received by an individual.

[7] According to Contrereas (2008), Emerson and Knabb (2006) and Galor and Tsiddon (1997), human capital of the parents play a crucial role in human capital development of the children.

$Y_t = w_t + A\varphi\,(1\text{-}s_t)$,

where w_t is the wage earned by the adult in the skilled sector. We assume wage earned in skilled sector (w_t) is proportional to the human capital acquired by that individual i.e. $w_t = \delta h_t$.

Utility function of an adult of the representative household is defined as follows:

$$U_t = \ln (c_t - \underline{c}) + \beta \ln [f\,\delta\,(bs_t h_t + \underline{h}\,) + (1\text{-}f)\,\{A + (1\text{-}\,s_t)\underline{h}\}], \qquad (4)$$

where c_t represents consumption, $\underline{c}$ represents subsistence consumption. The utility function is defined on the range $c_t \geq \underline{c}$. Adult believes that the probability of the child getting job in skilled sector is f (present employment rate of skilled sector). $\delta\,(bs_t h_t + \underline{h}\,)$ is the return that the child may get as an adult if he gets job in the skilled sector. Adult believes that the probability of the child not getting job in skilled sector is (1-f). While modelling parental expectation, adaptive expectation is assumed. Parents observe present unemployment rate and expect that the same unemployment rate would prevail. So they believe that their children will get employed in skilled sector with probability f if the employment rate of skilled sector is f and rate of unemployment in skilled sector would be (1-f). It is assumed that whoever does not get job in skilled sector gets employed in unskilled sector. Unskilled sector absorbs all the residual labour force. So there is no possibility of remaining fully unemployed. $[A + (1\text{-}\,s_t)\underline{h}\,]$ is the return that the child may get as an adult if he gets job in unskilled sector. $[f\,\delta(bs_t h_t + \underline{h}\,) + (1\text{-}f)\,\{A + (1\text{-}\,s_t)\underline{h}\,\}]$ represents total expected earning of child.

Let us first apply the model in the short run equilibrium context in case of unskilled sector and understand the relationship between parental human capital and schooling of the child.

3. Short-run equilibrium when adults work in the unskilled sector

Utility maximization problem of an adult of the representative household is to maximize the utility, given by equation (4), subject to budget constraint given by equation (3) with respect to the decision variables of the household, viz, c_t and s_t.

From the first order conditions[8] of the above optimization problem, we obtain:

$$s_t = \frac{\beta\{f\delta b h_t - (1-f)\underline{h}\}\{A(1+\varphi)+(1-s_{t-1})\underline{h}-p_c\underline{c}\}-\{f\delta\underline{h}+(1-f)(A+\underline{h})\}(A\varphi+\rho)}{\{f\delta b h_t-(1-f)\underline{h}\}(A\varphi+\rho)(1+\beta)} \qquad (5)$$

From equation (A.2), $f\delta b h_t - (1-f)\underline{h} > 0$

Therefore for $s_t > 0$,

$$h_t > \frac{\{f\delta\underline{h}+(1-f)(A+\underline{h})\}(A\varphi+\rho)+\beta(1-f)\underline{h}\{A(1+\varphi)+(1-s_{t-1})\underline{h}-p_c\underline{c}\}}{\beta f\delta b\{A(1+\varphi)+(1-s_{t-1})\underline{h}-p_c\underline{c}\}} = h_0$$

$$s_t = 1 \text{ when } h_t \geq \frac{\{f\delta\underline{h}+(1-f)(A+\underline{h})\}(A\varphi+\rho)+(1-f)\underline{h}[\beta\{A(1+\varphi)+(1-s_{t-1})\underline{h}-p_c\underline{c}\}-(A\varphi+\rho)(1+\beta)]}{f\delta b[\beta\{A(1+\varphi)+(1-s_{t-1})\underline{h}-p_c\underline{c}\}-(A\varphi+\rho)(1+\beta)]} = \hat{h}$$

[8] For detailed derivation please see equations (A.1) and (A.2) of Appendix.

Proposition 1: If parental human capital is higher than $\hat{h}$ there will be no child labour and if initial human capital is less than h_0 there will be no schooling of child.

Differentiating s_t with respect to s_{t-1} we get

$$\frac{ds_t}{ds_{t-1}} = \frac{-\beta\underline{h}}{(A\varphi+\rho)(1+\beta)} < 0$$

This implies that if schooling in one period is low, in the next period schooling will be high. This is because even if parents are not much educated, in expectation that their children may get job in the skilled sector in the future they send their children to school for higher number of hours.

