WILL AN INCREASE IN LANDHOLDING SIZE REDUCE CHILD LABOUR IN THE PRESENCE OF UNEMPLOYMENT? A THEORETICAL ANALYSIS

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

KEY WORDS: child labour, human capital, land holding, schooling, unemployment

JEL CLASSIFICATION: E24, J22, J24, O15, Q15
1. INTRODUCTION

The term ‘child labour’ brings to mind the picture of a child working in harsh, inhuman conditions, and we often blame the parents for such a fate. However, in reality parents are often forced to send their children to work because of the family’s grave economic situation. This is what is termed the ‘luxury axiom’. Many papers in the child labour literature present evidence of 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 the luxury axiom holds true in the case of agriculture and present results that contradict it. Generally, land is considered a source of household wealth. Therefore, according to the luxury axiom, an increase in land implies an increase in household wealth and thus should reduce the incidence of child labour in the family. However, many recent empirical papers that study the relationship between landholding and child labour have found the opposite that an increase in land holding leads to an increase in child labour. This is known as the ‘wealth paradox’, according to which the children of land-rich households are more likely to work than children of land-poor households. As in developing countries a high percentage of child labour is engaged in family farming and other land-related activities, the relationship between landholding and child labour is worth studying. Working at an early age denies the child proper schooling, which is a major source of the child’s human capital formation. However, few studies examine the relationship between landholding, child labour, and children’s human capital formation. Our paper examines the relationship between land holding, child labour, and children’s human capital formation against the backdrop of unemployment.

Many empirical studies address the relationship between landholding and child labour, and in the majority the results support the wealth paradox. Bhalotra and Heady (2003) consider two developing countries, Ghana and Pakistan, and find that as landholding increased in these two countries, child labour also increased. Boutin (2012) conducts his study using data from Mali where children help the elders in family farming. He finds that as the household’s landholding increases, more children are involved in family farming as helpers. Children and adults are often used as substitutes in farming. However, the absence of an adult labour
market often results in children being used in farming activities instead. Dumas (2007) shows that as landholding increases, more child labour will be used if it is not possible to hire adult labour from outside the family. In India Rozenweig and Evenson (1977) first identified the existence of the wealth paradox when they used 1961 census data to study the relationship between landholding and child labour. They show that as landholding increases, the value of the marginal contribution of children also increases. Thus, when landholding increases, children spend fewer hours in school and are instead sent to work on the land. However, Moura's (2009) study of the relationship between land tenure security and child labour, based on empirical data from Brazil, shows that as land tenure security increases, child labour is replaced by adult labour. However, none of these papers focus on the relationship between landholding, child labour, and children’s human capital formation.

Only a few theoretical studies deal with the relationship between landholding and child labour. Basu, Das, and Dutta (2007) assume that the parents’ utility depends on consumption and child leisure and they decide how much time the child will devote to work and how much to leisure. Their theoretical model shows an inverted U-shaped relationship between landholding and child labour. They test this result empirically using data from India, and find that although initially when landholdings increase, child labour also increases, when a landholding surpasses 3.6 acres, child labour starts to decline. Bar and Basu (2008) show that when landholding increases by a small amount, child labour increases not only in the short run but also in the long run. However, when the land holding size exceeds a particular level, child labour starts falling in the long run. Neither of these papers considers the education of child labour. However, Chakraborty and Chakraborty (2014) incorporate the education of child labour in their theoretical paper on landholding, child labour, and human capital formation, and conclude that as landholding increases, child labour increases in the short run. However, in the long run, steady state human capital and human capital growth rate have a U-shaped relationship with landholding size. The paper assumes that adults work only in manufacturing and children work only on the land. It attempts to extend Chakraborty and Chakraborty’s (2014) model to a situation where unemployment exists in the manufacturing sector and both parents and children work on the land. Parents may work as agricultural labourers either on their own land or on land owned by others. The parents’ aspiration is that their children
should work in manufacturing sector on becoming adults, while at the same time realising that despite schooling this may not happen due to a lack of manufacturing jobs. In Chakraborty and Chakraborty’s (2014) model, children’s schooling involves a cost, and household utility depends on the child’s human capital formation. However, in our paper it is assumed that schooling is available free of cost and the utility of the household depends on the expected future earnings of the child, rather than its human capital. Thus, our paper studies the effect of increased landholding on child labour and children’s human capital formation when parents derive utility from children’s expected future earnings and there is unemployment in the manufacturing sector.

