Child labour and poverty linkages: A micro analysis from rural Malawian data

Chiwaula, Levison/S
University of Malawi

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Levison S. Chiwaula
Department of Economics
University of Malawi
P.O. Box 280
Zomba, Malawi
E-mail: lchiwaula@yahoo.co.uk

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Abstract

This study assesses the impact of income and asset poverty on child work using the rural sub-sample of the 2004 Malawi Integrated Household Survey. Instrumenting consumption expenditure with a location dummy variable and interacting consumption expenditure with household land-holding size in probit models, the likelihood of child labour is found to relate negatively with household consumption. On the other hand child labour relates positively with household land-holding size for consumption poor households only and when labour markets are imperfect. These findings do not discourage asset accumulation policies as a remedy against child labour but support policies that aim at increasing returns on the assets.

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1 Introduction

In 2004, about 218 million children worldwide were estimated to be part of the labour force (ILO, 2006). Most of these working children, labelled "child labourers", help their families at home, on family farms or in family businesses (Edmonds, 2008). In Malawi alone, the 2002 Malawi Child Labour Survey estimated that 1.5 million children aged between 5 and 17 years old were in usual economic activities while 1.7 million were in usual non-economic activities, representing 38.8 percent, 44.5 percent, respectively (Malawi Government and ILO, 2004). This reflects a high prevalence of the child labour both in Malawi and in other poor countries. This problem has been in existence in poor communities for a long time and has led to a series of theoretical and policy oriented research geared towards supporting interventions aimed at eliminating child labour.

Over the years, child labour research has focused on finding the determinants of child labour supply, with emphasis on the role of poverty, fertility and liquidity constraints (Bellettini et al., 2005). Among the determinants that have been studied so far, poverty has emerged as the major one and a positive relationship is generally expected. According to Edmonds (2008), there are many reasons that can theoretically explain the negative connection between family incomes (positive connection between poverty) and child labour. Edmonds (2008) identifies the following three explanations. First, child labour may be "bad" in parental preferences so that as incomes improve, the family chooses to have children work less. Second, with diminishing marginal utility of income, the value of the marginal contribution of the child's income decreases as family incomes increase. Third, higher family incomes may facilitate the purchase of substitutes for child labour that lower the return to child labour within the household. Although the positive relationship between child labour and poverty has been well explained theoretically (Basu and Van, 1998; Baland and Robinson, 2000; Bellettini et al., 2005), empirical research has not been conclusive (Edmonds, 2008). Positive relationships between poverty and child labour have been established in some cases (Canagarajah and Coulombe, 1997; Sasaki and Temesgen, 1999; Blunch and Verner, 2000; Okupkpara and Odurukwe, 2006) and rejected in other cases (Ray, 2000). Some studies have not established any relationship (Nielsen, 1998; Sasaki and Temesgen, 1999). Most intriguing is the finding that household wealth increases child labour (Bhalotra and Heady, 2003; Beegle et al., 2006; Dumas, 2007). This finding casts doubt on a well established fact that child labour emerges as a result of household poverty (Basu et al., *forthcoming).*

The conflicting research findings on the relationship between child labour and poverty may be due to a number of differences in these studies such as definitional differences, methodological differences and spatial differences. Different results can be obtained when child labour is defined differently in different studies (see World Bank, 2005). Different definitions of child labour relates to types of work that are considered as child work, the amount of time a child is involved in an activity and the definition of the child. Even when the definitions of child work have been standardized, different results can still be obtained if different methodologies have been used. For example, Basu et al. (*forthcoming*) argue that lack of explicit modelling of labour markets in developing countries in child labour models can result in misleading results such as the positive relationship between household wealth and child labour. In addition, there is a cultural component associated with child work decisions; this means that the significance of poverty in explaining child work decisions in different countries and/or cultural settings will differ. This indicates the need for country-specific child labour studies and also studies that broaden the definition of child labour.

Using data from rural children from Malawi aged between 5 and 14 years old, this study explored the relationship between child labour and household poverty. Specifically, the study aimed to show that income poverty relates positively with child labour but the effect of household wealth on child labour depends on household consumption level when labour markets are imperfect.

The rest of the paper is organized as follows. Section 2 gives a review of the literature, Section 3 presents the methodology and Section 4 describes the data, defines the variables and presents descriptive statistics. Empirical results are presented in Section 5 and Section 6 concludes the paper.

2 Literature review

Child labour literature looks at a diversity of theoretical and empirical issues as they relate to child labour. Although, some work had been done on child labour before the 1999 International Labour Organization (ILO) Worst Form of Child Labour Convention, most of the research activities have been conducted after the convention. For example, Edmonds (2008), in an economic literature search, found that there were a total of six peer reviewed journal articles on child labour between 1980 and 1990. Between 1990 and 2000, there were 65 peer reviewed papers, and 143 articles in the first 5 years of this decade. An example of

child labour research that was done before the 1999 ILO international convention, is the economic model of child labour by Basu and Van (1998). This work is considered by many researchers (see, for example, Swinnerton and Rogers, 1999; Bellettini, et al., 2005; Edmonds, 2008) as groundbreaking in theoretical investigations of the determinants of child labour. The model characterizes a developing economy that exhibits multiple equilibria, with children working in at least one. Two axioms about micro-level behaviour of households and firms for sending children to work are presented in this model. The first axiom is the luxury axiom which states that a family sends its children to the labour market only if its income from sources other than child labour is very low. The second is called the substitution axiom that states that from the point of view of firms, child labour is substitutable for adult labour. Extending the Basu-Van model, Swinnerton and Rogers (1999) add the third axiom which they called the distribution axiom which states that income or wealth from non-labour sources must be sufficiently concentrated in the hands of a few agents if child labour is to exist. If non-labour income is distributed with sufficient equality this axiom states that market equilibrium with child labour cannot exist in the Basu-Van model.

