Will increase in size of landholding reduce child labour in presence of unemployment? A theoretical analysis

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Abstract

This paper builds an overlapping generations household economy model in rural set up and examines the relationship between landholding and child labour in presence of unemployment in the manufacturing sector. We find that irrespective of whether the parents work in the agricultural sector as farmers or they work on own land, increase in size of land holding leads to decline in schooling of the child worker in the short run, and decline in growth rate of human capital formation in the long run but may lead to increase in the steady state human capital in the long run.

Keywords: land holding, child labour, human capital, schooling, unemployment

JEL Classification Numbers: E24, J22, J24, O15, Q15

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1. Introduction

The term 'child labour' brings to our mind the picture of a child working in harsh inhuman conditions and we often blame the parents for such fate of their children. But in reality parents, in spite of being altruistic towards their children are often forced to send their children to work because of the grave economic situation of the family. This is what is termed as 'Luxury Axiom'. Many works in child labour literature may be presented as evidence to this phenomenon (Basu and Van 1998, Basu 1999, Emerson and Souza 2003, Edmonds and Pavcnik 2005, Edmonds 2005, Rickey and Jayachandran 2009).

Although the general belief is that child labour is the result of poverty, many empirical papers challenge the view that 'Luxury Axiom' will hold true in case of agriculture as well. These papers derive results that contradict the 'Luxury Axiom'. Generally land is considered as a source of wealth for a household. So according to the 'Luxury Axiom' increase in land should imply addition to wealth of the household and thus should reduce the incidence of child labour in the family. However many recent empirical papers find contradictory results while studying the relationship between land holding and child labour. They find that increase in land holding leads to increase in child labour. This is known as 'Wealth Paradox'. According to this paradox, children of land rich households are more likely to work than children of land poor households. Since in developing countries a high percentage of child labour is engaged in family farming and other land related activities, the relationship between land holding and child labour is worth studying. Working at an early age denies the child proper schooling which is a major source of human capital formation of the child. However not many works are present that study the relationship among land holding, child labour and their human capital formation. Our paper seeks to conduct a theoretical study of the relationship among land holding, child labour and their human capital formation at the backdrop of unemployment.

The relationship between land holding and child labour is addressed by many empirical studies. Most of them find results in favour of 'Wealth Paradox'. Bhalotra and Heady (2003) consider two developing countries-Ghana and Pakistan for their study and they conclude from their study that as land holding increases in these two countries, child labour also increases. Boutin (2012) conducts his study using data from Mali where children help the elders in family farming. The study points out that as land holding of the household increases more children are involved in family farming as helpers. Children and adults are often used as substitutes in farming. However absence of hired adult labour market often propels to use the children in farming activities instead. Dumas (2007) shows that as land holding increases, more child labour will be used if the option of hiring adult labour from outside the family is absent. In India the existence of 'Wealth Paradox' can be traced back to the study of Rozenweig and Evenson (1977) who use the 1961 Census data from India to study the relationship between land holding and child labour. They show that as land holding increases value of marginal contribution of children also increases. Thus, with increase in land holding, children are sent to school for lesser number of hours and are instead sent to work on land. Moura (2009)'s study of the relationship between security of land tenure and child labour, based on the empirical data from Brazil, however shows that with increase in security of land tenure, child labour is actually be replaced by adult labour. As a result, adult labour increases and child labour falls. However none of these papers focus on the relationship among land holding, child labour and their human capital formation.

Only a few theoretical studies deal with the relationship among land holding and child labour. Basu, Das and Dutta (2007) assume that utility of the parents depends on consumption and child leisure and parents decide how much time the child will devote to work and how much time the child will enjoy leisure. Their theoretical model shows an inverted U shaped relationship between land holding and child labour. When this result is tested empirically using data from India, it is found that as land holding increases beyond 3.6 acres, child labour starts falling although initially with increase in land holding child labour increases. Bar and Basu(2008) show that when land holding increases by a small amount child labour increases not only in the short run but also in the long run. However as size of land holding exceeds a particular level child labour starts falling in the long run. However in both these papers education of child labour is not accommodated for. Chakraborty and Chakraborty (2014) incorporate education of child labour in their theoretical paper on landholding, child labour and human capital formation. This paper concludes that as land holding increases child labour increases in the short run. However in the long run, steady state human capital and growth rate of human capital bear a U-shaped relation with size of land holding. However this paper assumes that adults work only in manufacturing sector and children are sent to work on land only. This paper tries to extend Chakraborty and Chakraborty (2014) model to a situation where both parents and children work on land.

Since intergenerational persistence of child labour is quite common in real world we consider an overlapping generations model to capture this dynamic aspect of child labour. This allows us to discuss the issue of child labour from both short run as well long run perspective. This paper also includes expected earnings from child in parental utility function and studies the relationship among landholding, child labour and human capital at the backdrop of unemployment. Mukherjee and Sinha (2006), in their paper on child labour, include expected earnings from child in parental utility function in the presence of unemployment in formal sector. But their paper is not modelled in a dynamic setting.