Now $\left| \frac{ds_t}{ds_{t-1}} \right| = \frac{\beta\underline{h}}{(A\varphi+\rho)(1+\beta)}$

$\left|\frac{ds_t}{ds_{t-1}}\right| < 1$ if $\underline{h} < \frac{(A\varphi+\rho)(1+\beta)}{\beta}$

We assume the minimum human capital attained by a child even if she does not attend school is less than a critical level (i.e. $\underline{h} < \frac{(A\varphi+\rho)(1+\beta)}{\beta}$). We require this condition for convergent equilibrium.

4. Dynamics of schooling

At steady state, $s_t = s_{t-1} = s^*$

So from equation (5) we get,

$$s^* = \frac{\beta\{f\delta bh_t-(1-f)\underline{h}\}\{A(1+\varphi)+\underline{h}-p_c\underline{c}\}-\{f\delta\underline{h}+(1-f)(A+\underline{h})\}(A\varphi+\rho)}{\{f\delta bh_t-(1-f)\underline{h}\}\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}}$$

$$s^* = 0 \text{ if } \beta\{f\delta bh_t - (1-f)\underline{h}\}\{A(1+\varphi) + \underline{h} - p_c\underline{c}\} \leq \{f\delta\underline{h} + (1-f)(A+\underline{h})\}(A\varphi+\rho)$$

Sufficient condition for $s^* = 0$ is $A(1+\varphi) + \underline{h} - p_c\underline{c} < 0$.This implies that the sufficient condition for steady state schooling to be zero is that the sum of adult's earning, child's earning and minimum level of human capital attained by the child even if she does not attend school must be less than the subsistence consumption expenditure of the household.

Now intercept of $s_t = \frac{\beta\{f\delta bh_t-(1-f)\underline{h}\}\{A(1+\varphi)+\underline{h}-p_c\underline{c}\}-\{f\delta\underline{h}+(1-f)(A+\underline{h})\}(A\varphi+\rho)}{\{f\delta bh_t-(1-f)\underline{h}\}(A\varphi+\rho)(1+\beta)} > s^*$

Necessary condition for $s^* = 1$ is $A - p_c\underline{c} > \frac{A\varphi+\rho(1+\beta)}{\beta}$. This condition will hold true if $A - p_c\underline{c} > 0$ and is sufficiently high. This implies that the necessary condition for full schooling in steady state is that adult wage must exceed subsistence consumption expenditure of the household and the difference between adult wage and subsistence consumption expenditure must be sufficiently high.

We assume $s^* > 0$. Therefore intercept of $s_t > 0$.

s_t will thus be a downward sloping straight line with positive intercept.

In the following diagram we show the case where $|\frac{ds_t}{ds_{t-1}}|<1$. Here we get a convergent equilibrium. We rule out the case where $|\frac{ds_t}{ds_{t-1}}|>1$ because then we get a divergent equilibrium. Only if the minimum human capital attained by a child even if she does not attend school is less than a critical level (i.e. $\underline{h}<\frac{(A\varphi+\rho)(1+\beta)}{\beta}$), we get the case of convergent equilibrium.

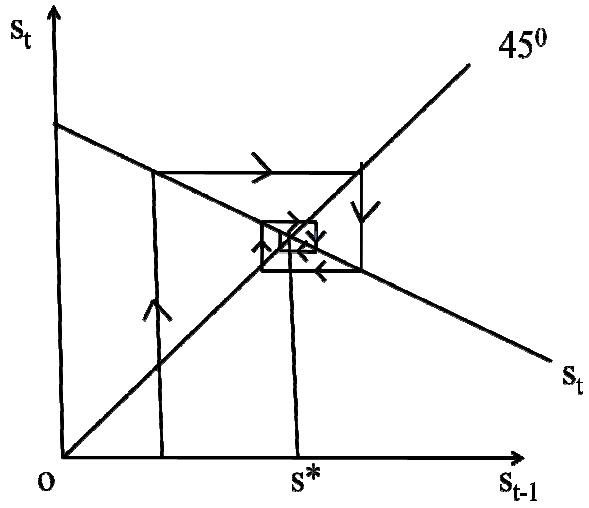

Figure 1

In Figure 1, schooling converges to steady state level s^*over time. Since $\frac{ds_t}{ds_{t-1}}<0$, the time path of schooling will be oscillating in nature. We assume that $|\frac{ds_t}{ds_{t-1}}|<1$. Thus the time path will be oscillating but convergent in nature.

Proposition 2: In the presence of learning by doing effect the time path of schooling would be oscillating but convergent provided the minimum level of human capital possessed by a child, even if she does not attend school, is less than a critical level.