Related to the substitution axiom, Bellettini et al. (2005) analysed determinants of a firm's demand on unskilled labour (which includes child labour) versus skilled labour and its interaction with education choices of households. Their results are that child labour occurs due to firms' reluctance to innovate or households' unwillingness to educate or both. The argument on firms' reluctance to innovate agrees with earlier observations that the supply of labour by children and women is critical for the early stages of industrialization because they are both cheap and suited for affine tasks that require small fingers (see Edmonds, 2008). While agreeing with the assertion that technological backwardness of firms leads to employment of child labour as a source of cheap unskilled labour, this study questioned the conclusion on household unwillingness to educate their children. We questioned the notion that households (parents) can be unwilling to educate their children because this conflicts with the parents' altruism which is a well grounded assumption in child labour literature. We think that parents are aware of the importance of child education and the negative effects of child labour and that they send their children to work for survival of their families and their children (Wahba, 2001). The altruism assumption agrees with earlier microeconomic models of fertility most of which show that, *ceteris paribus*, parents wish to maximize the welfare of their children (see Montgomery and Tussell, 1986; Wong, 1987; Becker, 1991). The welfare of the children enters the utility function of their parents and the household as a whole. These

economic theorists have referred to welfare of the children as child quality and this is usually assumed to be a function of the time and money lavished on children (Montgomery and Tussell, 1986). Parents obtain utility from the status of their children now and in the future. However, these are constrained by the available resources in the family. Much as the good welfare of the child produces utility to the parent, "poor welfare" produces disutility.

A more recent model of child labour has been developed by Basu et al. (*forthcoming*), which not only looks at income poverty but also at asset poverty as causes of child labour. This model explains the positive relationship between child labour and household wealth such as land-holding size that has been found in some empirical studies. The model shows that an increase in household wealth increases child labour when the labour market is imperfect such that increase in land for income poor households provides working opportunities for children.

Empirically, there have been a number of studies on the relationship between child labour and poverty. In general, researchers who compare poor households to rich households at a single point in time in a country find mixed evidence of a link between poverty and child labour (Edmonds, 2008). Some studies support the notion that there is a positive significant relationship between household poverty and child labour while others fail to confirm this relationship. For example, Blunch and Verner (2000) and Okupkpara and Odurukwe (2006) found that a positive relationship between poverty and child labour exists in Ghana and Nigeria respectively. This relationship was also found in Pakistan by Ray (2000) who studied the likelihood of households earning below poverty line to send their children to work. However, Ray (2000) failed to confirm the same relationship in Peru. This author's results in Peru are similar to those of Nielsen (1998) in Zambia. However, Canagarajah and Coulombe (1997) find a weak relationship between child labour and poverty in Ghana, while Sasaki and Temesgen (1999) report no significant relationship between household income per capita and work decisions in Peru. Studies that include household wealth mainly in the form of land-holding size have found a positive relationship between child labour and poverty (Bhalotra and Heady, 2003; Beegle et al., 2006; Dumas, 2007).

Further to the assertion that poverty leads to child labour, Wahba (2001) looked at the impact of child labour on poverty transmission and found that having a parent who had been a child labourer increases the probability of a child working. However, having a parent who worked as a child labourer does not affect significantly the likelihood of a child going to school.

Related to this is the work by Emerson and Souza (2003, 2007). In their earlier work, the authors developed a dynamic intergenerational model of child labour which they used to test the persistence of child labour. The model predicts that children are more likely to work when they come from households with parents who were child labourers, from households with parents who have lower educational attainment and that child labour has adverse effects on children's educational attainment and their adult earnings. The empirical application of their model to Brazil and their later work confirmed that higher parental education decreases the likelihood of a child entering the labour market.

3 Methodology

3.1 Theoretical framework

This study followed Basu et al. (*forthcoming)* to model the relationship between household poverty and child work decisions. Unlike earlier economic models of child labour (Basu and Van, 1998; Baland and Robinson, 2000) that only consider income/consumption poverty, this framework considered both income and asset poverty and explained the strange positive relationship between household wealth and child work as has been empirically found in some studies (Bhalotra and Heady, 2003; Dumas, 2007). The model supposes that we have a one-adult household whose labour supply is assumed to be inelastic. It is also assumed that if the household income from non-child work sources rises sufficiently high, the household would on its own accord withdraw the children from the work which is normally referred to as the "luxury axiom" in child labour literature. The household is assumed to have a utility function of the form:

$$u = u(x, H) \tag{1}$$

where x is the total consumption of the household and H is child work decisions which takes the value 0 when the child does not work and 1 when the child is working. A simple specification of the utility function is considered to account for the luxury axiom into Equation 1.