This paper builds an overlapping generations model of household economy in rural set up. The economy consists of a manufacturing sector and an agricultural sector. If one individual is employed in manufacturing sector she gets wage proportional to human capital whereas agricultural sector gives a fixed return. Expected future earning of child is included in the parental utility function and parental choice of schooling vis-a-vis child work is considered. Since overwhelming portion of child labours work in agricultural sector we consider the problem of parental choice of schooling for a farmer household. A farmer might own the farmed land or might work as a labourer on land owned by others. In advanced economies, a farmer is usually a farm owner, while in developing countries they are mere employees of the farm owned by someone else and are known as farm workers. In this paper, first we consider the case where adult and child of a household work in agricultural sector as farm workers and they get competitive wages. Next we consider the case where both adult and child work on household owned land. This paper attempts to understand the relationship among land size, child labour and human capital development in both the cases. This paper considers parental choice of schooling vis-a-vis child work to understand the relationship among land size, child labour and human capital development, in the short run and the long run. We find that though an increase in land size reduces child schooling and increases child labour in short run and reduces growth rate in the long run, it may increase steady state human capital in the long run.

The rest of this paper is organized as follows. Section 2 describes the basic model, section 3 discusses the case where parents work in agricultural sector as farmer, section 4 discusses the case where parents work on household owned land, section 5 presents the major findings and propositions obtained from the analysis of the two cases discussed in this paper. Concluding remarks are made in section 6.

2. The Model

We consider an economy that consists of identical households in overlapping generations framework[2]. Each household consists of one adult and one child. We consider two parents as one adult and two children as one child. Following Glomm (1997) and Chakraborty and Chakraborty (2014), we assume parental choice of human capital investment. The adult decides the time allocation of the child between work and schooling. Utility function of the adult depends on family consumption and expected earnings of the child in future[3]. When the child becomes adult he may not get opportunity to work as skilled labour in manufacturing sector due to job uncertainty in the manufacturing sector in presence of unemployment. If she does not get job in manufacturing sector she gets absorbed in the agricultural sector. Adult forms expectations over whether she believes that the child will get job in manufacturing sector on becoming adult[4]. This forecasting depends on present level of unemployment in the economy.

[2] Other papers which use overlapping generations frame work include Becker and Tomes (1979), Acemoglu and Pischke (2000), Glomm (1997), Glomm and Ravikumar (1998), Chakraborty and Chakraborty (2014).

[3] In Mukherjee and Sinha (2006), child's future earning enters the parent's utility function. According to Genicot and Ray (2010), people's incentive to invest depends on their aspirations for their future well beings (or that of their off springs). Utility of parent depends on expectations of the parents from their children.

[4] In Emerson and Knabb (2007), households form expectations over whether they believe the government will keep its promise to implement the social security program that will help to eradicate child labour. In Chakraborty and Chakraborty (2014) adults form expectations whether their children will get job in manufacturing sector in future.

Human capital formation of the child depends on the time devoted to schooling by the child and human capital of the parent.

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

Human capital accumulation function of a child is assumed to take the following form[5]:

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

where 's_t' is the time devoted to studies by the child, and 'h_t' represents the level of human capital possessed by the adult; b>0 is a positive constant 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.

We consider two cases.

3. Case 1: Parents work in agricultural sector as farmers

In first case we consider an economy that consists of two sectors- a manufacturing sector and an agricultural sector. If one individual is employed in manufacturing sector she gets wage proportional to human capital whereas agricultural sector gives a return which is equal to the value of marginal productivity of labour. The child, if she works, will be employed only as agricultural worker. We discuss the case where parents work in agricultural sector as farmers.

[5] Following Wahba (2005), Oreopoulos,Page and Stevens(2003),Ray (2000),Khan (2003),Emerson and Souza(2003), Contreras (2008), Emerson and Knabb (2006) and Galor and Tsiddon (1997)we assume that parental human capital is a major determinant of human capital formation of child.

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 agricultural sector. Wages earned by the adult and by the child constitute the total income of the household. If the child joins the manufacturing sector, on becoming adult, she gets a wage which is a fixed proportion of the human capital possessed by her (δh_{t+1})[6]. In agricultural sector the adult gets a wage which is equal to the value of her marginal productivity. We assume that the production function in the agricultural sector is given by $Y_{at} = AL^{1-\alpha}T^{\alpha}$ where Y_{at} is the agricultural output, A is the technological index of the agricultural sector, T is the size of land holding used for agricultural production and L is the labour employed in the agricultural sector. Thus wage of the adult is given by $P_a A(1-\alpha)L^{-\alpha}T^{\alpha}$ where P_a is the price of the agricultural good. Children, by working in the agricultural sector get a fixed proportion of the competitive wage received by adults, which is less than the return obtained by the adults from agricultural sector.

