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Child Labour: Insights from an Agricultural Household Model

*Diego Angemi**

* Centro Studi Luca d'Agliano

CHILD LABOUR: INSIGHTS FROM AN AGRICULTURAL HOUSEHOLD MODEL

Diego Angemi

(diego.angemi@wadh.oxon.org)

Abstract

This manuscript investigates the extent to which children contribute to the household's agricultural activities. The conclusion that children play an important role in the farming activities of Ugandan agricultural households is supported by two key findings: (i) Child labour accounts for approximately 9% of the household's annual agricultural earnings; and (ii) on the bases that most child labour is performed on the family farm and smoothly functioning labour markets are rare, land ownership increases the household's demand for child labour in agricultural activities.

JEL classification: J22, O12
Keywords: Child labour; labour market; agricultural earnings; land ownership

1.1 INTRODUCTION

About one third of all the working children in the world are found in Africa, even though the continent contains only 10% of the world's population. Labour force participation rates for children 5-14 years of age average 40%, and in some countries exceed 50%. Several factors lay behind such high incidence of child labour: continent-wide poverty, cultural views, which often condone child labour, and badly functioning education systems, to name a few.

The aim of this manuscript is twofold. First, to analyse the determinants of agricultural child labour, in order to test the hypothesis that if the household faces imperfections in the labour market, increased ownership of land intensifies the need for child labour. In Africa's traditional small-holder agriculture, labour-supply is the main constraint on expanding acreage (Kamuzora, 1984). In such an economic environment, if the household faces imperfections in the labour market, and, as a result, we observe some involuntary unemployment in the rural labour market, children become a particularly valuable asset.

On this note, this work also aims to quantify the extent to which, at such young age, children contribute to the household's agricultural activities. A small survey in a Northern Indian city of Bhavnagar reveals that close of 60% of boys and girls contribute between 10 and 30% of household income (Swaminathan, 1998). Similarly, in rural Pakistan, 10-14 year old boys and girls have been found to contribute about one-third and 15% of household wage income, respectively (Bhalotra, 2007).

In a survey of 110 households in the urban informal sector of Patalia in Northern India, Sharma and Mittar (1990) find that children's contributions are more than 20% in two-thirds of households, with a fifth of households enjoying a contribution of more than 40%. They also find that the proportion of households with per capita income below the poverty line is greater once children's earnings are excluded from household income.

Patrinos and Psacharopoulos (1994) observe that children in Paraguay contribute as much as one third of household income at certain times of the year. In Asuncion, Paraguay, 6% of households depend entirely on child earnings, and 50% reported that child work contributed at least half of household income (Myers, 1989). Finally, Kassouf (1998) finds that the contribution of 5-14 year old children in Brazil is less than 10% for a third of households, but lies between 10 and 30% for almost 50% of their sample.

The structure of this paper is as follows: Section 1.2 provides an extensive discussion of the existing literature. Section 1.3 sets out the theoretical framework at the heart of our analysis, and section 1.4 outlines the empirical strategy. Notably, the formal analysis of child labour is closely related to the modeling of household behaviour (Basu, 1999).

Section 1.5 presents the data, while Section 1.6 discusses the main results. This work contributes to the existing body of literature by allowing (and testing) for the absence of a smoothly functioning market for adult labour in evaluating the determinants of agricultural child labour. Further, in quantifying the contribution of child labour to the household's agricultural earnings by means of a production function, this contribution challenges the common assumption of perfect substitutability among farm workers.

Finally, Section 1.7 summarizes the main conclusions and lays out the policy implications of this analysis.

1.2 LITERATURE REVIEW

A striking feature of developing economies is the typically large proportion of the work force that is not primarily engaged in wage labour. Self-employment is particularly pervasive in agriculture where the dominant unit of production is the family farm. In their efforts to analyse the complex interactions between the labour supply and demand decisions of farm households, most studies have relied on the empirical advantages offered by separability (e.g. Barnum and Squire, 1979; Rosenzweig, 1980).

Under this assumption, the production decisions of the agricultural household are separable from the household's consumption choices. The farm household seeks to maximise profits from its production activities, subject to production constraints. Then the resulting farm profits form part of its full income constraint, subject to which the household is assumed to maximise its utility from consumption. The prominent assumptions made are that rural labour markets are efficient and free of transaction costs, and that family and hired labour are perfect substitutes.

The separability of the model ensures that any variation in household assets will only affect labour supply through its effect on household profits. An increase in household assets will increase the marginal productivity of labour in household production leading to increased labour hiring, and reduced labour supply of the household members. In the presence of a smoothly functioning market for adult labour, increased ownership of land will unambiguously increase income, and (assuming that child leisure is a normal good) reduce child labour. In the absence of a smoothly functioning market for adult labour,

however, it is not possible to predict the effects on child labour. The net effect on labour supply is ambiguous and depends on the relative importance of the conflicting income and substitution effects.

In spite of the analytical advantages provided by separability in the context of empirical analysis, its shortcomings have been clearly documented in the empirical literature. In Bardhan and Udry's (1999) own words, in most developing countries where the hypothesis has been examined it is clear that the separation property does not hold. Everywhere in Africa, Latin America, and most of Asia where the hypothesis has been examined, it has decisively been rejected (Kevane, 1996; Udry, 1998; Barrett, 1996; Collier, 1983; Jacoby, 1993; Carter, 1984; Bardhan, 1973). There is an interesting pair of papers, however, by Benjamin (1992, 1995) and another by Pitt and Rosenzweig (1986), which indicate that the separation property is not far from true in a large Indonesian data set. In most developing-country contexts, the separation property seems more useful as a benchmark for comparison rather than as a basis for empirical work.

Additionally, the near absence of functioning markets, coupled with the existence of institutionally imposed constraints, constitutes one of the main sources of interdependence of production and consumption decisions. In the absence of separability, the production and consumption decisions of farm households must be treated as non-separable in the sense that labour supply choices cannot be considered independently of their labour needs on the family farm (Abdulai and Regmi, 2000).

Studies for a diverse set of countries suggest that the fraction of household income contributed by working children is, on average, large enough that the household may rely upon it. Two influential studies which support the view that children make significant and early contributions to household income are Cain (1977) for Bangladesh, and Nag, White and Peet (1978) for Java and Nepal. These studies are frequently cited to support the views that economic incentives determine both high fertility and child labour. Cain's innovative study of the village of Char Gopalpur in Bangladesh collected data on time use, including time budgets for children. This showed that children began serious work at a very young age (often within households, thereby releasing adult labour for use elsewhere), that boys became net producers by age 12, that they compensate for their own cumulative consumption by age 15 (using age-specific data on calorie consumption), and that they compensate for their own and sister's cumulative consumption by age 22. Similarly, for Java and Nepal, Nag et al. (1978) found that children began work in the household at 6-8 years. Comparing the household's income with its food expenditure, they suggest that children's labour made a significant contribution to household net income, and that this led to a strong demand for children.

Notably, however, the view that children make a significant and early net contribution to household income has been challenged. Eva Mueller (1976) simulated income-generation and consumption over the life-cycle of children in a number of countries, and concluded that in smallholder agriculture children consume more than they produce up until they become more productive adults, and therefore they have a negative economic value.