$$u = \phi(x) - c.H \tag{2}$$

where $\phi'(x) > 0$ and $\phi''(x) < 0$, for all x and c is a positive real number. Assuming the absence of a labour market—an extreme case of labour market imperfection—each household

will have to fend for itself.[1] If the household owns *k* units of land, its production function, *f*, is given by:

$$q = f(k, H+1) \tag{3}$$

where *q* is the output produced, $H+1$ is the amount of labour used – *H* from the children and 1 from the adult. We assume that $f_k, f_H > 0$; $f_{kk}, f_{HH} < 0$ and $f_{kH} > 0$. Since there is no labour market in the economy, the household consumes what it produces, so that $x = q$. Substituting the household output into the household utility function, Equation 2, the optimization problem becomes:

$$\max_H \phi(f(k, H+1)) - c.H \tag{4}$$

The first order condition is given as:

$$\phi_x . f_H = c \tag{5}$$

Taking total differentials with respect to *k* and *H* and re-arranging terms we get:

$$\frac{dH}{dk} = -\frac{f_H f_k \phi_{xx} + \phi_x f_{Hk}}{f_H^2 \phi_{xx} + \phi_x f_{HH}} \tag{6}$$

Equation 6 shows the impact of land-holding size on child labour. Since $\phi_{xx}, f_{HH} < 0$ and $f_H, \phi_x > 0$, the denominator of the equation is always negative implying that the sign of $\frac{dH}{dk}$ is determined by the enumerator. It can also be shown that the first term of the enumerator is negative while the second term is positive. This means that the relative sizes of these terms determine the sign of Equation 6. When the first term of the enumerator is large relative to the second term, Equation 6 will have a negative sign. Large values of the first term can be achieved when either or both of f_k and f_H are large. According to production theory and empirical studies (see Sen, 1962; Deolalikar, 1981) small farms are expected to have higher land productivity but lower labour productivity, i.e., a large f_k and a small f_H. This

[1]

makes it difficult to theoretically determine the effect of an increase in land-holding size on the first term because land productivity and labour productivity are going in different directions as a result of a change in farm size. Since production and consumption activities are closely linked in this model, and we expect lower total output for households with small farms, consumer theory would suggest that households with small farms will also have high marginal utility of output ϕ_x which increases the second term and overall positive effects of land on child labour. We therefore expect a positive relationship between child work and land-holding size among the income poor and a negative relationship among the income non-poor.

3.2 Model specification

The main objective of the empirical analysis is to show that household consumption is negatively related to child work and that the effect of land-holding size depends on the level of consumption. To do this, we included per capita consumption expenditure, per capita land-holding size and their interaction term in the child work equation. The specification for testing our hypothesis is given as:

$$H_i = \beta_0 + \beta_1 PCE_i + \beta_2 land_i + \beta_3 (PCE_i * land_i) + \delta Z_i + v_i \quad (7)$$

For child i, H_i is a child work measure; PCE_i is the household per capita consumption expenditure; $land_i$ is the per capita land-holding size; and Z_i is a vector of child, household and community control variables. The parameter β_1 captures the effect of per capita consumption expenditure on child work hours when per capita land-holding size is equal to zero. Similarly β_2 measures the effect of land-holding size on child work hours when per capita consumption expenditure is equal to zero. However, β_1 and β_2 are supposed to be interpreted together with β_3 (see Wooldridge, 2002; Brambor et al., 2006). The interpretation of the parameter estimate on the interaction term is almost similar to the interpretation of quadratic terms which are simply interaction terms of the variable with itself. If we obtain the following results on the following pair of parameters $\beta_2 > 0$ and $\beta_3 < 0$, we will interpret it as an increase in per capita land-holding size increases child work when per capita consumption is equal to zero and that the increasing effect reduces when consumption expenditure increases from zero.

One of the major empirical challenges we faced was how to model the dependent variable. The outcome variable, child work hours, has many observations where zero hours are reported and this has to be taken care of since ordinary least squares (OLS) regression will produce biased and inconsistent estimates. Standard Tobit models (Tobin, 1958) have been used to estimate models with such data in many previous studies. However, there is growing literature that disputes the adequacy of Tobit models in handling such data because the Tobit model considers all zero values as corner solution outcomes. Some of the zeros in child work data are true corner solutions such that those children will never work. Other zeros have a positive probability of working, but the children do not work because of other factors such as unavailability of working opportunities. This makes sense when the labour market conditions are imperfect. The double-hurdle model proposed by (Cragg, 1971) and used in many other studies (Yen and Jones, 1996; Moffatt, 2005; Aristei and Pieroni, 2009) provides a solution to such data problems. The double-hurdle model allows for a separate stochastic process that describes the individual decision to participate and the level of participation. The first hurdle equation (participation decision) in this study is specified as:

$$d_i^* = z_i\alpha + u_i \qquad u_i \sim N(0,1)$$

$$d = \begin{cases} 1 & if \;\; H_i > 0 \\ 0 & otherwise \end{cases} \tag{8}$$

where d_i^* is a latent variable that takes the value 1 if the child reports a positive value of child work hours H_i and zero otherwise; z_i is a vector of regressors; and α is a vector of parameters. The second hurdle equation (level of participation decision) is given as:

$$H_i^* = x_i\beta + v_i \qquad v_i \sim N(0,\sigma^2)$$

$$H_i = \begin{cases} H_i^* & if \;\; H_i^* > 0 \\ 0 & otherwise \end{cases} \tag{9}$$

where x_i is a vector of regressors and β is a vector of parameters. The error terms are assumed to follow a bivariate normal distribution.