When adult works in the agricultural sector as farmer they are paid marginal productivity of labour as their wage. In this case, household income is given by:

$$Y_t = P_a A(1-\alpha)L^{-\alpha}T^{\alpha} \{1+\theta(1-s_t)\}, \quad (2)$$

where Y_t is total income of the household, $P_a A(1-\alpha)L^{-\alpha}T^{\alpha}$ is the wage earned by the adult in agricultural sector and θ is the fraction of adult wage that a child labour receives. Here $0< \theta <1$ is a positive constant.

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

[6] Hare and Ulph (1979) assume that ability and amount of education received by an individual are the major determinants of wage rate of an individual.

$$P_a A(1-\alpha)L^{-\alpha}T^{\alpha} \{1+\theta(1-s_t)\} = p_c c_t, \qquad (3)$$

where p_c is the price of the consumption good and $p_c c_t$ represents the total consumption expenditure.

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

$$Y_t = w_t + P_a A (1-\alpha)L^{-\alpha}T^{\alpha} \theta (1-s_t) ,$$

where w_t is the wage earned by the adult in the manufacturing sector. We assume wage earned in manufacturing 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:

$$U_t = \beta \ln (c_t) + (1-\beta) \ln [f\, \delta(bs_t h_t + \underline{h}) + (1-f) P_a A(1-\alpha)L^{-\alpha}T^{\alpha}] , \qquad (4)$$

where c_t represents consumption. Adult believes that the probability of the child getting job in manufacturing sector is f (present employment rate of manufacturing 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 manufacturing sector, adult believes that the probability of the child not getting job in manufacturing 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 manufacturing sector with probability f if the employment rate of manufacturing sector is f and rate of unemployment in manufacturing sector would be (1-f). It is assumed that whoever does not get job in manufacturing sector gets employed in agricultural sector. Agricultural sector absorbs all the residual labour force. So there is no possibility of remaining fully unemployed. $P_a\ A(1\text{-}\alpha)L^{-\alpha}T^{\alpha}$ is the return that the child may get as an adult if he gets job in agricultural sector. $[f\ \delta(bs_t h_t + \underline{h}) + (1\text{-}f)\ P_a\ A(1\text{-}\alpha)L^{-\alpha}T^{\alpha}]$ represents total expected earning of child.

Let us first apply the model in the short-run equilibrium context for the case where adults work in agricultural sector as farmers and understand the relationship between land size and schooling.

Short-run equilibrium when adults work in agricultural sector as farmers

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[7] of the above optimization problem, we obtain:

$$s_t = \frac{(1-\beta)f\delta b h_t(1+\theta)-\beta\theta[f\delta\underline{h}+(1-f)P_a\ A(1-\alpha)L^{-\alpha}T^{\alpha}]}{f\delta b\theta h_t} \tag{5}$$

Now $s_t = 1$ when $h_t \geq \frac{\beta\theta[f\delta\underline{h}+(1-f)P_a\ A(1-\alpha)L^{-\alpha}T^{\alpha}]}{f\delta b[1-\beta(1+\theta)]} = \hat{h}$

Lower is the value of $\hat{h}$ higher is the chance that $h_t \geq \hat{h}$.

The condition for positive schooling is $h_t \geq \frac{\beta\theta[f\delta\underline{h}+(1-f)P_a\ A(1-\alpha)L^{-\alpha}T^{\alpha}]}{(1-\beta)f\delta b(1+\theta)} = h_0$.

[7] For detailed derivation please see equations (A.1.1) and (A.1.2) of Appendix 1.

Differentiating equation (5) with respect to T gives

$$\frac{ds_t}{dT} = -\frac{\beta}{f\delta bh_t}\left[(1\text{-}f)\, P_a\, A(1-\alpha)L^{-\alpha}\alpha T^{\alpha-1}\right] < 0$$

This implies that as land holding increases, time devoted to schooling by the child decreases.

Dynamics of human capital formation when adults work in agricultural sector as farmers

Using equations (1) and (5) we have:

$$h_{t+1} = \frac{(1-\beta)f\delta bh_t(1+\theta)-\beta\theta\{f\delta\underline{h}+(1-f)P_a\, A(1-\alpha)L^{-\alpha}T^{\alpha}]}{f\delta\theta} + \underline{h} \qquad (6)$$

Differentiating h_{t+1} with respect to h_t we have

$$\frac{dh_{t+1}}{dh_t} = \frac{(1-\beta)b(1+\theta)}{\theta} > 0 \qquad (7)$$

This implies that parents having higher level of human capital are more likely to have children with higher human capital. Studies done by Ray (2000), Rickey and Jayachandran (2009), Akabayashi and Psacharapoulos (1999), Ravallion and Wodon (1999), Ray and Lancaster (2004), Chakraborty and Chakraborty (2014) – support this finding.

If $\frac{dh_{t+1}}{dh_t} > 1$, then no equilibrium exists. So we assume $\frac{dh_{t+1}}{dh_t} < 1$ in our model.