Similarly, Cassen (1978), who concentrates his analysis to the Indian household, is also doubtful that the economic value of children is positive.

Most of the work on child labour focuses on why families send their children to work. Comparatively few papers consider child productivity in the family or the wage market. This lack of research reflects the fact that very little child labour is in the formal labour market.[1] In countries like Uganda, children from larger households are more likely to work, as a consequence of resources per person being smaller in larger households (e.g. Patrinos and Psacharopoulos, 1997), and that fertility may be encouraged by the prospects of child work (e.g. Rosenzweig and Evenson (1977), Cain (1977), Singh and Schuh (1986), Eswaran (1996), Bardhan and Udry (1999)). The empirical results are mixed, but there is a tendency to find a positive association of household size and child work. Clearly, it may be argued that household size is endogenous in a model of child labour. However, since changes in household size tend to take a long time to happen, it seems reasonable to treat this variable as if it were exogenous to the child work decision. Since size and composition are clearly correlated, the relation between household size and child work will also depend upon whether household composition is held constant. Jensen and Nielsen (1997) and Psacharopoulos (1997), for example, include assets and size but not composition of the household. Kassouf (1998), Jensen (1999), Canagarajah and Coulombe (1997), Grootaert (1998) and Patrinos and Psacharopoulos (1997) include income (assumed exogenous) and composition, but size does not appear independent. For the work of family members on the household farm, hours of work will tend to be

[1] For a detailed overview of the state of the recent empirical literature on why and how children work as well as the consequences of that work, see Edmonds E. (2007).

increasing in land size until land is so abundant that the household rents it out (e.g. Sharif, 1994).

It has also been argued that households send children to work in order to augment their income but also to manage better the income risk they face. Child labour can be part of a strategy aimed at minimising adverse income fluctuations, and hence to reduce the potential impact of job loss by a family member, of a failed harvest, etc. Where the level of income is very low any interruption can be life-threatening, particularly in the absence of savings, liquid assets or ability to borrow (Mendelievich, 1979). Therefore, the risk argument provides a further explanation as to why child labour is more prevalent among poor households.

Evidence from rural India confirms that child labour plays a significant role in self-insurance strategy for poor households. It has been observed that when the variability of household income increases (measured by the difference in income from peak season to low season), children's school attendance declined. This was especially the case when a "shock" occurred which was external to the village. Small households suffer more from income shocks because they are less able from insuring themselves (Jacoby and Skoufias, 1998).

1.3 THE THEORETICAL FRAMEWORK

Consider a utility function, defined over consumption by each member of the household, and a budget constraint, which incorporates production on assets owned by a household with three members, two adults – male (denoted with subscript *m*) and female (denoted with subscript *f*), and a child (denoted with subscript *c*). Each member gets utility from consuming a good (C_m, C_f, C_c) and from leisure (l_m, l_f, l_c). Assuming a perfect labour market, the household maximizes the following utility function:

$$U = U(C_m, C_f, C_c, l_m, l_f, l_c) \qquad \textbf{[1.1]}$$

Subject to

$$Q = f(L, K) \qquad \textbf{[1.2]}$$

$$P(C_m + C_f + C_c) = f(L, K) + w(L_m^x + L_f^x + L_c^x) - wL_h =$$
$$= \Pi + w(L_m^x + L_f^x + L_c^x) \qquad \textbf{[1.3]}$$

$$L = L_m^o + L_f^o + L_c^o + L_h \qquad \textbf{[1.4]}$$

$$T_i = L_i^o + L_i^x + l_i \qquad \text{(where, i = m, f, c)} \qquad \textbf{[1.5]}$$

Where, C = consumption, l = non-work (school and leisure) time, Q = production, L = labour time in household production, K = household assets (exogenous), L^o = household

labour used on the farm, L^x = household labour supplied to the market, L_h = hired labour, P = the commodity price, w = the market wage rate, Π = profits from household production, $(PQ - wL_h)$, and T = time endowment.

Substituting **[1.4]-[1.5]** into **[1.3]** yields a single constraint of the form:

$$P(C_m + C_f + C_c) = \Pi + w(T_m + T_f + T_c) - w(l_m + l_f + l_c) \qquad \textbf{[1.6]}$$

This result is often called the "separation property" of the agricultural household model, because the production decisions are separable from the household's consumption choices. Notice that the converse is not true. The consumption choices of the household do depend on the profit realised from production through the budget constraint. To reiterate the logic, the existence of complete markets implies that a utility-maximising household will choose to maximise profits in its production enterprise. Profit maximisation (or, as it is commonly called in the literature, the separation property) is not an assumption: rather, it is derived from the twin assumptions of utility maximisation and complete markets.[2]

The household can choose the levels of consumption and total labour input into agricultural production that maximise utility. Consider labour input; the first order condition is:

[2] Bardhan P. and Udry C., pg. 9-10, 1999

$$\delta Q/\delta L_i = w/P = f_L$$

$$P\delta Q/\delta L_i = w \qquad \text{(where, i = m, f, c)} \qquad \textbf{[1.7]}$$

That is, the household will equate the marginal revenue product of labour to the market wage. This gives us the demand for labour inputs to the household farm:

$$L_i = L_i(w, P, K) \qquad \text{(where, i = m, f, c)} \qquad \textbf{[1.8]}$$

Or the corresponding labour supply functions:

$$R_i = R_i(w, P, K) \qquad \text{(where, i = m, f, c)} \qquad \textbf{[1.9]}$$

The solution to equation **[1.8]** can then be substituted into the right-hand side of the constraint (equation **[1.6]**) to obtain the value of full income when farm profits have been maximised through an appropriate choice of labour input. Maximising utility subject to this new version of the constraint yields the standard conditions for consumer demand theory.

The separability of the model ensures that any variation in household assets, *K*, will only affect labour supply through its effect on household profits and that its effects will be unambiguous. An increase in household assets will increase the marginal productivity of labour in household production leading to increased labour hiring. However, as the

market wage rate is exogenous, the only change on the consumption side of the model will be the resulting increase in profits. Assuming that non-labour time is a normal good, this will unambiguously reduce the labour supply of the household members. Thus, in the presence of a smoothly functioning market for labour, increased ownership of land will unambiguously increase income, and (assuming that child leisure is a normal good) reduce child labour.