Since the intergenerational persistence of child labour is quite common in the 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 in both the short and the long run. Our paper also includes children’s expected earnings in the parental utility function and studies the relationship between landholding, child labour, and human capital against the backdrop of unemployment. In their paper on child labour, Mukherjee and Sinha (2006) include children’s expected earnings in the parental utility function in the presence of unemployment in the formal sector. However, their paper is not modelled in a dynamic setting.

This paper builds an overlapping generations model of household economy in a rural set up. The economy consists of a manufacturing sector and an agricultural sector. If an individual is employed in the manufacturing sector she gets a wage proportional to human capital, whereas the agricultural sector gives a fixed return. The child’s expected future earnings are included in the parental utility function and parental choice of schooling versus child labour is considered. Since an overwhelming proportion of child labour is in the agricultural sector, we consider the problem of parental choice of schooling for an agricultural household. In the agricultural sector there are two types of farm worker, cultivators and agricultural labourers. Cultivators are those who work on their own land; agricultural labourers are those who work on the land of others. In this paper we first consider the case where an adult and a child of a household work in the agricultural sector as agricultural labourers and get competitive wages. Next, we consider the case where both adult and child work on household-owned land. In both cases this paper attempts to understand the relationship between
land size, child labour, and human capital development. It considers parental choice of schooling vis-a-vis child labour to understand the relationship between 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 the 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 the agricultural sector as agricultural labourers, section 4 discusses the case where parents work on household-owned land, and 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 an overlapping generations framework. 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 child’s time allocation between work and schooling. The utility function of the adult depends on family consumption and the expected earnings of the child. When the child becomes an adult they may not get the opportunity to work as skilled labour in the manufacturing sector due to job uncertainty and unemployment in the sector. If they do not get a job in the manufacturing sector they are absorbed into the agricultural sector. The adult forms expectations as to whether they believe that

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2 In Mukherjee and Sinha (2006) the child’s future earnings enter the parent’s utility function. According to Genicot and Ray (2010), people’s incentive to invest depends on their aspirations for their future wellbeing (or that of their offspring). The utility of the parent depends on the parents’ expectations of their children.
the child will get a job in the manufacturing sector on becoming an adult.\textsuperscript{3} This forecasting depends on the present level of unemployment in the economy.

The child’s human capital formation depends on the time the child devotes to schooling and the parent’s human capital.

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

The human capital accumulation function of a child is assumed to take the following form:\textsuperscript{4}

\[ h_{t+1} = bs_t h_t + \hat{h} \quad (1) \]

where $s_t$ is the time the child devotes to studying, $h_t$ represents the level of human capital possessed by the adult, $b>0$ is a positive constant, and $\hat{h}$ represents the minimum level of human capital achieved by a child even if they do not attend school (i.e., $s_t=0$). Thus, $h_{t+1}>0$ even if $s_t=0$.

We consider two cases.

\textbf{3. CASE 1: PARENTS WORK IN THE AGRICULTURAL SECTOR AS AGRICULTURAL LABOURERS}

We consider an economy that consists of two sectors, a manufacturing sector and an agricultural sector. The child, if they work, will only be employed as an agricultural worker. We first discuss the case where the parents work in the agricultural sector as hired agricultural labourers. 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

\textsuperscript{3} In Emerson and Knabb (2007), households form expectations as to whether they believe the government will keep its promise to implement a social security programme that will help to eradicate child labour. In Chakraborty and Chakraborty’s (2018) model, adults form expectations as to whether their children will get a job in the manufacturing sector in the future.

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 an adult they get a wage which is a fixed proportion of the human capital possessed by them ($\delta h_{t+1}$). In the 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 $Y_{at} = A L^{1-\alpha} T^\alpha$, where $Y_{at}$ is the agricultural output, $A$ is the technological index of the agricultural sector, and $T$ is the size of landholding possessed by the landlord for whom the parent works as an agricultural labourer. $L$ is the labourer employed in the agricultural sector. Thus the 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. By working in the agricultural sector, children get a fixed proportion of the competitive wage received by adults, which is less than the return obtained by the adults from the agricultural sector.