The relationship between h_t and h_{t+1} is shown in Figure 1

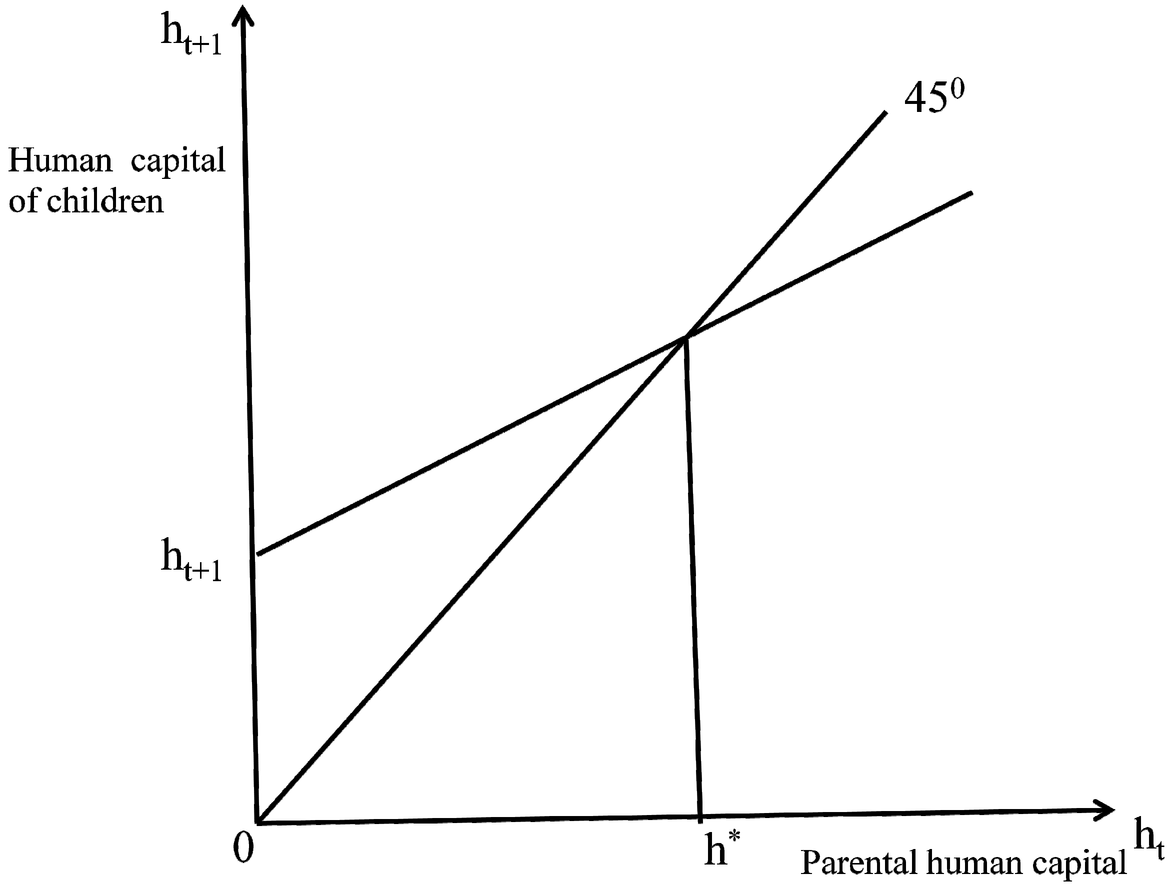

Figure 1: Relationship between parental human capital and human capital of children

Let the steady state level of h be h^*. At steady state, $h_t = h_{t+1}$. Then, from equation (6), the steady state level of human capital is given by:

$$h^* = \frac{\beta\theta\{f\delta\underline{h} + (1-f)P_a A(1-\alpha)L^{-\alpha}T^{\alpha}\} - f\delta\theta\underline{h}}{(1-\beta)f\delta b(1+\theta) - f\delta\theta} \tag{8}$$

Differentiating h^* with respect to T we get,

$$\frac{dh^*}{dT} = \frac{\beta\theta(1-f)P_a A(1-\alpha)L^{-\alpha}\alpha T^{\alpha-1}}{(1-\beta)f\delta b(1+\theta) - f\delta\theta}$$

$\frac{dh^*}{dT} > 0$ if $(1-\beta)f\delta b(1+\theta) - f\delta\theta > 0$ or $(1-\beta)b(1+\theta) - \theta > 0$

Let us now study the effect of increase in land size on growth rate of human capital.

Let the growth rate of human capital $\frac{h_{t+1} - h_t}{h_t}$ be denoted by φ. Then,

$$\varphi = \frac{h_{t+1} - h_t}{h_t} = \frac{(1-\beta)f\delta b h_t(1+\theta) - \beta\theta\{f\delta\underline{h} + (1-f)P_a A(1-\alpha)L^{-\alpha}T^{\alpha}\}}{f\delta\theta h_t} + \frac{\underline{h}}{h_t} - 1$$

Differentiating φ with respect to T we get,

$$\frac{d\varphi}{dT} = \frac{-\beta(1-f)P_a A(1-\alpha)L^{-\alpha}\alpha T^{\alpha-1}}{f\delta h_t} < 0$$