Following Bardhan and Udry (1999), let us now examine how these results change if the household faces imperfections in the labour market, and, as a result, we observe some involuntary unemployment in the rural labour market. The household cultivates its endowment of land, and might face a binding constraint on the amount of labour it can supply off its own farm. In this new framework, the household maximisation problem (now assuming just one person in the household) is:

$$\text{Max } U(C, l) \qquad \textbf{[1.10]}$$

Subject to

$$PC = f(L^o + L_h, K) - wL_h + wL^x \qquad \textbf{[1.11]}$$

$$T = L^o + L^x + l \qquad \textbf{[1.12]}$$

$$L^x \leq M \qquad \textbf{[1.13]}$$

Where, L_h is labour hired by the household to work on its farm, L^o is the household's own labour on its farm, L^x is the time spent by the household working for a wage, and M is the maximum amount of time the household can spend working for a wage as a result of some (here unmodelled) labour market rationing. If **[1.13]** is not binding, then **[1.11]** becomes:

$$PC + wl = f(L, K) - wL + wT \qquad \textbf{[1.14]}$$

Where, L is the amount of labour used on the farm. However, suppose **[1.13]** is binding, as it will be for small M, and when households decide to supply large amounts of labour to the market. In this case, $L^x = M$, $L_h = 0$. Setting the numeraire $P = 1$, the household's problem becomes:

$$\text{Max } U(C, l) \qquad \textbf{[1.15]}$$

Subject to

$$C = f(T - M + l, K) + wM \qquad \textbf{[1.16]}$$

The first order conditions are **[1.16]** and $U_l/U_C = F_L$. The household's problem is illustrated in figure 1.1. The outer axes measure the household consumption (goods consumption on the vertical axis, the time endowment minus leisure on the horizontal

axis). The inner axes demonstrate production on the household's farm, with output on the vertical axis and labour on the horizontal axis. *M* hours are spent working in the market, earning *wM*. The household's remaining labour time (L^o) is spent on the farm, producing *q**. So the household works $M + L^o$ hours and consumes $c^* = wM + f(L^o, K)$ units of the good. The household achieves a maximised utility of $U(c^*, l^*)$ and point *A*.

This sort of market structure could give rise to an oft-observed pattern in the rural areas of less developed countries, resulting in small farms being cultivated more intensively than their larger counterparts. Consider a household with more land than the household consuming at point *A* in figure 1.1, but facing the same wage and labour market constraint. If this household were to cultivate with the same intensity as household *A*, it would have to choose to produce and consume at point *D* in the figure. If leisure is a normal good, *D* will not be chosen. Instead, the household will choose to produce and consume at a point such as *B*, cultivating its large farm less intensively than the smaller farm of household *A*.

It follows that when a smoothly functioning market for labour is present, increased ownership of land will unambiguously increase income, and (assuming that child leisure is a normal good) reduce child labour. However, if the household faces imperfections in the labour market, it is not possible to predict the effects on child labour.[3]

[3] The basic conditions described in figure 1.1 are valid not only for total household production but also for any specific type of production. Indeed, it is possible to distinguish between two types of household production (Q_1 and Q_2) without altering the main conclusion.

1.4 THE EMPIRICAL STRATEGY

The theoretical model in the previous section concluded that if the household faces imperfections in the labour market, the effect of increased ownership of land on child labour remains ambiguous. The aim of this paper involves testing the hypothesis that, in Uganda, if the household faces imperfections in the labour market, increased ownership of land intensifies the need for child labour. In the absence of any frictions in off-farm employment, the marginal productivity of work on the family farm should be equal to the effective wage received by family members working off the farm. Further, assuming that working off the farm entails no transaction costs, the effective wage reported should be equal to the market wage.

In line with Jacoby's (1993) analysis of structural time allocation models for self-employed agricultural households in the Peruvian Sierra, to test whether labour markets function efficiently, it is possible to examine the relationship between the effective wage for adult male workers in the non-farm labour market, W_m, and their marginal productivity of work on the family farm, $\hat{W}_m$. The going market wage for men in the community, W_m, is provided in the community questionnaire of the Integrated Household Survey (IHS) 1992. The corresponding marginal products, $\hat{W}_m$, can be predicted from the estimated parameters of an agricultural production function with functional form f, $Y = f(L, K, \beta) + \varepsilon$.

This work focuses on the Cobb-Douglas specification of the production function. The attractiveness of the Cobb-Douglas representation stems from its ease of estimation and

interpretation of the elasticities of production and marginal products. On account of this property alone, the Cobb-Douglas production function holds a definite advantage over a wide spectrum of alternative specifications (e.g. translog) for it keeps our computation of the marginal productivity of work for adult men on the family farm manageable (see equations **[1.22]-[1.24]**).

The ease of estimation and interpretation of the Cobb-Douglas production function further implies that its estimated labour coefficients can be readily applied to quantify the economic value of children, the second aim of this paper. This attribute proves especially desirable in the case of Uganda, where most child labour can be categorized as unpaid family work.

Notably, in spite of differing efficiencies, perfect substitutability among farm workers has been an implicit assumption throughout our discussion. Deolalikar and Vijverberg (1987), however, show that this assumption is not necessarily true. A simple manipulation in the standard specification of the production function enables us to test the common assumption of perfect substitutability among farm workers. Let adult male, adult female, child, and hired labour equal L_m^o, L_f^o, L_c^o, and L_h, respectively. Moreover, let adult female labour, L_f^o, child labour, L_c^o, and adult male labour, L_m^o, be perfect substitutes subject to a hired-worker equivalent correction term. Equation **[1.17]** captures the new efficiency relationship among family adult males, females, children, and hired workers:

$$L^* = L_h + \tau L_f^o + \psi L_c^o + \delta L_m^o \qquad \textbf{[1.17]}$$

The objective is to test whether τ, ψ, and δ equal 1. Notably, $L = L_m^o + L_f^o + L_c^o + L_h$; it follows that

$$L^* = L + (\tau - 1)L_f^o + (\psi - 1)L_c^o + (\delta - 1)\, L_m^o \qquad \textbf{[1.18]}$$

$$L^* = L\,[1 + (\tau - 1)L_f^o/L + (\psi - 1)L_c^o/L + (\delta - 1)\, L_m^o/L] \qquad \textbf{[1.19]}$$

Equation **[1.19]** can be re-expressed as

$$\text{Ln } L^* = \text{Ln } L + \text{Ln } [1 + (\tau - 1)L_f^o/L + (\psi - 1)L_c^o/L + (\delta - 1)L_m^o/L] \qquad \textbf{[1.20]}$$

Let, $(\tau - 1)L_f^o/L + (\psi - 1)L_c^o/L + (\delta - 1)L_m^o/L = X$. If X is small, $Ln\ (1 + X) \approx X$. Hence,

$$\text{Ln } L^* \approx \text{Ln } L + (\tau - 1)L_f^o/L + (\psi - 1)L_c^o/L + (\delta - 1)L_m^o/L \qquad \textbf{[1.21]}$$

Equation **[1.21]** can be plugged back into **[1.2]**, in the estimation of the production function. The tests of $\tau = 1$, $\psi = 1$, and $\delta = 1$ equal the tests that $(\tau - 1) = 0$, $(\psi - 1) = 0$, and $(\delta - 1) = 0$. Intuitively, this tests whether, given the optimal amount of labour, L^*, the mix of family adult males, females, children, and hired workers affects total observed labour use.