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

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

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

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

$$P_a A(1-\alpha) L^{-\alpha} T^\alpha \{1 + \theta(1-s_t)\} = p_t c_t$$

Where $p_t$ is the price of the consumption good and $p_t c_t$ represents the total consumption expenditure.

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5 Hare and Ulph (1979) assume that ability and the amount of education received by an individual are the major determinants of an individual’s wage rate. It may be assumed that the production function of the manufacturing sector is $Y_m = \delta H_t$. 

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When adults work in the manufacturing sector the 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 that the wage earned in the manufacturing sector ($w_t$) is proportional to the human capital acquired by that individual; i.e., $w_t = \delta h_t$.

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

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

where $c_t$ represents consumption, $\beta$ represents the weight assigned to consumption, and $(1-\beta)$ is the weight assigned to the child’s expected income in the adult’s utility function. The adult believes that the probability of the child getting a job in the manufacturing sector is $f$ (present employment rate of manufacturing sector), $\delta (bs_t h_t + h)$ is the return that the child may get as an adult if they get a job in the manufacturing sector, and $(1-f)$ is the adult’s belief regarding the child’s probability of not getting a job in the manufacturing sector. When modelling parental expectations, adaptive expectation is assumed. Parents observe the present unemployment rate and expect the same unemployment rate to prevail, so they believe that their children will get employment in the manufacturing sector with probability $f$ if the employment rate of the manufacturing sector is $f$ and the unemployment rate in the manufacturing sector is $(1-f)$. It is assumed that whoever does not get a job in the manufacturing sector gets employment in the agricultural sector. The agricultural sector absorbs all the residual labour force, so there is no possibility of remaining fully unemployed. $P_a A (1-\alpha)L^{-\alpha}T^\alpha$ is the return that the child may get as an adult if they get a job in the agricultural sector. $[f \delta (bs_t h_t + h) + (1-f)P_a A (1-\alpha)L^{-\alpha}T^\alpha]$ represents the total expected earnings of the child.

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

The utility maximization problem of an adult of the representative household is to maximize the utility, given by Equation (4), subject to the 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 of the above optimization problem, we obtain:

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

(5)

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

The lower the value of $\hat{h}$, the higher the chance that $h_t \geq \hat{h}$.

Here, we find that once parental human capital exceeds a critical level, parents no longer send their children out to work; rather, they send their children to school full-time. The greater the probability of getting employment in the skilled sector ($f$), the greater the responsiveness of skilled wage to human capital ($\delta$); the more efficient the education technology ($b$) and the lower the importance given to consumption in the adult’s utility function ($\beta$) and the child’s wage ($\theta$), the lower the value of $\hat{h}$. The lower the value of $\hat{h}$, the greater the chance of full-time schooling for the child. Hence, if the above-mentioned factors are present, even low-skilled parents are motivated to send their children to school full-time.

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

Differentiating Equation (5) with respect to $T$ gives

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

This implies that as landholding increases the time the child devotes to schooling decreases.

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6 For detailed derivation see Equations (A.1.1) and (A.1.2) in Appendix 1.
The dynamics of human capital formation when adults work in the agricultural sector as agricultural labourers

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

\[ h_{t+1} = \frac{(1-\beta)f \delta h_t (1+\theta) - \beta \theta f \delta h + (1-f)P \alpha A (1-x) L^{-\alpha} P^\alpha}{\delta \theta} + h \]  

(6)

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

\[ \frac{dh_{t+1}}{dh_t} = \frac{(1-\beta)b(1+\theta)}{\theta} > 0 \]  

(7)

This implies that parents with a higher level of human capital are more likely to have children with higher human capital. Studies by Ray (2000), Rickey and Jayachandran (2009), Akabayashi and Psacharopoulos (1999), Ravallion and Wodon (1999), Ray and Lancaster (2004), and 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 children’s human capital
Let the steady state level of $h$ be $h^*$. At the steady state, $h_t = h_{t+1}$. Then, from Equation (6), the steady state level of human capital is given by:

$$h^* = \frac{\beta \theta f \delta h + (1-f)P_a A(1-\alpha)L^{-a} \tau^\alpha}{(1-\beta)f \delta b(1+\theta) - f \delta \theta}$$  \hspace{1cm} (8)$$

Differentiating $h^*$ with respect to $T$ we get,

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

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

This implies that if parental altruism $(1-\beta)$ is high, educational technology is very efficient $(b)$ is high), and the fraction of adult wage that a child labourer receives $(\theta)$ is low, parents are more motivated to send their children to school for more of the time and the steady state human capital increases in response to increased landholding.