Note that[9]:

i) $\frac{ds^*}{d\delta}>0$. This implies that as δ increases i.e. the responsiveness of skilled wage to human capital increases, steady state schooling also increases. As δ captures the marginal return to human capital, an increase in δ results in an increase in steady state schooling of the child.

ii) $\frac{ds^*}{d\varphi}<0$ if $A>\rho+p_c\underline{c}$. This implies that if adult unskilled wage exceeds sum of the schooling cost and subsistence expenditure of the household then even if child wage falls,

[9] For detailed derivation please see equations (A.5), (A.6) (A.7), (A.8), (A.9) and (A.10) of Appendix.

steady state schooling of the child increases. In this case wage obtained from child work is no longer necessary for household. In this context, as child earns a lower proportion of the earning earned by the adult by working in the unskilled sector, schooling rises. This is because lower earnings by the child obtained by working the same number of hours induce the parent to reduce the working hours of the child, necessary to meet subsistence consumption needs and instead increase the schooling hours of the child. However if $A<\rho + p_c\underline{c}$ i.e. if adult unskilled wage is less than the sum of the schooling cost and subsistence expenditure of the household, $\frac{ds^*}{d\varphi}$ may be >0 or < 0.This implies that with fall in child wage steady state schooling of the child may or may not increase.

iii) $\frac{ds^*}{d\rho} < 0$. This implies that with fall in schooling cost steady state schooling increases.

iv) $\frac{ds^*}{dA} > 0$ if $bh_t > \frac{\beta\underline{h}\{f\delta\underline{h}+(1-f)(A+\underline{h})\}\varphi-\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}(1-f)(A\varphi+\rho)}{f\delta[\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}\beta(1+\varphi)-\beta\{A(1+\varphi)+\underline{h}-p_c\underline{c}\}(1+\beta)\varphi]} + \frac{(1-f)\underline{h}}{f\delta}$. If b or h_t is very high, this condition is more likely to be satisfied. This implies that if education technology is highly efficient or parental human capital is very high, only then with increase in unskilled adult wage, steady state schooling will increase. Otherwise increase in unskilled adult wage may also lead to fall in steady state schooling.

v) In this model $\frac{ds^*}{dh_t} = \frac{f\delta\beta\{f\delta\underline{h}+(1-f)(A+\underline{h})\}(A\varphi+\rho)}{\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}\{f\delta bh_t-(1-f)\underline{h}\}^2} > 0$. This implies that as parental human capital increases, steady state schooling of child also increases. This is quite obvious. Parents who are more educated will care more for the education of the child.

vi) $\frac{ds^*}{df} > 0$. This implies that with increase in the probability of getting employment in the skilled sector, steady state schooling rises.

5. Comparison between the effects of ban and subsidy

In this section we compare the effects of ban and education subsidy on steady state schooling.

$$\left|\frac{ds^*}{d\varphi}\right| - \left|\frac{ds^*}{d\rho}\right|$$

$$= \frac{\beta[\{f\delta bh_t-(1-f)\underline{h}\}\{A(1+\beta)(A-\rho-p_c\underline{c}-1-\varphi)+\underline{h}(A-1-\beta)+(1+\beta)p_c\underline{c}\}+\underline{h}\{f\delta\underline{h}+(1-f)(A+\underline{h})\}(A-1)}{\{f\delta bh_t-(1-f)\underline{h}\}\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}^2}$$

Now $A< \min\{(1+\rho+\varphi+p_c\underline{c}), (1+\beta)\}$ is the sufficient condition for $\left|\frac{ds^*}{d\rho}\right| > \left|\frac{ds^*}{d\varphi}\right|$.

This implies that if unskilled wage is sufficiently small, education subsidy (i.e. lowering education cost) is more effective in enhancing steady state schooling than banning child labour.

Proposition 3: If unskilled wage is sufficiently low, providing education subsidy is a better policy option to increase schooling than banning child labour. On the other hand if unskilled wage is not all that low child ban is a better policy measure to enhance schooling.

6. Effects of ban on utility

In this section we study the effects of ban on utility level of the household in the steady state.