In view of the above, **Eq.s [1.22]** and **[1.24]** represent the Cobb-Douglas production function and the corresponding marginal products of labour for adult male workers, respectively.

$$Y = L^{\alpha}\, e^{\alpha\Lambda}\, K^{\beta} \qquad \textbf{[1.22]}$$

$$\Lambda = 1 + (\tau - 1)\, L_f/(L_m + L_f + L_c + L_h) + (\psi - 1)\, L_c/(L_m + L_f + L_c + L_h) +$$
$$+ (\delta - 1)\, L_m/(L_m + L_f + L_c + L_h) \qquad \textbf{[1.23]}$$

$$\left(\frac{\delta Y}{\delta L_m} = \right) \hat{W}_m = \alpha \{1 - [(\tau - 1)\frac{L_f}{L} + (\psi - 1)\frac{L_c}{L} + (\delta - 1)\frac{L - L_m}{L}]\} (\hat{Y}/L) \qquad \textbf{[1.24]}$$

$\hat{Y}$ is the predicted value of output derived from the estimated coefficients α, $(\tau - 1)$, $(\psi - 1)$ and $(\delta - 1)$; L_m, L_f, L_c and L_h (i.e. $L = L_m + L_f + L_c + L_h$) are total hours of labour by family males, females, children, and hired workers, respectively; and K is a vector of household's fixed inputs such as capital and land; β's are the parameters of the production function; and e is the production disturbance. Additive disturbances are assumed for the sake of exposition.

In turn, equation **[1.25]** tests for the equality of marginal productivity and wage rate among the sub-sample of male workers who reported working mostly for wages during the survey period. Following Jacoby (1993), using Ordinary Least Squares (OLS), the

null hypothesis of the absence of any frictions in off-farm employment implies that $\alpha = 0$ and $\beta = 1$.

$$\ln \hat{W}_m^* = \alpha + \beta \ln W_m + \varepsilon_m \qquad \textbf{[1.25]}$$

$\hat{W}_m^*$ is the estimated marginal productivity of adult family male workers, W_m is the median market wage for male labour at the community level, and ε_m is a random term probably including measurement error.

Clearly, if a variable is incorrectly omitted from the regression model, the residual of the estimated model incorporates the effect of this omitted variable. In so far as the omitted variable varies with the regressor included in the model, heteroscedastic residuals may result (Mukherjee et al., 1998). In this particular application, even using White (1980, 1982) heteroscedasticity consistent standard errors may not be sufficient. Heteroscedasticity does not destroy the unbiasedness and consistency properties of the OLS estimators, but it renders them inefficient. Under normal circumstances, this lack of efficiency makes the usual hypothesis-testing procedure of dubious value. In this case, however, the researcher's interest goes beyond the interpretation of the individual coefficient estimate. The absence of any frictions in off-farm employment is embodied in the null hypothesis $(\alpha, \beta = 0, 1)$.

1.5 THE DATA

The data are drawn from the Integrated Household Survey (IHS) 1992. The IHS aims at collecting data on all socio-economic aspects of the household comprising household characteristics. It is spread over a period of 12 months adopting IPNS design (Interpenetrating Network of Sub-samples), and draws on a large sample of approximately 10,000 households. The wide coverage of different sites is a particular strength of the data. The IHS 1992/93 covers 1,018 communities.

The choice of this data was motivated by the fact that the IHS 1992/93 includes a Labour Force Survey Questionnaire, which represents one of the first large nationally representative household surveys for low income countries documenting activity, employment and time use for both adults and children. As such, it provides a unique opportunity to improve our understanding of child labour in Uganda.

Table 1.1 shows activity rates for Ugandan children, men and women. Own-farm employment is the most prominent form of child labour with 26% of children aged between 7 and 14 working on the household farm. Boys (29%) are more likely to engage in agricultural production than girls (22%), and children in school (22%) are less likely to do so than children not in school (35%). On a related note, 21% of both men and women are associated with employment off the family farm, and 27% engage primarily in wage employment. Encouragingly, in spite of high labour participation rates, school attendance rates have remained high, especially for young boys (74%) and girls (68%).

Table 1.1 also reveals that child (self-) employment is primarily a rural phenomenon. Children living in rural areas (28%) are significantly more likely to be employed on the family farm than their counterparts living in urban areas (7%). Notably, further disaggregation of the data shows that, within rural areas, child (self-) employment appears to be more heavily concentrated in Eastern and Northern Uganda, the poorest regions of the country.

Leaving aside males aged over 14, who account for one third of the Ugandan population, women and children's off-farm and wage employment are either very low or negligible. In a sample of 10,459 surveyed children, 124 reported working for a wage in the week preceding the interview, and merely 140 reported being involved in wage employment in the year prior to the survey. Of the latter group of workers, only 30 have wages reported in the agricultural sector; the median child wage is 32 shillings per hour. By contrast, approximately 40% of an adult's expected earnings come from the agricultural sector; the median adult wage is 77 shillings per hour.

1.6 LABOUR MARKET EFFICIENCY AND CHILD LABOUR

Cain et al. (1980), and Grootaert and Kanbur (1995) have argued that the economic value of children and its implications for the reproductive behaviour cannot properly be assessed without reference to the structure of the labour market. The latter determines the level of wages, which in turn determines the contribution of child labour to household income. In competitive markets, children can substitute for adults in the market place. Where wages are at a floor level, whether due to legislation, collective action or because they have reached an adult subsistence minimum, the employer will prefer adult to child workers. The remainder of this section is structured as follows: Section 1.6.1 estimates the Cobb-Douglas production function, and tests for equality between the marginal productivity of work on the family farm and the effective market wage, in order to establish the existence of a smoothly functioning market for adult labour. Section 1.6.2 investigates the determinants of child labour. Finally, section 1.6.3 quantifies children's contribution to the household's agricultural activities.

1.6.1 THE COBB-DOUGLAS PRODUCTION FUNCTION

Table 1.2 contains the empirical definitions and summary statistics of the variables used in the estimation of our production function. The dependent variable is annual household agricultural earnings. Earnings from crop agriculture were aggregated using the median price for individual crops at regional level. As such, variations in household earnings reflect differences in physical production rather than spatial or temporal differences in prices.[4]

Three factors of production enter the empirical specification: Labour, land and capital. Labour is measured in terms of the number of hours of work annually performed on the farm; land is measured as available cultivable land; and capital as the value of capital goods, including agricultural equipment and buildings. Labour and land cannot be equal to zero in agricultural production. In the case of capital, however, zero values are possible and the logarithmic transformation was carried out by adding 1 to it.[5] On a related note, assuming constant return in percentage, it seems more appropriate to control for age and education in levels rather than logs.

On the premise that agricultural productivity varies across regions over time, a series of regional dummy variables were added to the empirical specification of the production function.[6] These spatial variables have been generated by dividing the country into eight parts – rural and urban areas of the four administrative regions (Central, Northern, Eastern and Western).[7]

Notably, in our estimation of the Cobb-Douglas production function, for the production disturbance to be orthogonal to the variable inputs, it must be unknown to the farmer in advance of input decisions (Zellner, Kmenta and Dreze, 1966). Simultaneity bias in the

[4] Aggregate agricultural earnings do not reflect revenue net of pecuniary costs.

[5] The same analysis was performed adding 2 to capital in the logarithmic transformation in the presence of zero values. When this additive constant is set at 2 the resulting conclusions remain unchanged. Thus, the results will be robust to the choice of the constant.

[6] The pattern of these differences is expected, given the variation in climate and soil qualities. For instance, central areas of the country are more productive than northern regions (Appleton and Balihuta, 1996).