4. Case 2: Parents work on own land

In this section we discuss the case where both parents and children work on land owned by the household themselves. On becoming adult, children may join manufacturing sector if they get job in that sector. If they do not get job in manufacturing sector they keep on working on own land with their parents. 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 household owned land. Revenue earned by selling the agricultural produce in the market constitutes the total income of the household. If the child joins the manufacturing sector, on becoming adult, she gets a wage which is a fixed proportion of the human capital possessed by her (δh_{t+1}). We assume that the production function[8] in the agricultural sector is given by $Y_{at} = A\{1+\theta(1-s_t)\}T^{\alpha}$ where Y_{at} is the agricultural output, A is the technological index of the agricultural sector, T is the land used for agricultural production and θ is the adult equivalent scaling. Total return from land is given by $P_a\ A\{1+\theta(1-s_t)\}T^{\alpha}$ where P_a is the price of the agricultural good.

When adult works on household owned land household income is given by:

$$Y_t = P_a A\{1+\theta(1-s_t)\}T^{\alpha}, \tag{9}$$

where Y_t is total income of the household. Here $0< \theta <1$ is a positive constant.

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

$$P_a A\{1+\theta(1-s_t)\}T^{\alpha} = p_c c_t, \tag{10}$$

[8] Note that we consider a production function that is different from Case 1 considered in section 3. This is done only for the sake of technical simplicity.

where p_c is the price of the consumption good and $p_c c_t$ represents the total consumption expenditure.

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

$$U_t = \beta \ln (c_t) + (1-\beta) \ln [f\, \delta(bs_t h_t + \underline{h}\,) + (1\text{-}f)\, P_a\, AT^{\alpha}] , \qquad (11)$$

where c_t represents family consumption. Adult believes that the probability of the child getting job in manufacturing sector is f (present employment rate of manufacturing 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 manufacturing sector, adult believes that the probability of the child not getting job in manufacturing 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 manufacturing sector with probability f if the employment rate of manufacturing sector is f and rate of unemployment in manufacturing sector would be (1-f). It is assumed that whoever does not get job in manufacturing sector gets employed on household owned land. Household land absorbs all the residual labour force. So there is no possibility of remaining fully unemployed. $P_a\, AT^{\alpha}$ is the return that the child may get as an adult if he works on household owned land. $[f\, \delta(bs_t h_t + \underline{h}\,) + (1\text{-}f)\, P_a\, AT^{\alpha}]$ represents total expected earning of child.

Let us now apply the model in the short-run equilibrium context for the case where adults work on own land and understand the relationship between land size and schooling.

Short-run equilibrium when adults work on household owned land

Utility maximization problem of an adult of the representative household is to maximize the utility, given by equation (11), subject to budget constraint given by equation (10) with respect to the decision variables of the household, viz, c_t and s_t.

From the first order conditions[9] of the above optimization problem, we obtain:

$$s_t = \frac{(1-\beta)f\delta b h_t(1+\theta)-\beta\theta[f\delta\underline{h}+(1-f)P_a\,AT^{\alpha}]}{f\delta b\theta h_t} \tag{12}$$

Now $s_t = 1$ when $h_t \geq \frac{\beta\theta[f\delta\underline{h}+(1-f)P_a\,AT^{\alpha}]}{f\delta b[1-\beta(1+\theta)]} = \hat{h}$

Lower is the value of $\hat{h}$ higher is the chance that $h_t \geq \hat{h}$.

The condition for positive schooling is $h_t \geq \frac{\beta\theta[f\delta\underline{h}+(1-f)P_a\,AT^{\alpha}]}{(1-\beta)f\delta b(1+\theta)} = h_0$.

Differentiating equation (12) with respect to T gives

$$\frac{ds_t}{dT} = -\frac{\beta}{f\delta b h_t}[(1-f)\,P_a\,A\alpha T^{\alpha-1}] < 0$$

This implies that as land holding increases, time devoted to schooling by the child decreases.

Dynamics of human capital formation when adults work on own land

Using equations (1) and (12) we have:

$$h_{t+1} = \frac{(1-\beta)f\delta b h_t(1+\theta)-\beta\theta\{f\delta\underline{h}+(1-f)P_a\,AT^{\alpha}]}{f\delta\theta} + \underline{h} \tag{13}$$

[9] For detailed derivation please see equations (A.2.1) and (A.2.2) of Appendix 2.

Differentiating h_{t+1} with respect to h_t we have

$$\frac{dh_{t+1}}{dh_t} = \frac{(1-\beta)b(1+\theta)}{\theta} > 0 \qquad (14)$$

This implies that parents having higher level of human capital are more likely to have children with higher human capital.

If $\frac{dh_{t+1}}{dh_t} > 1$, then no equilibrium exists. So we assume $\frac{dh_{t+1}}{dh_t} < 1$ in our model.

The figure showing the relationship between h_t and h_{t+1} will be identical to Figure 1.