Without determining the correct specification for our data, we statistically compared the Tobit and double-hurdle specifications using the likelihood ratio test.

An additional estimation challenge was the endogeneity of consumption expenditure which may have been due to self consumption and also because part of the household income comes from child work. The endogeneity problem may also be caused by the fact that poor households differ from rich households in many ways that might be associated with child labour (Edmonds, 2008). There are two approaches researchers commonly use to handle this problem in child labour studies. First, some studies address part of the problem by relating child labour to variation in income that excludes the child's income (Ray, 2000; Duryea and Arends-Kuenning, 2003). While this technique addresses the mechanical source of endogeneity, it does not deal with the joint nature of child time allocation and family living standards (Edmonds, 2008). In addition, this is only possible when we are considering child work that is remunerated. In cases where child work includes non-remunerated work such as household domestic chores or work in family enterprises, this approach is not appropriate since it will not value the indirect income the child is contributing to household income by freeing adults' time for other remunerated activities. An appropriate procedure is to use the instrumental variables estimation technique which aims to handle the broader endogeneity problem (see Bhalotra and Heady, 2003; Ersado, 2005). Since we expect per capita consumption expenditure to be endogenous, the interaction term between per capita consumption and land will also be endogenous. In this case, the interaction between land-holding size and the identified instrument will be a valid instrument for the interaction term (Wooldridge, 2002). We corrected for endogeneity by using a procedure that was proposed by Smith and Blundell (1986) and elaborated by Wooldridge (2002) for a case of endogeneity of an interaction term. In this procedure, the suspected endogenous variable (per capita consumption expenditure) is regressed on all the exogenous variables and instrumental variables (instrument for consumption expenditure and for the interaction term) using OLS and the residual terms from these equations are included in the main equation we are estimating. Significance of the parameter estimates on the residual term in the main equation confirms and corrects endogeneity. A dummy variable that divided the districts into two groups according to their mean consumption levels was used as an instrument for consumption expenditure. At first the mean consumption expenditure for all the districts was ranked and the poorest 50% of the districts were assigned a 1 and 0 otherwise. This

instrument managed to identify households in districts whose consumption expenditure is similar but their child labour allocations may be different due to different local situations. The instrument was statistically tested in the consumption and child work regressions. It was found to be a good instrument that was significantly related to consumption expenditure but not to child work thereby meeting the exclusion requirements.

4 Data and variables description

The estimated models included variables that were used to control for child characteristics, household characteristics and community characteristics. Child age and its square, sex of the child and relationship of the child to the household head (whether the child is a biological child or not) were used to control for child characteristics. Number of male and female adult (more than 14 years old) members, number of children aged under five, age of the household head, age of the mother and sex of the household head were used to control for household demographic characteristics that also reflects the intra-household labour supply situation. In addition, dummy variables for the highest educational attainment for the household head (no education and primary education) were also used to control for household level characteristics. Community level characteristics were controlled for by the inclusion of dummy variables of two of the three major administrative/political regions (Central and North), distance to the nearest primary school, and number of school days in the previous two weeks. Number of school days in the previous two weeks was used to control for schooling time which competes with child work for the child's time. Since some of the activities carried out by the children are seasonal, and households were interviewed at different times of the year, we included a dummy variable that controlled for seasonality of the activities which took the value 1 if the household was interviewed during the rainy season, and 0 otherwise.

The data used were from the 2004 Malawi Integrated Household Survey that was collected by the Malawi National Statistical Office (NSO) from March 2004 to April 2005. The survey collected information from a nationally representative sample of 11,280 households; it was designed to cover a wide array of subject matter, with the primary objective of providing a complete and integrated data set to better understand the socioeconomic status of the population in Malawi (MEPD, NSO and World Bank, 2005). This study used the module on time use and labour of the household questionnaire to generate dependent variables. Household members were asked the question: "How many hours in the last seven days did you do (*insert name of activity*?)". Recalls for domestic activities were for the previous 24

hours because these are normally done on a daily basis and a 24-hour recall would give a more precise estimate. Children who were employed as house servants in the interviewed households were excluded from the sample because the poverty of the households where they came from, which was not captured in the study, was more important for them. This resulted in a sample of 7,108 rural children between 5 and 14 years old. The descriptive statistics for explanatory variables are presented in Table 1.

[INSERT TABLE1 HERE]

The mean per capita consumption expenditure of 15,253 Malawi Kwacha (MWK) showed that most of the households in the sample had their consumption expenditure below the poverty line of MWK16,165 set by the Malawi Government. The mean per capita land-holding size of 0.48ha showed the existence of land pressure in the sample. The descriptive statistics also showed that 50% of the children were girls; the average age of children in the sample was 9.17 years. About 76% of these children were the household head's own and the remainder were other relations. Up to 52% of the household heads had no formal education, while 8% had attained secondary education as their highest level of education.

The dependent variable is defined and described in Table 2.