Differentiating the utility function with respect to φ we get[10]

$$\frac{dU_t}{d\varphi} = \frac{(A\varphi+\rho)\frac{ds^*}{d\varphi}\{f\delta bh_t-(1-f)\underline{h}\}(1+\beta)+\left[s^*\{f\delta bh_t-(1-f)\underline{h}\}+f\delta\underline{h}+(1-f)(A+\underline{h})\right]A}{\left[s^*\{f\delta bh_t-(1-f)\underline{h}\}+f\delta\underline{h}+(1-f)(A+\underline{h})\right](A\varphi+\rho)}$$

If $\frac{ds^*}{d\varphi}>0$, then $\frac{dU_t}{d\varphi}>0$. This possibility may arise if $\rho+p_c\underline{c}>A$ and $\rho+p_c\underline{c}$ is very high. When education cost and subsistence expenditure is very high a child labour ban decreases both steady state schooling and utility level of the household. Otherwise even if $\rho+p_c\underline{c}>A$, $\frac{ds^*}{d\varphi}<0$. In that case $\frac{dU_t}{d\varphi}$ may be <0 or >0.

If $\frac{ds^*}{d\varphi}<0$, then $\frac{dU_t}{d\varphi}<0$ if the following condition holds:

$$\left|(A\varphi+\rho)\frac{ds^*}{d\varphi}\{f\delta bh_t-(1-f)\underline{h}\}(1+\beta)\right| > \left[s^*\{f\delta bh_t-(1-f)\underline{h}\}+f\delta\underline{h}+(1-f)(A+\underline{h})\right]A$$

So a child labour ban that increases steady state schooling may not necessarily increase utility level of the household. This is because due to child labour ban, when child wage i.e. φ falls, steady state schooling (s^*) rises. This increases utility level of the household but due to fall in φ, consumption level of the household falls which reduces utility level of the household. If the effect on consumption dominates the effect on steady state schooling, then child labour ban reduces utility level of the household.

Proposition 4: A child labour ban that increases steady state schooling of the child does not necessarily increase utility level of the household. The overall impact of the ban depends on the relative strength of two opposing effects working on consumption and steady state schooling.

7. Conclusion

Child labour continues to remain a social evil in developing countries. At times schooling cost is so high that even if the parent wants her child to study she is unable to do so because of poor financial condition of the household. Income of the parent is often not good enough to meet the subsistence consumption expenditure of the household. Thus the parent needs to depend on earnings of the child to satisfy the subsistence requirements of the family. Schooling cost adds to this burden. In such a situation banning child labour may not prove to be a fruitful solution to the problem. Instead subsidization of education may provide some relief to a poor parent and may act as an incentive to send her chid to school.

This paper builds an overlapping generations model of household economy consisting of a skilled sector and an unskilled sector. If one individual is employed in skilled sector she gets wage proportional to human capital whereas unskilled sector gives a fixed return and a

[10] For detailed derivation please see Appendix

positive learning by doing effect generated from working in her childhood. Expected future earning of child is included in the parental utility function. Parental choice of schooling vis-a-vis child work is considered. Human capital accumulation of the child depends on time devoted to schooling by the child and parental level of human capital. We consider the case where parents work in unskilled sector. This paper attempts to understand the effects of child labour ban and education subsidy on steady state schooling of child labour and effects of ban on utility level of the household. Moreover this paper studies the relative effectiveness of child labour ban and education subsidy in improving schooling of the child.

We find that steady state schooling increases with increase in the responsiveness of skilled wage to human capital, increase in parental level of human capital, increase in the probability of getting employment in the skilled sector, fall in schooling cost. As child wage falls, steady state schooling increases only if unskilled adult wage exceeds the sum of subsistence consumption expenditure and schooling cost of the household. Otherwise fall in child wage may or may not increase steady state schooling of the child. While analysing the dynamics we find that in the presence of learning by doing effect on unskilled income the time path of schooling is oscillating but convergent. Comparing the effects of ban and education subsidy on steady state schooling we get the result that if unskilled adult wage is sufficiently small, education subsidy is more effective in enhancing schooling than banning child labour. A child labour ban that increases steady state schooling may not necessarily increase utility level of the household.

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Appendix

The optimization problem of the household is to maximize

$$Z = \ln(c_t - \underline{c}) + \beta \ln [f\delta(bs_t h_t + \underline{h}) + (1-f)\{A + (1-s_t)\underline{h}\}] + \lambda [\{A + (1-s_{t-1})\underline{h}\} + A\varphi(1-s_t) - p_c c_t - \rho s_t]$$

where λ is the Lagrange multiplier. The decision variables of the household are c_t and s_t. The first order conditions for maximization of utility are given by:

$$\frac{\delta Z}{\delta c_t} = \frac{1}{c_t - \underline{c}} - \lambda p_c = 0 \qquad (A.1)$$

$$\frac{\delta Z}{\delta s_t} = \frac{\beta\{f\delta b h_t - (1-f)\underline{h}\}}{f\delta(bs_t h_t + \underline{h}) + (1-f)\{A + (1-s_t)\underline{h}\}} - \lambda(A\varphi + \rho) = 0 \qquad (A.2)$$