Let the steady state level of h be h^*. At steady state, $h_t = h_{t+1}$. Then, from equation (6), the steady state level of human capital is given by:

$$h^* = \frac{\beta\theta\{f\delta\underline{h} + (1-f)P_a AT^{\alpha}\} - f\delta\theta\underline{h}}{(1-\beta)f\delta b(1+\theta) - f\delta\theta} \qquad (15)$$

Differentiating h^* with respect to T we get,

$$\frac{dh^*}{dT} = \frac{\beta\theta(1-f)P_a A\alpha T^{\alpha-1}}{(1-\beta)f\delta b(1+\theta) - f\delta\theta}$$

$\frac{dh^*}{dT} > 0$ if $(1-\beta)f\delta b(1+\theta) - f\delta\theta > 0$ or $(1-\beta)b(1+\theta) - \theta > 0$

Let us now study the effect of increase in land size on growth rate of human capital.

Let the growth rate of human capital $\frac{h_{t+1}-h_t}{h_t}$ be denoted by φ. Then,

$$\varphi = \frac{h_{t+1}-h_t}{h_t} = \frac{(1-\beta)f\delta b h_t(1+\theta)-\beta\theta\{f\delta\underline{h}+(1-f)P_a AT^{\alpha}\}}{f\delta\theta h_t} + \frac{\underline{h}}{h_t} - 1$$

Differentiating φ with respect to T we get,

$$\frac{d\varphi}{dT} = \frac{-\beta(1-f)P_a A\alpha T^{\alpha-1}}{f\delta h_t} < 0$$

5. Major findings and Propositions

Analysis of the above two cases helps us to reach the major findings and propositions of this paper.

Irrespective of whether the parents work in agricultural sector as farmer or they work on household land there exists a particular level of parental human capital beyond which parents send their children for full schooling. The children having parents with above this critical level of human capital will not work as child labour. There also exists a particular level of human capital below which schooling of child becomes zero. So for sending children to school parents need minimum level of human capital.

Proposition 1: If initial 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.

As size of landholding increases time devoted to schooling by the child decreases in the short run irrespective of whether the parents work in agricultural sector as farmers or they work on own land.

Proposition 2: In the short run equilibrium, increase in the size of land holding decreases school attendance of child (increases child labour).

As the land size increases, marginal productivity of child labour goes up. Hence, in the short run, as size of land holding increases parents are motivated to send their children to work for higher number of hours and curtail the time children devote to schooling. This result tallies with the results of existing literature e.g. Bhalotra and Heady (2003), Bar and Basu (2008), Rosenzweig and Evenson (1977), Dumas (2007), Chakraborty and Chakraborty (2014) etc., and contradicts the finding of Moura (2009).

If (1- β) is high i.e. parental altruism is high, b is high i.e. educational technology is highly efficient and θ is low i.e. the fraction of adult wage that a child labour receives is low, there is higher possibility of the steady state human capital to increase in response to increase in size of land holding. This will hold true when parents work in agricultural sector as farmer or they work on own land. With increase in household land size, parents send their children to school for lesser number of hours due to increase in marginal return from farm work, but at the same time parental altruism factor propels parents to send their children to school for higher number of hours. If the parental altruism factor dominates then steady state human capital may increase with increase in land holding. Similarly if educational technology is highly efficient, then in spite of attending school for lesser number of hours, steady state human capital may increase. Moreover if the fraction of adult wage that a child labour receives by working on land is low, parents feel less motivated to send their children to work on land. In this case, due to increase in landholding, although marginal return from farm work increases, steady state human capital may increase.

Proposition 3: If parental altruism is high, educational technology is highly efficient and the fraction of adult wage that a child labour receives is low, there is higher possibility of the steady state human capital to increase in response to increase in land holding no matter the adults work as hired farmers or they work on their own land.

As landholding increases, growth rate falls irrespective of whether the parents work in agricultural sector as farmers or work on household owned land. An increase in land size leads the adult to send her child to work on household land for extended units of time rather than sending the child to school. Time devoted to schooling keeps on decreasing with increase in land size, due to the enhanced marginal return from child work compared to schooling at margin. Consequently, human capital formation of the child gets affected as the hours of schooling falls, and the growth rate of human capital decreases.

Proposition 4: Given h_t, there is a negative relationship between the growth rate of human capital and the size of land holding.

6. Concluding Remarks

This paper builds an overlapping generations household economy model in a rural set up and examines the impact of an increase in the size of landholding on school attendance by the child labourer, and the child's human capital formation and growth at the backdrop of unemployment.