[INSERT TABLE 2 HERE]

Although we did not run econometric models for child work in domestic activities, we still gave descriptive statistics for it. It is shown that about 54% of children in this age group worked in at least one activity and, on average, the children worked for 7.89 hours a week. Most of the children (43%) were reported to have performed domestic chores which included cleaning the house, fetching water, fetching firewood and cooking. The average weekly hours worked for this activity was 4.80. There was low participation in market work which included child work in remunerated activities and in family businesses.

5 Empirical results

The empirical estimation began with the selection of the appropriate model. We first compared the Tobit specification with the double-hurdle specification using the likelihood ratio test. Since the log likelihood for Tobit model ($\log L_T$) is the sum of the log likelihoods of the truncated regression model ($\log L_{TR}$) and probit model ($\log L_P$), the likelihood ratio (LR) statistic can be computed as:

$$LR = -2[\log L_T - (\log L_P + \log L_{TR})] \quad (10)$$

Which is χ^2~distributed with $k_T + k_P + K_{TR}$ degrees of freedom (see Martínez-Espiñeira, 2006). The results of the model selection test are presented in Table 3.

[INSERT TABLE 3 HERE]

The likelihood statistic of 400.02 is greater than the critical chi-square statistic of 95.62 which suggests that the double-hurdle model fits the data better than the Tobit model. An assessment of the coefficients and their significance levels also showed some differences in the double-hurdle model and the Tobit model. However, the results showed that consumption expenditure and land-holding size were insignificant in explaining child work hours. These were significant in the Tobit model which has been found to be less suitable than the double-hurdle model. This makes both the double-hurdle model and the Tobit model useless in our study since the second stage of the double-hurdle model has little value addition to our hypothesis. We therefore chose the probit model which was estimated by using the ivprobit command in stata to obtain reliable standard errors. We also modelled the disaggregated child work equations in the same fashion. The results of the parameter estimates and the marginal effects obtained from the instrumental variable probit model are presented in Table 4.

[INSERT TABLE 4 HERE]

The Wald statistic indicates that the model is significant. Apart from the variables of interest in this study, there are also interesting results on other variables which we discuss before we discuss the core variables. The results confirmed the presence of gender bias in child labour where boys were found to have a lower probability of working than girls, on aggregate. It was also found that the probability that a child will work increases with the increase in child age at a decreasing rate. In addition, the number of school days in the previous two weeks was found to significantly reduce the probability that a child would work. This showed that parents care about the education of their children.

We found that consumption expenditure was insignificant in determining the probability that a child would work in at least in one activity when land-holding size was equal to zero. However, land-holding size was found to positively influence the probability that the child would work in at least in one activity when consumption expenditure as equal to zero. However, this positive effect of land decreased when consumption expenditure increased. This means that at a certain high level of consumption expenditure, increase in land would no longer have a positive effect on the probability that a child would work. Solving the following derivative for consumption level (*PCE*) at which the effect of land becomes zero, will give us a point at which the effect of land on the probability that a child will work changes signs:

$$\frac{\partial P(H>0)}{\partial(land)} = \varpi_2 - \varpi_3 * PCE = 0 \qquad (11)$$

where ω_2 and ω_3 are marginal effects of land and the interaction term respectively. The solution to this derivative is MWK17,462.20 which implies that this is a consumption threshold above which an increase in landholding size does not increase the probability that a child will work. Below this threshold, an increase in land increases the probability that the child will work. To statistically test this result, we re-estimated the probit model for the two sub-samples.

[INSERT TABLE 5 HERE]

Since we have disaggregated the households with respect to consumption levels as they related to the consumption threshold level, the interaction variable in this estimation was dropped. The results showed that, on average, a unit increase in land-holding size increased probability that a child would work by 10% among low consumption households. However, this increase in land-holding size does not influence the probability that children would work in at least one activity among the high consumption households. The results also showed that consumption expenditure has a negative significant effect on the probability that a child would work in at least one activity among the high consumption households and the same was not significant among the low consumption level households. These results support the hypothesis that the positive effect of household land-holding size on child work is mainly among the income/consumption poor and when labour markets are absent.

We estimated similar models for child work in household non-market production activities and market activities to show the differential effects of land-holding size and consumption level on child work to check if these effects were different in different activities. The results of are presented in Table 6.

[INSERT TABLE 6 HERE]

As expected land-holding size was found to positively influence the probability that children would work in non-market household production activities, which are predominantly agricultural in rural Malawi, when household consumption was equal to zero but the positive effect declined when consumption level increased. Consumption level itself was not significant in explaining the probability that children would work in non-market activities when land-holding size was equal to zero. However, consumption level was found to significantly and negatively influence the probability that children would work in market activities when land-holding size was equal to zero.

Although consumption level has been interacted with land-holding size, the results in all estimated models suggested that the effect of consumption level on the probability that children would work was independent of the amount of land the household possessed since in models where consumption level only was significant the interaction term was not significant.

The Wald test for joint significance in this case may be misleading because the results depended heavily on the level of significance of the significant variable (consumption expenditure in this case). We therefore did not conduct this test.