[7] The inclusion urban households in a study of agricultural productivity provides us with a 'truly national picture'. Locations defined as urban often cover substantial areas of agricultural land and urban households may farm these, or other, areas. For a discussion of urban farming in Uganda, see Maxwell (1995).

production function estimates could result if the disturbance is anticipated, or if it contains unobservable inputs such as managerial ability. In the presence of simultaneity, the method of 2-Stage Least Squares (2-SLS)[8] will give estimators that are both consistent and efficient. The bias due to the adjustment of variable inputs in anticipation of shocks can be rectified if instruments are available that are determined prior to the shock. The validity of these instruments is ultimately an empirical question, which can only be resolved by testing the over-identifying restrictions supplied by the theoretical model.

Table 1.3 presents the results from the first stage regressions. Total labour, family child, adult female, and adult male labour (instrumented by 'Family', 'Adult females', 'Boys', 'Girls', and 'Female wage') are fairly well explained by the first stage regressions, with mostly significant variables and relatively high R^2s. Moreover, female market wage and household demographics satisfy a standard F-test of joint significance, while a test of over-identifying restrictions by Davidson and MacKinnon ascertains their validity as instruments [$\chi^2_{(1)} = 0.125$].

Table 1.4 reports the parameters of interest from the 2-SLS estimation of the Cobb-Douglas production function. In support of the argument that the labour variables need to be instrumented to avoid simultaneity, the Durbin-Wu-Hausman test rejects the null hypothesis of no simultaneity in the labour supply functions [$F_{(4, 5393)} = 44.46$***].

[8] 2-SLS allows us to find a 'proxy' for the stochastic explanatory variable L^* such that, although 'resembling' L^* (in the sense that it is highly correlated with L^*), it is uncorrelated with the production disturbance.

As it was argued at the outset, from the estimated parameters of the Cobb-Douglas production function, it is possible to predict the marginal productivity of work on the family farm for adult male workers (i.e. equation **[1.24]**). Jacoby's (1993) methodology can, in turn, be applied to test whether labour markets function efficiently by examining the relationship between the marginal productivity of work for adult male workers on the family farm and their effective wage in the non-farm labour market.

The results from table 1.5 clearly reject the null hypothesis of the absence of any frictions in off-farm employment [$F_{(2, 604)}$ = 64,132.59***]. This finding is in line with the earlier results reported by Jacoby (1993), Skoufias (1994), and Abdulai and Regmi (2000). Following Jacoby (1993), besides the irrelevance of the utility maximisation hypothesis, there are various potential explanations for this rejection. It is possible that there are frictions or community costs associated with wage work. Alternatively, there may be employment constraints in the labour market due to a comparative advantage for household members to work in their own farm. This, in turn, will prevent households from equating the marginal returns across different activities.

In terms of the Cobb-Douglas production function, most of our results conform with Appleton and Balihuta's (1996) work on the impact of education on agricultural productivity in Uganda. That is, central areas of the country are more productive than northern regions, and higher levels of both primary and secondary education, in addition to being an end in themselves, play an important role in agricultural production. This

evidence supports the widely accepted role of human capital toward improving farmers' efficiency, and it is consistent with a World Bank study in Kenya, showing that the incomes of self-employed small landowners increase with the level of education.

In contrast with Appleton and Balihuta (1996), who claim decreasing returns to scale in agriculture, a standard F-test [$F_{(1, 819)} = 0.87$] on the factors of production does not reject the null hypothesis of constant returns to scale. Notably, the inclusion of individual worker efficiency in the production function may provide a more accurate account of production practices in Ugandan agriculture.

1.6.2 THE DETERMINANTS OF CHILD LABOUR

Having established the absence of a smoothly functioning market for adult labour, we move on to investigate the determinants of child labour. In particular, we are interested in assessing the labour supply responses of children in Ugandan farm households to changes in household ownership of land. This relationship is captured in equation **[1.26]**:

$$\text{Ln } L^*_c = \alpha + \kappa \ln\mathbf{K} + \omega \ln\mathbf{W} + \beta \ln\mathbf{X} + u_c \qquad \textbf{[1.26]}$$

where, L^*_c is total hours of agricultural (family) child labour. As such, it was constructed by aggregating total hours of labour performed by family children on the farm. $\boldsymbol{K}$ is a vector of inputs available to the household in agricultural production. These are represented by total cultivable land, and the monetary value of capital goods. As it was mentioned at the outset, in Uganda's traditional small-holder agriculture, labour-supply

accounts for one of the major constraints on expanding acreage. This is especially the case if a household faces imperfections in the labour market. In view of this argument, and on the bases of our results from the previous section, we expect increased access to cultivable land to intensify the need for child labour.

$\boldsymbol{X}$ is a vector of household-specific observable characteristics. These include household demographics, specified as household size, the proportion of children to adult members of the household, the average age of adult members of the household, and the average education level. The latter is included to capture preferences for education and the efficiency of household production of human capital (Behrman et al., 1999). Intuitively, educated parents may be more averse to child work.

$\boldsymbol{W}$ is the median market wage for male labour at the community level. This variable proxies the gains from children's next best foregone employment alternative, and it controls for the opportunity cost of child (self-) employment. Regional dummies have also been included to capture geographical variation in cultural attitudes towards child (self-) employment. Finally, α, κ, ω, and β are the parameters to be estimated, and u_c is an error term summarising the effect on unobservable factors.

There are several ways to econometrically model the supply of child labour. Existing work has tended to concentrate on the participation decision. In line with Bhalotra and Heady's (2003) comparison of the determinants of child labour in Pakistan and Ghana, however, our dependent variable on hours of agricultural (family) child labour exhibits

substantial variation, with many children working less than 10 hours a week. From a policy perspective, participation at 10 hours a week is rather different from participation at 40 hours per week. In order to utilize the information on work hours, and on the basis that many Ugandan households do not report employing children in farm activities, we use a tobit estimation. The main results are reported in table 1.6.

These results clearly support the null hypothesis of a positive relationship between household ownership of land and agricultural child labour. Bhalotra and Heady (2003), in their work on the determinants of child labour in Pakistan and Ghana, also find a similar relationship: (i) Acres of land operated by the household have a positive effect on girls' work, though they are insignificant for boys, in Pakistan; (ii) The number of farms operated by the household has a positive effect on hours of work for boys and girls in Ghana. Further, land and livestock ownership and having a family enterprise have all been shown to increase child labour participation (e.g. Bhalotra and Heady, 2001; Canagarajah and Coulombe, 1997; Cockburn, 2000; De Tray, 1983; Levison and Moe, 1998; Mergos, 1992; Mueller, 1984; and Rosenzweig and Evenson, 1977).

Table 1.6 also shows that child labour increases (at a decreasing rate) with the number of total household members and the proportion of children to adults (i.e. child ratio). By contrast, it decreases with the average age of adults (at an increasing rate), and the average level of adult primary education.

In line with Patrinos and Psacharopoulos (1997), child labour is more likely to be employed in large households, and in households characterised by a high dependency ratio, as a consequence of resources per person being smaller. Fertility may also be encouraged by the prospects of child work (e.g. Rosenzweig and Evenson, 1977; Cain, 1977; Singh and Schuh, 1986; Eswaran, 1996; Bardhan and Udry, 1999).