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

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

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

Differentiating $\varphi$ with respect to $T$ we get

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

Given $h$, there is a negative relationship between the growth rate of human capital and landholding size. This implies that with an increase in landholding size the growth rate of human capital falls. When land size increases the adult is motivated to send her child to work on the land for more of the time. This is because of the enhanced marginal return from child labour compared to schooling at margin. As a result the time devoted to schooling keeps on decreasing with increases in
land size. Consequently, the child’s human capital formation is hampered and the human capital growth rate decreases in the long run.

4. CASE 2: PARENTS WORK ON THEIR OWN LAND

In Indian agriculture there are both cultivators who work on their own land and agricultural workers who work as hired labour on land owned by others. According to data from the 2011 Census of India, 45.1% of agricultural workers were cultivators and 54.8% were agricultural labourers. In this section we discuss the case where both parents and children work on their own land. To model the case of cultivators, we assume that the production function in the agricultural sector is given by

\[ Y_t = A \{1 + \theta (1 - s_t)\} T^\alpha, \]

where \( Y_t \) is the agricultural output, \( A \) is the technological index of the agricultural sector, \( T \) is the land possessed by the household and used for agricultural production, and \( \theta \) is the adult equivalent scaling. Note that this production function differs from that in Section 3, case 1 because, in contrast to section 3, no hired labour works on the land, so the agricultural output is a function of technology, labour hours devoted by household members, and land size. The 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. The rest of the assumptions remain the same as in Section 3.

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

\[ Y_t = P_a A \{1 + \theta (1 - s_t)\} T^\alpha \] (9)

The budget constraint of the household is given by:

\[ P_a A \{1 + \theta (1 - s_t)\} T^\alpha = p_c c_t \] (10)

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

\[ U_t = \beta \ln (c_t) + (1- \beta) \ln \left[ f \delta (bs_t h_t + h) + (1-f) P_a A T^\alpha \right] \] (11)

where the symbols carry the same meaning as in Section 3. \( P_a A T^\alpha \) is the return that the child may get as an adult if they work on household-owned land. \( f \delta (bs_t h_t + h) + (1-f) P_a A T^\alpha \) represents the child’s total expected earnings.
Let us now apply the model in the short-run equilibrium context to the case where adults work on their own land, to understand the relationship between land size and schooling.

**Short-run equilibrium when the adults work on household-owned land**

The utility maximization problem of an adult of the representative household is to maximize the utility, given by Equation (11), subject to the 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\(^7\) of the above optimization problem, we obtain:

\[
    s_t = \frac{(1 - \beta) f \delta b h_t (1 + \theta) - \beta \theta [f \delta h + (1 - f) P_a A T^a]}{f \delta b h_t} \tag{12}
\]

Now $s_t = 1$ when

\[
    h_t \geq \frac{\beta \theta [f \delta h + (1 - f) P_a A T^a]}{f \delta b [1 - \beta (1 + \theta)]} = \hat{h}
\]

The lower the value of $\hat{h}$, the higher the chance that $h_t \geq \hat{h}$.

The condition for positive schooling is

\[
    h_t \geq \frac{\beta \theta [f \delta h + (1 - f) P_a A T^a]}{(1 - \beta) f \delta b (1 + \theta)} = h_0.
\]

Differentiating Equation (12) with respect to $T$ gives

\[
    \frac{d s_t}{d T} = -\frac{\beta}{f \delta b h_t} \left[(1 - f) P_a A T^a - 1\right] < 0
\]

**Dynamics of human capital formation when the adults work on their own land**

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

\[
    h_{t+1} = \frac{(1 - \beta) f \delta b h_t (1 + \theta) - \beta \theta [f \delta h + (1 - f) P_a A T^a]}{f \delta \theta} + \frac{h_t}{h_t} \tag{13}
\]

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

\(^7\) For a detailed derivation see Equations (A.2.1) and (A.2.2) in Appendix 2.
\[
\frac{dh_{t+1}}{dh_t} = \frac{(1-\beta)b(1+\theta)}{\theta} > 0
\] (14)