In this model, each household consists of one adult and one child. We consider two cases. In the first case the adult is employed in the agricultural sector as a hired farmer. The child, on becoming adult may join the manufacturing sector or agricultural sector. If the child joins the manufacturing sector on becoming adult, she earns a wage proportional to her human capital while in the agricultural sector she earns a return equivalent to the value of her marginal productivity, as an adult. In the second case the adult works on own land. The child, on becoming adult may join the manufacturing sector or continue work on land. If the child joins the manufacturing sector on becoming adult, she earns a wage proportional to her human capital while in the agricultural sector she earns a fixed return. The adult derives satisfaction from household consumption and expected earning of child. She forms expectations over whether she believes that the child will get employment in the manufacturing sector in the future. Human capital accumulation of the child depends on the time devoted to schooling by the child and human capital of the parent. The adult maximizes her utility by making decisions about consumption and time allocation of child between schooling and work. We obtain some interesting results. We find that an increase in land size leads to a decline in schooling of the child worker in the short run and growth rate of human capital in the long run. However in the long run, steady state human capital may increase in response to increase in landholding. We also find that parents possessing higher levels of human capital are more likely to send their children to school. All these results hold true, irrespective of whether the adult works in agricultural sector as farmer or works on own land.

Barring some rare instances, parents generally have to bear some cost to educate their children. However in this paper we assume that schooling does not involve any cost attached to it. However inclusion of education expenditure on part of the parents can affect the results of our paper significantly. Moreover we assume the unemployment rate to be exogenous in our model. Assuming the unemployment rate to be endogenous can also have significant impact on the findings of this paper. This is because possibility of unemployment of child in the future is strongly related to her schooling in childhood. In spite of parental altruism child labour is often present due to poverty of the household. Existence of credit markets helps the household to overcome such a situation and lowers the incidence of child labour. We do not consider the existence of credit market in our model. All these may be considered for future research.

Appendix 1

When parents work in the agricultural sector as farmers the optimization problem of the household is to maximize

$Z = \beta \ln c_t + (1-\beta) \ln [f\delta(bs_t h_t + \underline{h}) + (1-f) P_a A(1-\alpha)L^{-\alpha}T^{\alpha}] + \lambda [P_a A(1-\alpha)L^{-\alpha}T^{\alpha} \{1+\theta(1-s_t)\} - p_c c_t]$

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:

$$\frac{\delta Z}{\delta c_t} = \frac{\beta}{c_t} - \lambda p_c = 0 \qquad \text{(A.1.1)}$$

$$\frac{\delta Z}{\delta s_t} = \frac{(1-\beta) f\delta b h_t}{f\delta(bs_t h_t + \underline{h}) + (1-f)P_a A(1-\alpha)L^{-\alpha}T^{\alpha}} - \lambda P_a A(1-\alpha)L^{-\alpha}T^{\alpha}\theta = 0 \qquad \text{(A.1.2)}$$

From (A.1.1) and budget constraint $P_a A(1-\alpha)L^{-\alpha}T^{\alpha} \{1+\theta(1-s_t)\} = p_c c_t$, we get

$$\frac{\beta}{P_a A(1-\alpha)L^{-\alpha}T^{\alpha}\{1+\theta(1-s_t)\}} = \lambda \qquad \text{(A.1.3)}$$

From (A.1.2) and using (A.1.3) we get,

$$s_t = \frac{(1-\beta) f\delta b h_t (1+\theta) - \beta\theta[f\delta\underline{h} + (1-f)P_a A(1-\alpha)L^{-\alpha}T^{\alpha}]}{f\delta b\theta h_t} \qquad \text{(A.1.4)}$$

Appendix 2

When parents work on household owned land the optimization problem of the household is to maximize

$$Z= \beta \ln c_t + (1-\beta) \ln [f\delta(bs_t h_t + \underline{h}) + (1-f) P_a AT^{\alpha}] + \lambda [P_a AT^{\alpha} \{1+\theta(1-s_t)\} - p_c c_t]$$

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:

$$\frac{\delta Z}{\delta c_t} = \frac{\beta}{c_t} - \lambda p_c = 0 \qquad \text{(A.2.1)}$$

$$\frac{\delta Z}{\delta s_t} = \frac{(1-\beta) f\delta b h_t}{f\delta(bs_t h_t + \underline{h}) + (1-f) P_a AT^{\alpha}} - \lambda P_a AT^{\alpha} \theta = 0 \qquad \text{(A.2.2)}$$

From (A.2.1) and budget constraint $P_a AT^{\alpha} \{1+\theta(1-s_t)\} = p_c c_t$, we get

$$\frac{\beta}{P_a AT^{\alpha} \{1+\theta(1-s_t)\}} = \lambda \qquad \text{(A.2.3)}$$

From (A.2.2) and using (A.2.3) we get,

$$s_t = \frac{(1-\beta) f\delta b h_t (1+\theta) - \beta\theta[f\delta\underline{h} + (1-f) P_a AT^{\alpha}]}{f\delta b\theta h_t} \qquad \text{(A.2.4)}$$

References

Acemoglu D., Pischke J.S. (2000): ‘Changes in the wage structure, family income, and children’s education’, *NBER Working Paper Number* 7986.

Akabayashi K., Psacharopoulos G. (1999): ‘The trade-off between child labour and human capital formation: A Tanzanian case study’, *Journal of Development Studies*, 35(5), pp.120–140.

Bar T., Basu K. (2008): ‘Children, Education, Labour and Land: In the Long Run and Short’ *CAE Working Paper* # 08-06.