From (A.1) and budget constraint $[A + (1-s_{t-1})\underline{h}] + A\varphi(1-s_t) = p_c c_t + \rho s_t$, we get

$$\frac{1}{A + (1-s_{t-1})\underline{h} + A\varphi(1-st) - p_c\underline{c} - \rho\, st} = \lambda \qquad (A.3)$$

From (A.2) and (A.3) we get,

$$s_t = \frac{\beta\{f\delta bh_t-(1-f)\underline{h}\}\{A(1+\varphi)+(1-s_{t-1})\underline{h}-p_c\underline{c}\}-\{f\delta\underline{h}+(1-f)(A+\underline{h})\}(A\varphi+\rho)}{\{f\delta bh_t-(1-f)\underline{h}\}(A\varphi+\rho)(1+\beta)} \quad (A.4)$$

$$\frac{ds^*}{d\delta} = \frac{(A\varphi+\rho)[\,(1-f)(A+\underline{h})fbh_t+(1-f)f\underline{h}^2]}{\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}\{f\delta bh_t-(1-f)\underline{h}\}^2} \quad (A.5)$$

$$\frac{ds^*}{d\varphi} = \frac{-[A\beta\{f\delta bh_t-(1-f)\underline{h}\}\{(1+\beta)(A-\rho-p_c\underline{c})+\underline{h}\}+A\beta\underline{h}\{f\delta\underline{h}+(1-f)(A+\underline{h})\}]}{\{f\delta bh_t-(1-f)\underline{h}\}\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}^2} \quad (A.6)$$

$$\frac{ds^*}{d\rho} = -[\frac{\beta\{A(1+\varphi)+\underline{h}-p_c\underline{c}\}(1+\beta)}{\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}^2}+\frac{\beta\underline{h}\{f\delta\underline{h}+(1-f)(A+\underline{h})\}}{\{f\delta bh_t-(1-f)\underline{h}\}\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}^2}] \quad (A.7)$$

$$\frac{ds^*}{dA} = \frac{[f\delta bh_t-(1-f)\underline{h}][\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}\{\beta(1+\varphi\}-\beta\{A(1+\varphi)+\underline{h}-p_c\underline{c}\}(1+\beta)\varphi]-\beta\underline{h}\{f\delta\underline{h}+(1-f)(A+\underline{h})\}\varphi}{\{f\delta bh_t-(1-f)\underline{h}\}\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}^2} \quad (A.8)$$

$$\frac{ds^*}{dh_t} = \frac{f\delta\beta\{f\delta\underline{h}+(1-f)(A+\underline{h})\}(A\varphi+\rho)}{\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}\{f\delta bh_t-(1-f)\underline{h}\}^2} \quad (A.9)$$

$$\frac{ds^*}{df} = \frac{(A\varphi+\rho)[\,\delta\underline{h}^2+(A+\underline{h})\delta bh_t]}{\{(A\varphi+\rho)(1+\beta)+\beta\underline{h}\}\{f\delta bh_t-(1-f)\underline{h}\}^2} \quad (A.10)$$

Derivation of $\frac{dU_t}{d\varphi}$

From (A.1) and (A.2)

$$c_t = \frac{[f\delta(bs_th_t+\underline{h})+(1-f)\{A+(1-s_t)\underline{h}\}](A\varphi+\rho)}{p_c\beta\{f\delta bh_t-(1-f)\underline{h}\}} + \underline{c}$$

Substituting the value of c_t and putting $s_t = s_{t+1} = s^*$ in the utility function we get

$$U_t = \ln[\frac{s^*\{f\delta bh_t-(1-f)\underline{h}\}+f\delta\underline{h}+(1-f)(A+\underline{h})]\,(A\varphi+\rho)}{p_c\beta\{f\delta bh_t-(1-f)\underline{h}\}}] + \beta\ln[s^*\{f\delta bh_t-(1-f)\underline{h}\}+f\delta\underline{h}+(1-f)(A+\underline{h})]$$

Now differentiating the utility function with respect to φ we get

$$\frac{dU_t}{d\varphi} = \frac{(A\varphi+\rho)\frac{ds^*}{d\varphi}\{f\delta bh_t-(1-f)\underline{h}\}(1+\beta)+[s^*\{f\delta bh_t-(1-f)\underline{h}\}+f\delta\underline{h}+(1-f)(A+\underline{h})]A}{[s^*\{f\delta bh_t-(1-f)\underline{h}\}+f\delta\underline{h}+(1-f)(A+\underline{h})](A\varphi+\rho)}$$