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

From Equation (13), the steady state level of human capital \(h^*\) is given by:

\[
h^* = \frac{\beta \theta (f \delta h + (1-f)P_a AT^a) - f \delta h}{(1-\beta)f \delta b(1+\theta) - f \delta}\]

(15)

Differentiating \(h^*\) with respect to \(T\) we get

\[
\frac{dh^*}{dT} = \frac{\beta \theta (1-f) P_a AaT^{a-1}}{(1-\beta)f \delta b(1+\theta) - f \delta}\]

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

The growth rate of human capital is given as

\[
\varphi = \frac{h_{t+1} - h_t}{h_t} = \frac{(1-\beta)f \delta bh_t(1+\theta) - \beta \theta (f \delta h + (1-f)P_a AT^a)}{f \delta h_t} + \frac{h}{h_t} - 1
\]

Differentiating \(\varphi\) with respect to \(T\) we get

\[
\frac{d\varphi}{dT} = -\frac{\beta(1-f)P_a AaT^{a-1}}{f \delta h_t} < 0
\]

The economic interpretation of all the results in this section will be the same as in Section 3.

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 the agricultural sector as labourers or on household land, there exists a particular level of parental human capital beyond which parents send their children to school full-time. The children whose
parents possess human capital above this critical level will not work as child labour. There also exists a particular level of human capital below which children’s schooling becomes zero. Thus, to send children to school, parents need to possess a minimum level of human capital.

**Proposition 1:** If parental human capital is higher than \( \hat{h} \) there will be no child labour and if parental human capital is less than \( h_0 \) there will be no schooling for children.

As landholding size increases the time the child devotes to schooling decreases in the short run, irrespective of whether the parents work in the agricultural sector as labourers or work on their own land.

**Proposition 2:** In the short-run equilibrium, increased landholding size decreases the school attendance of children (increases child labour).

As land size increases the marginal productivity of child labour goes up. Hence, in the short run, as landholding size increases, parents are motivated to send their children to work for longer 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 \( (1-\beta) \) is high, i.e., parental altruism is high, \( b \) is high; i.e., educational technology is highly efficient and \( \theta \) is low; i.e., the fraction of adult wage that a child labourer receives is low and there is a greater possibility of the steady state human capital increasing in response to increases in landholding size. Here educational technology implies an efficient education system or school quality: a higher education technology implies a better school quality. This will hold true whether parents work in the agricultural sector as labourers or work on their own land. With increased landholding, parents send their children to school for fewer hours due to the increase in the marginal return from farm work, but at the same time the parental altruism factor propels parents to send their children to school for more of the time. If the parental altruism factor dominates, then the steady state human capital may increase with increases in landholding. Similarly, if the educational technology is very efficient, then in spite of attending school less the
steady state human capital may increase. Moreover, if the fraction of adult wage that a child labourer receives by working on the land is low, parents are less motivated to send their children to work on the land. In that case, due to increases in landholding, although the marginal return from farm work increases, the steady state human capital may also increase.

Proposition 3: If parental altruism is high, educational technology is very efficient, and the fraction of adult wage that a child labourer receives is low, there is a greater possibility that the steady state human capital increases in response to increases in landholding, whether the adults work as hired agricultural labourers or on their own land.

As landholding increases the growth rate falls, irrespective of whether the parents work in the agricultural sector as labourers or on household-owned land. An increase in land size results in the adult sending her child to work on the land for extended units of time rather than sending the child to school. Time devoted to schooling keeps on decreasing with increased land size due to the enhanced marginal return from child labour compared to schooling at margin. Consequently, the child’s human capital formation is affected as the hours of schooling decrease, and the growth rate of human capital decreases. Although land is considered a source of household wealth, since there is no cost attached to the schooling of the child, increased landholding does not provide any extra impetus for parents to send their children to school for more of the time, which in turn can increase the child’s human capital formation. This is contrary to Chakraborty and Chakraborty’s (2014) finding that increased landholding propels the parent to send her child to work on the land for longer hours due to the increased marginal return to child labour from the land, while at the same time increased landholding provides the household with higher financial resources to spend on the child’s education. In the long run the latter effect dominates the former so that the human capital growth rate keeps on rising. Unlike in Chakraborty and Chakraborty (2014), where the growth rate of human capital increases with increased landholding above a critical level, here the growth rate keeps on falling with increased landholding.