Basu K. (1999): ‘Child labour: Cause, consequences and cure, with remarks on international labour standard’, *Journal of Economic Literature*, 37, pp.1083-1119.

Basu K., Das S. and Dutta B. (2007): ‘Child Labour and Household Wealth: Theory and Empirical Evidence of an Inverted-U’, *IZA Discussion Paper Number* 2736.

Basu K., Van P. (1998): ‘The Economics of Child Labour’, *The American Economic Review*, 88, pp.412-427.

Becker G.S., Tomes N. (1979): ‘An Equilibrium Theory of the Distribution of Income and Intergenerational Mobility’, *Journal of Political Economy*, 87 (6).

Bhalotra S., Heady C. (2003): ‘Child Farm Labour-The Wealth Paradox’, *The World Bank Economic Review*, 17(2), pp.197-227.

Boutin D. (2012): ‘Family Farming, child labour and the wealth paradox: evidence from Mali’, *Economics Bulletin*, 32, pp.3471-3479.

Chakraborty B., Chakraborty K. (2014): ‘Child Labour, human capital formation and size of landholding: short run and long run analysis’, *Economics Bulletin*, 34(3), pp.2024-2037.

Contreras S. (2008): ‘Child labor participation, human capital accumulation, and economic development’, *Journal of Macroeconomics*, 30, pp.499-512.

Dumas A. (2007): ‘Why do parents make their children work? A test of the poverty hypothesis in rural area of Burkina Faso’, *Oxford Economic Papers*, 59, pp.301-329.

Edmonds E.V. (2005): ‘Does child labour decline with improving economic status?’ , *The Journal of Human Resources*, 40(1).

Edmonds E., Pavcnik N. (2005): ‘Child Labour in the Global Economy’, *Journal of Economic Perspectives*, 18(1), pp.199-220.

Emerson P., Souza A. (2003): ‘Is There a Child Labour Trap? Intergenerational Persistence of Child Labour in Brazil’, *Economic Development and Cultural Change*, 51(2), pp. 376-397.

Emerson P.M., Knabb S.D. (2006): ‘Opportunity, Inequality and the Intergenerational Transmission of Child Labour’, *Economica*, *New Series*, 73(291), pp.413-434.

Emerson P.M., Knabb S.D. (2007): ‘Fiscal Policy, Expectation Traps and Child Labor’, *Economic Inquiry*, 45 (3), pp.453-469.

Galor O., Tsiddon D. (1997): ‘The Distribution of Human Capital and Economic Growth’, *Journal of Economic Growth*, 2, pp.93-124.

Genicot G., Ray D. (2010): ‘Aspirations and Inequality’, *NBER Working Paper Number* 19976.

Glomm G. (1997): ‘Parental choice of human capital investment’, *Journal of Development Economics*, 53, pp.99-114.

Glomm G., Ravikumar B. (1998) ‘Increasing returns, human capital, and the Kuznets curve’, *Journal of Development Economics*, 55, pp.353-367.

Hare P.G., Ulph D.T. (1979): ‘On Education and Distribution’, *Journal of Political Economy*, 87(5).

Khan R.E.A. (2003): ‘Children in Different Activities: Child Schooling and Child Labour’, *The Pakistan Development Review*, 42(2), pp.137-160.

Moav O. (2005): ‘Cheap children and the Persistence of Poverty’, *Economic Journal*, *Royal Economic Society*, 115(500), pp.88-110.

Moura M. (2009): ‘How Land Title Affects Child Labour?’, *World Bank Policy Research Working Paper* 5010.

Mukherjee D., Sinha U.B. (2006): ‘Schooling, Job Prospect and Child Labour in a Developing Economy’, *mimeo: Indian Statistical Institute*, *Kolkata.*

Oreopoulos P., Page M.E. and Stevens A.H. (2003): ‘Does Human Capital Transfer from Parent to Child? The Intergenerational Effects of Compulsory Schooling’, *NBER Working Paper Number* 10164.

Ravallion M., Wodon Q. (2000): ‘Does Child Labour Displace schooling? Evidence on Behavioral Responses to an Enrolment Subsidy’, *Economic Journal*, *Royal Economic Society*, 110(462), pp.158-175.

Ray R. (2000): ‘Analysis of child labour in Peru and Pakistan: A comparative study’ *Journal of Population Economics*, Springer, 13(1), pp.3-19.

Ray R., Lancaster G. (2004): ‘The Impact of Children’s work on Schooling: Multi Country Evidence Based on SIMPOC Data’ Econometric Society 2004, Australasian Meetings 68, Econometric Society.

Rickey L., Jayachandran S. (2009): ‘The Determinants of Child Labour and Schooling in Philippines’ *Stanford University Working Paper.*

Rosenzweig, M. R., Evenson R. (1977): ‘Fertility, Schooling, and the Economic Contribution of Children in Rural India: An Econometric Analysis', *Econometrica*, 45(5), pp.1065-1079.

Wahba J. (2005): 'The Influence of Market Wages and Parental History on Child Labour and Schooling in Egypt', *IZA Discussion Paper Number* 1771.