The fact that agricultural child labour decreases with the average age of adults, and the average level of adult primary education can also be easily explained. Firstly, in accordance with Abdulai and Regmi's (2000) conclusions, the older (and more experienced) the household's adult members, the lower the likelihood of agricultural child labour. Secondly, in line with the existing literature, having more educated parents decreases the likelihood of agricultural child labour (e.g. Psacharopoulos and Arriagada, 1989; Grootaert, 1998; Wahba, 2001).

1.6.3 THE ECONOMIC VALUE OF CHILDREN

The analysis in sections 1.6.1 and 1.6.2 suggests that in the absence of a smoothly functioning market for adult labour, increased ownership of land intensifies the need for child labour. By implication, in Uganda, children play an important role in the household's agricultural activities. This final section aims to quantify such involvement.

On the bases of our estimated coefficients from the Cobb-Douglas production function presented in table 1.4, we cannot reject the hypothesis that all types of labour employed on the family farm are equally efficient. As a direct result, in quantifying children's contribution to household earnings from agricultural activities, column A in table 1.7 imposes the null hypothesis' restriction that all types of labour are equally effective.[9] Within this framework, child (self-) employment accounts for approximately 9% of the household's annual agricultural earnings.[10] This evidence supports the argument that children contribute significantly to the household's agricultural activities, and is consistent with a number of studies reported in the introduction to this paper.

At this juncture, it may be argued that the type of wage paid to hired workers (e.g. efficiency wage, piece-rate, crop-sharing) will affect their productivity, and should be built into our model of agricultural production. While this may be true, examining hired labour responses to differing market incentives is beyond the scope of this analysis.

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[9] Directly from our derivation of equation **[1.21]**, section 1.4, $\{(\tau - 1) = 0, (\psi - 1) = 0$, and $(\delta - 1) = 0\}$ implies $\{\tau = 1, \psi = 1,$ *and* $\delta = 1\}$.

[10] Relaxing the restriction of equality, and computing children's contribution from the actual coefficient estimated in table 1.6, children's contribution rises to approximately a quarter of household annual agricultural earnings.

Our results fail to support Canagarajah and Nielsen's (2001) argument that there may exist several activities for which children are more suited than hired workers. According to Canagarajah and Nielsen (2001), children are irreplaceable because of their nimble fingers. Following this argument, only children can pluck the delicate jasmine flowers without breaking branches; only children with small fingers have the ability to make fine, hand knotted carpets; and, similarly, only physically small individuals are able to climb mine tunnels. Notably, however, the activities that Canagarajah and Nielsen (2001) refer to are unlikely to be those that Ugandan children typically work on.

The discussion above suggests that high incidence of child labour in Uganda does not come as a result of children's comparative advantage in agricultural production. Child (self-) employment may reflect a parental maximizing response to differential labour-market returns with respect to the mix of labour inputs in agricultural production. This argument is consistent with the notion that high levels of child involvement in agricultural activities stem primarily from continent-wide poverty, and cultural views which often condone child labour. Many poor rural societies view child labour as part of a socialization process, which gradually introduces children into work activities and teaches them survival skills. It follows that many parents conclude that taking children out of school and putting them to work is the most sensible solution for survival, and the education method, which offers the best prospects for the future. As one African commentator put it: "Education broadens your mind but it does not teach you how to survive" (Grootaert C. and Kanbur R., 1995).

1.7 DISCUSSION AND CONCLUSION

Comparative work is the first step in gaining an insight into the universality of the issue of child work. The empirical literature discussed in the previous section shares several differences and similarities corresponding to the diversity of regions and age groups studied, and the variety of specifications used. Our results suggest that, accounting for approximately 9% of the household's annual agricultural earnings, children play an important role in the farming activities of Ugandan agricultural households. On this note, Cain (1977) conceptualises a child's productive life cycle within the parental household as having four distinct phases. After an initial period when the child is completely dependent, the child becomes increasingly economically active but produces less than he or she consumes. Then comes a period during which the child produces more than he or she consumes but less than an adult produces. Finally, the child's productivity becomes equivalent to an adult's.

The rate at which the child's total productivity increases depends on a number of highly interrelated factors, viz. the age at which the child begins working, the amount of time the child spends working, the relative efficiency of children in performing economic activities, and the productiveness of the tasks to which children devote their time.

That children play an important role in Uganda's agricultural households is further corroborated by the finding that, as most child labour is performed within the household and smoothly functioning labour markets are rare, land ownership increases the household's demand for child labour in agricultural activities. By rejecting the hypothesis

of efficient labour markets, the analysis above also indirectly supports the concern of non-separability between the production decisions and the consumption choices of the Ugandan agricultural household.

The discussion above leads to some important policy considerations. On the one hand, government funded initiatives of land reform programmes may have an undesirable effect on agricultural child labour (at the cost of reducing schooling and/or leisure time). On the other, higher adult education, together with improved markets for adult labour can displace children from labour activities; thus, allowing them to enjoy more schooling and/or leisure.

Table 1.1: Activity rates in Uganda (for week preceding interview)

	N		Household Employment		Wage Employment	School Attendance
			Farm	Off-farm		
Children (7-14)	10459	P H	0.26 (0.44) 22 (16)	0.00 (0.07) 31 (19)	0.01 (0.10) 57 (16)	0.71 (0.45)
Men (>14)	11578	P H	0.63 (0.48) 33 (17)	0.13 (0.34) 42 (24)	0.22 (0.42) 47 (20)	0.15 (0.36)
Women (>14)	12598	P H	0.68 (0.47) 31 (13)	0.08 (0.28) 32 (21)	0.05 (0.22) 42 (18)	0.07 (0.26)
Boys	5286	P H	0.29 (0.45) 23 (17)	0.00 (0.06) 36 (20)	0.01 (0.09) 57 (18)	0.74 (0.44)
Girls	5173	P H	0.22 (0.42) 21 (14)	0.01 (0.08) 28 (17)	0.01 (0.10) 57 (14)	0.68 (0.47)
Rural Children	7043	P H	0.28 (0.45) 22 (16)	0.00 (0.06) 31 (18)	0.01 (0.07) 56 (18)	0.70 (0.46)
Urban Children	3416	P H	0.07 (0.26) 19 (12)	0.01 (0.11) 29 (20)	0.04 (0.19) 58 (14)	0.82 (0.39)
Children in school	7641	P H	0.22 (0.42) 16 (12)	0.00 (0.05) 30 (24)	0.00 (0.03) 46 (17)	1
Children not in school	2818	P H	0.35 (0.48) 32 (16)	0.01 (0.11) 31 (15)	0.03 (0.17) 58 (16)	0

Note: N is the number in the relevant group. P refers to participation rate and H to hours per week of those participating. Figures are means, and standard deviations are presented in parentheses.