A look at the consumption threshold levels revealed that child work in household non-market productive activities had a lower threshold than that for child work in market activities. This result may suggest that the influence of poverty may be greater in child work in market activities than it does on child work in non-market activities. In other words, it takes a higher consumption level to reduce child work in market activities than it does in non-market activities. As we did above, we also assessed the impact of land and consumption expenditure for households above and below the consumption threshold level. The estimation results are presented in Table 7.

[INSERT TABLE 7 HERE]

The results show that consumption level significantly reduced the probability that children would work in household non-market production activities among high consumption households but not among the low consumption households. However, increase in land-holding size was found to significantly increase the probability that children would work when in non-market household production activities. These results were similar to those for all activities as presented above. However, the results on child work in market activities showed slightly different results where consumption level reduced the probability that children from households with both high and low consumption levels would work in market activities while land-holding size only increased the probability that children from low consumption households would work in market activities. These results may imply that child work in non-market activities was mainly due to consumption poverty while child work in non-market household production activities may have been due to both asset poverty and consumption poverty.

6 Conclusions

This study was conducted to assess the relationship between child work decisions and household income and asset poverty using of the rural sub-sample of the 2004 Malawi

Integrated Household Survey. The descriptive statistics showed that children in rural Malawi work in different activities with more time spent in domestic work and household non-market productive activities.

Using instrumental variable probit models and controlling for child, household and community characteristics, the study re-affirmed the presence of a positive relationship between child labour and income poverty thereby accepting the hypothesis that child work in developing countries is largely due to poverty. Furthermore, the study also showed that increase in household wealth in the form of land-holding size increases the likelihood that children will work only among income poor households and when labour markets are imperfect. No significant relationship was found between land-holding size and child work decisions among income non-poor households suggesting that the probability that a child will work is inelastic to land-holding size for income non-poor households. These results support the Basu et al. (*forthcoming*) hypothesis that the increase in land-holding size provides working opportunities for children from income poor households. In addition, the study showed that the impact of household consumption expenditure on child labour is independent of household wealth.

Earlier studies (Bhalotra and Heady, 2003; Beegle et al., 2006; Dumas, 2007) found that a positive relationship between household wealth in the form of land-holding size and child labour exists without qualifying the conditions under which household wealth and child work relate. This finding made household wealth to be looked at as the cause of child labour?. However, this study has shown that consumption poverty is the main cause of child work and that when the inability of the labour market to provide jobs when the child labour needs emerges in the household, land availability generates the work opportunities. These results do not discourage policies that encourage asset accumulation as a means of reducing poverty but they rather show that policies that increase the returns on these assets may be more effective since income poverty has been re-affirmed as the main cause of child labour. In addition, the findings in this study show that poverty reduction policies that increase the labour demands on the household such as public work programmes and promotion of small businesses may have adverse effects on child labour among poor households.

Notes

1. A case of perfect market is presented in Basu et al (2010).

References

Aristei D. and L. Pieroni. 2009. "A double-hurdle approach to modelling tobacco consumption in Italy". *Empirica,* 36(3): 245–272.

Baland, J.-M. and J.A. Robinson. 2000. "Is child labour inefficient?". *Journal of Political Economy*, 108(4): 663–681.

Basu, K. and P.H. Van. 1998. "The economics of child labour". *American Economic Review,* 88: 412–427.

Basu, K., S. Das and B. Dutta. *forthcoming*. "Child labour and household wealth: Theory and empirical evidence of an inverted U". *Journal of Development Economics*.

Bhalotra, S. and C. Heady. 2003. "Child farm labour: The wealth paradox". *World Bank Economic Review,* 17: 197–227.

Becker, G. 1991. *A Treatise on the Family*. Cambridge, Massachusetts: Harvard University Press.

Beegle, K., R.H. Dehejia and R. Gatti. 2006. "Child labour and agricultural shocks". *Journal of Development Economics,* 81: 80–96.

Bellettinni G., B.C. Ceroni and G.I.P. Ottaviano. 2005. "Child labour and resistance to change". *Economica*, 72: 397–411.

Blunch, N.H. and D.Verner. 2000. "Revisiting the link between poverty and child labour: The Ghanaian experience". Policy Research Working Paper No. 2488. The World Bank, Washington, D.C.

Brambor, T., W.R. Clark and M. Golder. 2006. "Understanding interaction models: Improving empirical analysis". *Political Analysis*, 14: 63–82.

Canagarajah, S. and H. Coulombe. 1997. "Child labour and schooling in Ghana". Policy Research Working Paper No. 1844. The World Bank, Washington, D.C.

Cragg, J.G. 1971. "Some statistical models for limited dependent variables with applications to the demand for durable goods". *Econometrica*, 39: 829-844.

Deolalikar, A.B. 1981. "The inverse relationship between productivity and farm size: a test

using regional data from India". *American Journal of Agricultural Economics,* 63:275–279.

Dumas, C. 2007. "Why do parents make their children work? A test of the poverty hypothesis in rural Burkina Faso". *Oxford Economic Papers,* 59: 301–329.

Duryea, S. and M. Arends-Kuenning. 2003. "School attendance, child labour and local labour market fluctuations in urban Brazil". *World Development,* 31: 1165–1178.

Edmonds, E.V. 2008. "Child labour". in T. P. Schultz and J. Strauss, eds., *Handbook of Development Economics,* 4:3607-3709

Emerson, P. and A. Souza. 2003. "Is there a child labour trap? Inter-generational persistence of child labour in Brazil". *Economic Development and Cultural Change,* 51(2): 375–398.