Proposition 4: Given $h_n$, there is a negative relationship between human capital growth rate and landholding size.
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 landholding size on school attendance by the child labourer, and the child’s human capital formation and growth in the absence of a direct schooling cost and against a backdrop of unemployment. In this model each household consists of one adult and one child. The adult derives satisfaction from household consumption and the expected earnings of the child. She forms expectations over whether she believes that the child will get employment in the manufacturing sector in the future, since unemployment exists in the manufacturing sector. The human capital accumulation of the child depends on the time devoted to schooling by the child and the human capital of the parent. The adult maximizes her utility by making decisions about the child’s consumption of and time allocation between schooling and work. We consider two cases. In the first case the adult is employed in the agricultural sector as a hired agricultural labourer. The child, on becoming adult, may join the manufacturing sector or the agricultural sector. If the child joins the manufacturing sector on becoming an 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 her own land. The child, on becoming an adult, may join the manufacturing sector or continue to work on the land. If the child joins the manufacturing sector on becoming an adult she earns a wage proportional to her human capital, while in the agricultural sector she earns a fixed return.

We obtain some interesting results. We find that an increase in land size leads to a decline in the child worker’s schooling in the short run and in the growth rate of human capital in the long run. However, in the long run the steady state human capital may increase in response to an increase in landholding. We also find that parents with higher levels of human capital are more likely to send their children to school. These results hold true irrespective of whether the adult works in the agricultural sector as an agricultural labourer or works on her 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. Inclusion of education expenditure on the part of the parents can significantly affect the results of our paper. Moreover, in our model we assume
the unemployment rate to be exogenous. Assuming the unemployment rate to be endogenous can also significantly impact the findings of this paper because the possibility of the child being unemployed in the future is strongly related to her schooling in childhood. Despite parental altruism, child labour is often present due to household poverty. The existence of credit markets helps the household to overcome this situation and lowers the incidence of child labour. We do not consider the existence of credit markets in our model. All these may be considered in future research.

REFERENCES


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APPENDIX 1

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

\[ Z = \beta \ln c_t + (1 - \beta) \ln \left[ f \delta(b s, h_t + h) + (1 - f) P_a A(1 - \alpha)L^{-\alpha}T^\alpha \right] + \lambda \left[ P_a A(1 - \alpha)L^{-\alpha}T^\alpha \{1 + \theta(1 - s_t)\} - p_c c_t \right] \]

where \( \lambda \) 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:

\[ \frac{\delta Z}{\delta c_t} = \frac{\beta}{c_t} - \lambda p_c = 0 \quad (A.1.1) \]

\[ \frac{\delta Z}{\delta s_t} = \frac{(1 - \beta) f \delta b \delta h_t}{f \delta(b s, h_t + h) + (1 - f) P_a A(1 - \alpha)L^{-\alpha}T^\alpha} - \lambda P_a A(1 - \alpha)L^{-\alpha}T^\alpha \theta = 0 \quad (A.1.2) \]

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

\[ \frac{\beta}{P_a A(1 - \alpha)L^{-\alpha}T^\alpha \{1 + \theta(1 - s_t)\}} = \lambda \quad (A.1.3) \]

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

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

APPENDIX 2

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

\[ Z = \beta \ln c_t + (1 - \beta) \ln \left[ f \delta(b s, h_t + h) + (1 - f) P_a A T^\alpha \right] + \lambda \left[ P_a A T^\alpha \{1 + \theta(1 - s_t)\} - p_c c_t \right] \]

where \( \lambda \) 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:

\[ \frac{\delta Z}{\delta c_t} = \frac{\beta}{c_t} - \lambda p_c = 0 \quad (A.2.1) \]
\[
\frac{\delta Z}{\delta s_t} = \frac{(1-\beta) f \delta b h_t}{f \delta (b s_t h_t + h) + (1-f) P_a A^{T\alpha}} - \lambda P_a A^{T\alpha} \theta = 0
\]  \tag{A.2.2}

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

\[
\frac{\beta}{P_a A^{T\alpha} (1+\theta(1-s_t))} = \lambda
\]  \tag{A.2.3}

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

\[
s_t = \frac{(1-\beta) f \delta b h_t (1+\theta) - \beta \theta [f \delta h + (1-f) P_a A^{T\alpha}]}{f \delta b \theta h_t}
\]  \tag{A.2.4}