Table 1.2: Definition of variables

Variables	*Description*	*Mean*	*S.D.*
Income	Annual household agricultural earnings (Ugandan shillings)	318,231.70	405,046.70
Labour	Total hours of agricultural household labour	3,744.94	2,559.51
Female labour	Proportion of hours of female adult labour to total hours of agricultural household labour (females defined between the ages of 15 and 60 – inclusive)	0.52	0.29
Male labour	Proportion of hours of male adult labour to total hours of agricultural household labour (males defined between the ages of 15 and 60 – inclusive)	0.39	0.29
Child labour	Proportion of hours of child labour to total hours of agricultural household labour (children defined below the age of 14 – inclusive)	0.07	0.15
Family children hours of labour	Total hours of agricultural work by family children	339.96	882.31
Land	Total cultivable land (Acres)	3.26	10.69
Capital	Monetary value of capital goods (Ugandan shillings)	149,805	1,142.261
Family	Total number of household members	5.22	3.00
Adult females	Proportion of total number of household females aged between 15 and 60 (inclusive) to total number of household members	0.26	0.18
Boys	Proportion of total number of household boys aged between 8 and 14 (inclusive) to total number of household members	0.10	0.14
Girls	Proportion of total number of household girls aged between 8 and 14 (inclusive) to total number of household members	0.09	0.13
Child ratio	Proportion of the number of members of the household younger than 15 years of age to the number of members of the household older than 15 years of age	1.14	1.06
Age	Average age of adult members of the household	33.35	13.23
Primary education	Average level of adult primary education	2.80	2.27
Secondary education	Average level of adult secondary education	0.22	0.69
Male wage	Median market wage for male labour at the community level	607.32	397.69
Female wage	Median market wage for female labour at the community level	538.48	327.18
Central rural	Dummy variable controlling for central rural location	0.21	0.41
Central urban	Dummy variable controlling for central urban location	0.03	0.18
Western rural	Dummy variable controlling for western rural location	0.24	0.43
Western urban	Dummy variable controlling for western urban location	0.03	0.17
Eastern rural	Dummy variable controlling for eastern rural location	0.23	0.42

Eastern urban	Dummy variable controlling for eastern urban location	0.03	0.17
Northern rural	Dummy variable controlling for northern rural location	0.19	0.39
Northern urban	Dummy variable controlling for northern urban location	0.03	0.18
Constructed marginal product			
$\mathbf{Mp_m}$	Marginal product – Adult men	0.02	0.02

Source: Integrated Household Survey (IHS), Uganda (1992).

Table 1.3: 2-SLS – First stage regressions of the Cobb-Douglas production function

	Ln(Labour)	Child labour	Female labour	*Male Labour*
Ln(Land)	**0.143*** **	0.002	**– 0.048*** **	**0.028*** **
	(12.17)	(0.97)	**(– 9.87)**	**(5.72)**
Ln(Capital)	**0.035*** **	**0.003*** **	**– 0.017*** **	**0.008*** **
	(7.93)	**(3.98)**	**(– 9.39)**	**(4.09)**
Primary education	**– 0.027*** **	**– 0.018*** **	0.002	**0.013*** **
	(– 6.55)	**(– 22.69)**	(1.39)	**(7.41)**
Secondary education	**– 0.083*** **	– 0.001	**– 0.024*** **	– 0.004
	(– 6.29)	(– 0.25)	**(– 4.32)**	(– 0.72)
Age	**– 0.008*** **	**– 0.004*** **	**0.005*** **	– 0.0004
	(– 12.25)	**(– 33.61)**	**(15.93)**	(– 1.55)
Central rural[TT]	**0.213*** **	0.015	– 0.026	0.018
	(4.46)	(1.62)	(– 1.31)	(0.88)
Central urban[TT]	**– 0.232*** **	**0.039*** **	0.040	**– 0.095*** **
	(– 3.73)	**(3.27)**	(1.55)	**(– 3.69)**
Western rural[TT]	**0.414*** **	**– 0.018** **	0.028	0.009
	(8.76)	**(– 2.02)**	(1.40)	(0.47)
Western urban[TT]	**0.130** **	**– 0.028** **	**0.093*** **	**– 0.083*** **
	(2.00)	**(– 2.30)**	**(3.43)**	**(– 3.08)**
Eastern rural[TT]	**0.164*** **	**0.024*** **	– 0.028	0.025
	(3.46)	**(2.64)**	(– 1.39)	(1.28)
Eastern urban[TT]	**– 0.298*** **	**0.025** **	0.014	**– 0.061** **
	(– 4.58)	**(2.04)**	(0.50)	**(– 2.25)**
Northern rural[TT]	**0.269*** **	– 0.006	– 0.014	**0.049** **
	(5.61)	(– 0.68)	(– 0.69)	**(2.48)**
Constant	**7.142*** **	**0.175*** **	**0.146*** **	**0.626*** **
	(55.02)	**(7.10)**	**(2.69)**	**(11.62)**
Instruments				
Ln(Family)	**0.526*** **	**– 0.026*** **	**0.110*** **	**– 0.076*** **
	(32.01)	**(– 8.37)**	**(16.02)**	**(– 11.21)**
Adult Females	**0.340*** **	**– 0.079*** **	**0.787*** **	**– 0.707*** **
	(7.20)	**(– 8.88)**	**(39.90)**	**(– 36.13)**
Boys	**– 0.215*** **	**0.375*** **	0.010	**– 0.398*** **
	(– 3.35)	**(30.92)**	(0.38)	**(– 14.98)**
Girls	**– 0.447*** **	**0.345*** **	**0.109*** **	**– 0.488*** **
	(– 6.44)	**(26.26)**	**(3.77)**	**(– 16.96)**
Ln(Female wage)	**– 0.042** **	**0.007***	0.008	0.003
	(– 2.38)	**(1.93)**	(1.09)	(0.35)
F-test $[F_{(5, 5396)}]$	222.72***	380.13***	346.92***	350.78***
R^2	0.3763	0.4166	0.2838	0.2804
Total no. of clusters	820	820	820	820
Total no. of observations	5414	5414	5414	5414

[TT] Omitted category: Northern urban.

Note: * denotes statistical significance at 10%, ** significant at 5%, *** significant at 1%. In addition, all reported standard errors are robust (White H., 1980; 1982), and adjusted to permit observations within clusters (primary sampling units) to be correlated (Deaton A., 1997).

Table 1.4: 2-SLS estimation of the Cobb-Douglas production function

	Ln(Income)
Ln(Labour) ⊤	**0.788***** **(11.47)**
Child labour⊤	2.598 (1.08)
Female labour⊤	1.702 (0.73)
Male Labour⊤	1.758 (0.76)
Ln(Land)	**0.244***** **(4.32)**
Ln(Capital)	**0.065***** **(3.49)**
Primary education	**0.077***** **(7.22)**
Secondary education	**0.134**** **(1.99)**
Age	**0.011***** **(5.91)**
Central rural⊤⊤	**0.399***** **(4.12)**
Central urban⊤⊤	**0.493***** **(3.52)**
Western rural⊤⊤	**0.227**** **(2.18)**
Western urban⊤⊤	**0.610***** **(3.89)**
Eastern rural⊤⊤	0.064 (0.60)
Eastern urban⊤⊤	0.152 (1.02)
Northern rural⊤⊤	– 0.161 (– 1.46)
Constant	2.589 (1.13)
Durbin-Wu-Hausman test $[F_{(4, 5393)}]$	44.46***
Davidson and MacKinnon test $[\chi^2_{(1)}]$	0.125
F-test $[F_{(1, 819)}]$	0.75
R^2	0.1489
Total no. of clusters	820
Total no. of observations	5414

⊤ Instrumented by: Ln(Family), Adult females, Boys, Girls, Ln(Female wage).