Emerson, P. and A. Souza. 2007. "Child labour, school attendance and intra-household gender bias in Brazil". *The World Bank Economic Review,* 21(2): 301–316.

Ersado, L. 2005. "Child labour and school decisions in urban and rural areas: comparative evidence from Nepal, Peru, and Zimbabwe". *World Development,* 33: 455–480.

ILO. 2006. *The End of Child Labour: Within Reach.* Geneva: International Labour Organization.

Martínez-Espiñeira, R. 2006. "A Box-Cox double-hurdle model of wildlife valuation: The citizen's perspective". *Ecological Economics,* 58: 192–208.

MEPD, NSO and World Bank. 2005. "Second integrated household survey: an extract of findings". National Statistical Office, Zomba, Malawi. Unpublished document.

Moffat, P.G. 2005. "Hurdle models of loan default". *Journal of the Operational Research Society,* 62: 1063-1071

Montgomery, M. and J. Trussell. 1986. "Models of marital status and childbearing". *Handbook of Labour Economics,* 1: 205–254.

Nielsen, H.S. 1998. "Child labour and school attendance: Two joint decisions". CLS

Working Paper 98-15. Centre for Labour Market and Social Research, Åarhus, Denmark.

NSO. 2002. “Malawi child labour report”. Malawi National Statistical Office (NSO) and International Labour Organization, Zomba, Malawi. Unpublished document

Okupkpara, B.C. and N. Odurukwe. 2006. *Incidence and Determinants of Child Labour in Nigeria: Implications for Poverty Alleviation*. AERC Research Paper No. 156. African Economic Research Consortium, Nairobi, Kenya.

Ray, R. 2000. “Child labour, child schooling, and their interaction with adult labour: Empirical evidence for Peru and Pakistan”. *The World Bank Economic Review,* 14(2):347–467.

Sasaki, M. and T. Temesgen. 1999. “Children in different activities: Child labour and schooling in Peru”. Mimeo. The World Bank, Washington, D.C. Unpublished document

Sen, A.K. 1962. “An aspect of Indian agriculture”. *Economic and Political Weekly*, 14(4–6): 243–266.

Smith, R.J. and R.W. Blundell. 1986. “An exogeneity test for a simultaneous Tobit model with an application to labour supply”. *Econometrica*, 54(3): 679–685.

Swinnerton, K.A. and C.A. Roggers. 1999. “The economics of child labour: comment”. *American Economic Review*, 89: 1382–1385.

Tobin, J. 1958. “Estimation of relationships for limited dependent variables”. *Econometrica,* 26: 24–36.

Wahba, J. 2001. “Child labour and poverty transmission: No room for dreams”. University of Southampton, UK. Unpublished document

Wong Y. 1987. “The role of husband’s and wife’s economic activity status in the demand for children”. *Journal of Development Economics,* 25: 329–352.

World Bank. 2005. “Gender issues in child labour”. PREM Notes Number 1000, The World

Bank, Washington, D.C.

Wooldridge, J.M. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, Massachusetts: MIT Press.

Yen S.T and A.M. Jones. 1996. “Individual cigarette consumption and addiction: a flexible limited dependent variable approach”. *Health Economics,* 5: 105–117.

Table 1: Variable definitions and descriptive statistics

Variable	Definition	Mean	Std. dev.
PCE	Per capita consumption expenditure in MK	15,253.79	11,386.66
Land	Per capita land-holding in ha	0.48	1.35
Child age	Child age in years	9.17	2.84
Child sex	1 = male; 0 = otherwise	0.50	0.50
Own child	1= own child; 0= otherwise	0.76	0.43
Adult male	Number of male adults	1.42	1.05
Female adults	Number of female adults	1.54	0.85
Infants	Number of under five children	1.29	1.03
Head age	Age head in years	45.45	13.91
Head sex	1 = male; 0 = otherwise	0.75	0.43
No education	1 = head no formal education; 0 = otherwise	0.52	0.50
Primary education	1 = head primary education; 0 =otherwise	0.10	0.30
Secondary education	1 = head secondary education: 0 =otherwise	0.08	0.27
Primary school	Distance to primary school in km	1.52	2.95
School days	Number of school days in the previous two weeks	7.42	3.70
South	1 = Southern region: 0 = otherwise	0.42	0.49
North	1 = Northern region: 0 = otherwise	0.16	0.37
Season	1 = rainy season: 0 = otherwise	0.49	0.50
N		7,108	

Table 2: Definition and descriptions of dependent variable

	Proportion of children that worked		Hours of work	
Type of work	Mean	Std. dev	Mean	Std. dev.
All activities	0.54	0.50	7.89	12.06
Domestic	0.43	0.49	4.80	8.59
Non-market	0.26	0.44	2.42	5.97
Market	0.07	0.25	0.67	3.74
Observations	7,108		7,108	