⊤⊤ Omitted category: Northern urban.

Note: * denotes statistical significance at 10%, ** significant at 5%, *** significant at 1%. In addition, all reported standard errors are robust (White H., 1980; 1982), and adjusted to permit observations within clusters (primary sampling units) to be correlated (Deaton A., 1997).

Table 1.5: Testing the equality of marginal productivity on observed wages

	$Ln(Mp_m)$
Ln(Male wage)	**0.090***
	(1.86)
Constant	**– 4.104*****
	(– 13.38)
H_0: $\alpha = 0$ and $\beta = 1$ $[F_{(2, 604)}]$	64,132.59***
R^2	0.0037
No. of clusters	605
No. of observations	1181

Note: * denotes statistical significance at 10%, ** significant at 5%, *** significant at 1%. In addition, all reported standard errors are robust (White H., 1980; 1982), and adjusted to permit observations within clusters (primary sampling units) to be correlated (Deaton A., 1997).

Table 1.6: The determinants of child labour

	Ln(Family children hours of labour)
Ln(Land)	**1.012*** **
	(2.73)
Ln(Land)^2	0.036
	(0.27)
Ln(Capital)	0.059
	(0.19)
Ln(Capital)^2	0.017
	(1.12)
Ln(Family)	**9.937*** **
	(7.05)
Ln(Family)^2	**– 1.607*** **
	(– 4.14)
Child ratio	**3.331*** **
	(9.56)
Child ratio^2	**– 0.473*** **
	(– 7.19)
Age	**– 0.527*** **
	(– 10.33)
Age^2	**0.003*** **
	(4.77)
Primary education	**– 1.483*** **
	(– 20.65)
Secondary education	– 0.202
	(– 0.80)
Ln(Male wage)	– 0.153
	(– 0.47)
Central rural$^{\top\top}$	0.698
	(0.86)
Central urban$^{\top\top}$	0.893
	(0.76)
Western rural$^{\top\top}$	**– 3.956*** **
	(– 4.86)
Western urban$^{\top\top}$	**– 6.731*** **
	(– 4.14)
Eastern rural$^{\top\top}$	1.099
	(1.39)
Eastern urban$^{\top\top}$	0.431
	(0.44)
Northern rural$^{\top\top}$	– 0.927
	(– 1.16)
Constant	– 3.874
	(– 1.32)
Total no. of clusters	820
No. of total observations	5414
% of censored observations	0.7664

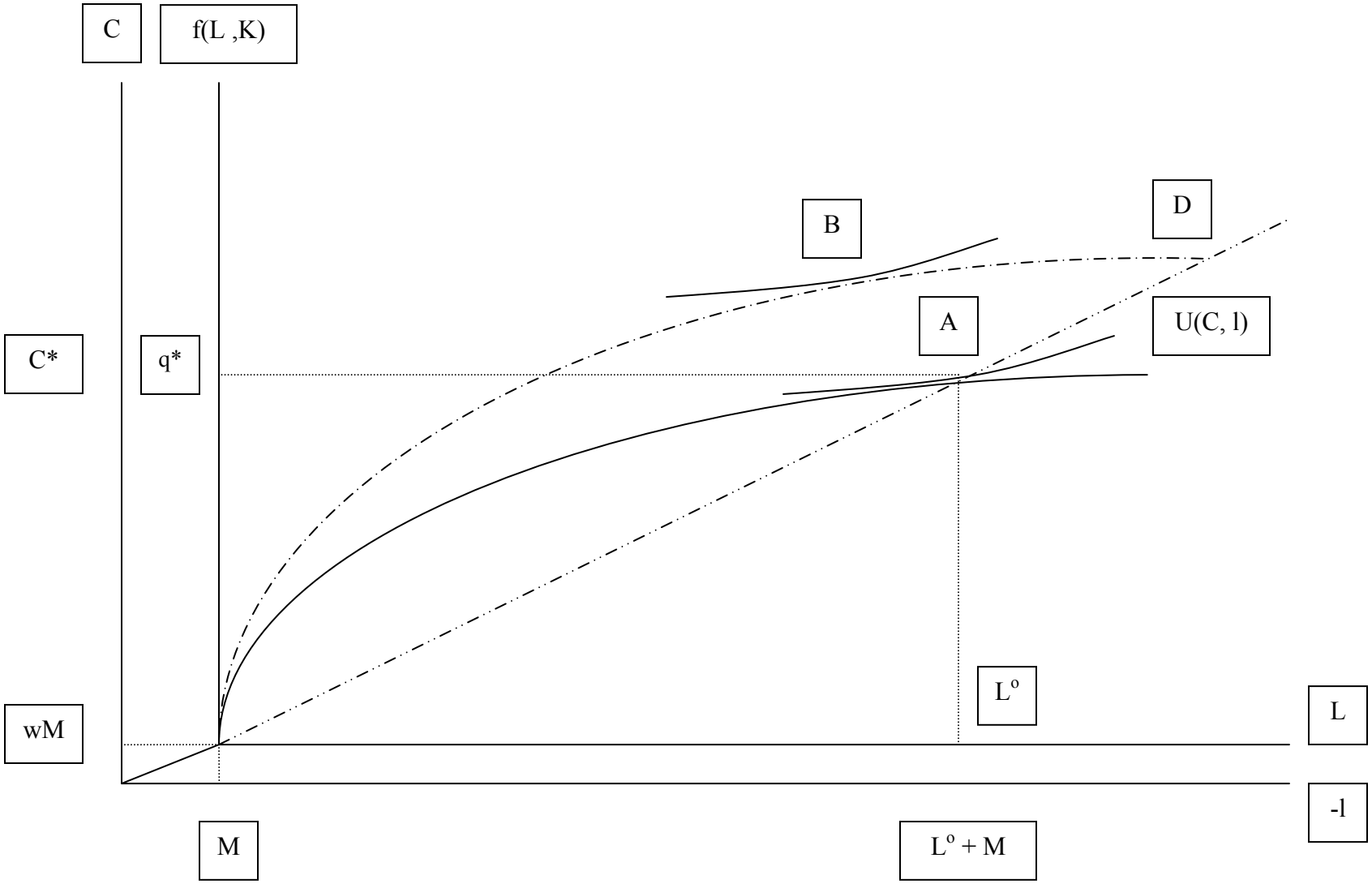
$^{\top\top}$ Omitted category: Northern urban.

Note: * denotes statistical significance at 10%, ** significant at 5%, *** significant at 1%. In addition, all reported standard errors are robust (White H., 1980; 1982), and adjusted to permit observations within clusters (primary sampling units) to be correlated (Deaton A., 1997).

Table 1.7: Individual contributions to household's agricultural activities

	Coefficient (A)	Hours of labour (B)	(A) x (B)	(A) x (B)/(T)
Uganda				
Child labour	(ψ =) 1	339.96	339.96	9.08%
Female labour	(τ =) 1	1,888.69	1,888.69	50.43%
Male labour	(δ =) 1	1,416.52	1,416.52	37.83%
[Hired labour	1	99.78	99.78	2.66%]
Total			3744.95 [= **(T)**]	100%

Figure 1.1: Labour-increasing (decreasing) physical asset accumulation



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