Table 3: Results of model selection test

	Tobit regression		Probit regression		Truncated regression	
Variable	coef	t-statistic	coef	z-statistic	coef	z-statistic
PCE	0.0002	1.33	0.0000	1.05	0.0006	1.06
PCE x Land	-0.0002	-2.01**	0.0000	-1.97*	-0.0003	-0.75
Land	3.2618	1.96*	0.2866	1.93*	4.8886	0.72
Child age	6.9812	11.30***	0.4853	10.68***	18.5497	5.20***
Chid age sqd	-0.1916	-6.07***	-0.0145	-6.08***	-0.5390	-3.34***
Child sex	-7.3551	-16.86***	-0.4783	-14.58***	-15.9156	-7.47***
Own child	-0.2681	-0.46	0.0412	0.94	-4.0393	-1.77*
Adult male	-0.7567	-3.06***	-0.0603	-3.22***	-0.9248	-0.93
Female adults	-1.4615	-5.12***	-0.0623	-2.90***	-5.2361	-4.19***
Infants	0.8531	2.76**	0.0422	1.81*	2.9624	2.32**
Head age	0.0691	3.10***	0.0054	3.21***	0.1017	1.14
Head sex	-1.6278	-2.59**	-0.0811	-1.70*	-5.1371	-2.04**
No education	1.1413	2.45**	0.0657	1.86*	2.7363	1.45
Secondary education	-0.9755	-0.76	0.0190	0.20	-9.5199	-1.72*
Primary school	0.1830	2.39**	-0.0015	-0.27	1.1487	4.05***
School days	-0.5582	-9.27***	-0.0350	-7.51***	-1.2208	-4.97***
South	0.9443	2.03**	0.0564	1.61	2.0821	1.09
North	-2.4660	-3.35***	-0.0822	-1.47	-11.2735	-3.50***
Season	-2.9682	-4.26**	-0.2627	-5.01***	-1.5488	-0.55
Residual1	-0.0001	-0.77	0.0000	-0.73	-0.0003	-0.59
Residual2	0.0002	1.77*	0.0000	1.76*	0.0003	0.68
Constant	-39.5892	-8.69***	-2.6821	-7.93***	-143.6483	-5.59***
Sigma	16.12				25.70	
Log likelihood	-18117.51		-4003.86		-13913.63	
LR Chi2	2214.68***		1861.46***			
Wald Chi2					156.20***	
Pseudo R2	0.06		0.18			
N	7108		7108		3869	
Likelihood ratio statistic	400.02***					

Note: *** denotes significance at 1%, ** denotes significance at 5%, and * denotes significance at 10%.

Table 4: Regression results of the ivprobit estimation for all child work

Variables	Coefficient.	Marginal effects	z- statistic
PCE	0.0000	0.0000	1.04
PCE x Land	0.0000	0.0000	-1.96*
Land	0.2866	0.2866	1.91*
Child age	0.4853	0.4853	10.58***
Chid age sqd	-0.0145	-0.0145	-6.02***
Child sex	-0.4783	-0.4783	-14.44***
Own child	0.0412	0.0412	0.93
Adult male	-0.0603	-0.0603	-3.19***
Female adults	-0.0623	-0.0623	-2.87***
Infants	0.0422	0.0422	1.79*
Head age	0.0054	0.0054	3.17***
Head sex	-0.0811	-0.0811	-1.68
No education	0.0657	0.0657	1.85*
Secondary education	0.0190	0.0190	0.20
Primary school	-0.0015	-0.0015	-0.26
School days	-0.0350	-0.0350	-7.44***
North	-0.0822	-0.0822	-1.46
South	-0.2627	-0.2627	-4.96***
Season	0.0564	0.0564	1.59
Constant	-2.6821	-2.6821	-7.85***
Wald Chi2		1,504.71***	
N		7,108	

Note: *** denotes significance at 1%, ** denotes significance at 5%, and * denotes significance at 10%.

Table 5: Effects of land below and above the threshold consumption

Variable	High consumption		Low consumption	
	Marginal effects	z-statistics	Marginal effects	z-statistics
PCE	-0.00	-1.94*	0.00	1.43
Land	-0.04	-0.99	0.10	2.42**
Wald Chi2		280.23***		1,161.55***
N		1,977		5,131

Note: *** denotes significance at 1%, ** denotes significance at 5%, and * denotes significance at 10%.

Table 6: IVprobit estimation results for child work in non-market and market activities

	Non-market production activities			Market activities		
	Coefficient.	Marginal effects	z- statistic	Coefficient.	Marginal effects	z- statistic
PCE	0.0000	0.0000	0.29	-0.0001	-0.0001	-3.60***
PCE x Land	0.0000	0.0000	-3.18***	0.0000	0.0000	-1.25
Land	0.5205	0.5205	3.29***	0.3151	0.3151	1.41
Threshold PCE		18554.88			19766.49	
N		7108			7108	

Note: *** denotes significance at 1%, ** denotes significance at 5%, and * denotes significance at 10%.

Table 7: Effects of land and consumption below and above the threshold consumption on child work in market and non-market activities

	High consumption		Low consumption	
Variable	Marginal effects	z-statistics	Marginal effects	z-statistics
	Non-market production activities			
PCE	-0.0001	-1.93*	0.0000	0.01
Land	0.0453	0.80	0.0514	2.59**
	Market activities			
PCE	-0.0003	-1.87*	-0.0002	-3.46***
Land	0.1622	1.08	0.0444	1.80*

Note: *** denotes significance at 1%, ** denotes significance at 5%, and * denotes significance at 10%.