

Idiosyncrasies of child labour in peasant households in sub-Saharan
Africa: anthropological observations and the economics of labour
obligations and exchange

by

Vegard Iversen,
School of Development Studies,
University of East Anglia,¹
Norwich NR4 7TJ,
England

Abstract: Africa has the highest incidence of child labour in the world, and agriculture is the principal activity of working children. Idiosyncrasies of rural household organisation provide cogent arguments for dispelling an assumption of “unitary” households. Accounting for anthropological observations of labour claims and obligations, a simple Nash-bargaining model of peasant household behaviour is developed. The model is used to study the effects on intrahousehold distribution of policy interventions to reduce child labour. The conventional presumption of short-term adversity cannot be taken for granted. This important result is shown to be sensitive to the precise nature of claims on household labour.

JEL-Classification: C7, D1, J13

Keywords: Child labour, Nash-bargaining, intrahousehold allocations, labour obligations, peasant agriculture.

¹ Phone: +44 1603 592 338; Fax: + 44 1603 451 999; e-mail: v.iversen@uea.ac.uk

Introduction

This paper develops a simple theory to study the short-term effects on the intrahousehold distribution of well-being of policy interventions to reduce child labour in peasant agriculture in sub-Saharan Africa. Seen through the lens of a conventional (unitary) theory of household behaviour, such an inquiry could perhaps be dismissed as futile. When accounting for the gendered idiosyncracies of rural household organisation, access to land and the prevalence of customary labour obligations, a more intriguing picture is uncovered.

Theoretical background

Many economists did, until recently, perceive households as altruistic and harmonious social units (Alderman et al.,1995). The last two decades have witnessed much effort to remedy the shortfalls of these unitary perspectives in providing explanations for persistent and systematic intrahousehold disparities in developing countries.²

² Strauss and Thomas (1995), Alderman et al (1995), Haddad et al (1997) and Behrman (1997) present excellent overviews of the relevant literature.

The emerging body of new theories, often with bargaining or game-theoretic foundations, place more emphasis on economic power and conflicts of interest in the analysis of household behaviour.³ The rapidly growing economic literature on child labour has yet to absorb the full dividends from these innovations, and this paper is a modest attempt to redress some prevailing and important lacunae.⁴

The geographical focus is motivated by three principal observations. Firstly, the case for relaxing the assumption of a unitary household is probably stronger in sub-Saharan Africa than anywhere else. For urban Nigeria, Fahopunda (1978) argued that unitary assumptions of income-pooling, an unambiguous demarkation of household boundaries, and monogamous marriages, were violated.

For rural Africa, the implausibility of unitary reasoning is even starker. In agricultural production systems, men and women often control and cultivate separate land plots. According to Doss (2001), female land plots, frequently used for subsistence crop cultivation, are often both smaller and less fertile than male plots.

³ Nash-bargaining models were pioneered by Manser and Brown (1980) and McElroy and Horney (1981). Early non-cooperative models were produced by Ulph (1988) and Woolley (1988), and subsequently complemented by Lundberg and Pollak (1993), Udry (1996) and Carter and Katz (1997).

⁴ Valuable theoretical contributions include Basu and Van's (1998) analysis of adult and child labour markets and Basu's (1999) model of child labour as a first-generation problem. See also Ranjan (2001). Andvig (1998) offers an informal, yet insightful discussion on child labour in sub-Saharan Africa. Moehling (1997) and Bhalotra and Attfield (1998) test effects of child earnings on intrahousehold allocations. For analysis of child labour using bargaining and collective perspectives on the household, see Iversen (2000), Andvig (2000) and Basu (2001).

With fragmented and thin female labour markets, intrahousehold inequality in land holdings provides an incentive for cooperation and labour exchange. Notice, though, that a non-cooperative outcome remains distinctly possible (Jones, 1983). A full retreat to subsistence crop cultivation is a natural candidate for a female threat point (fallback position) in a bilateral bargain (Kanbur and Haddad, 1994).⁵

Secondly, ILO (1996) has estimated that 41 % of children in the sub-continent are working, the highest incidence of working children for any region of the world. According to the Priority Survey of the Statistical Office in 1993, 80 % of the working children in Zambia were involved in subsistence agriculture (Jensen and Skyt-Nielsen, 1997).

Thirdly, time allocation decisions in rural households are mediated by requirements to fulfil customary and unremunerated labour obligations.⁶ Such obligations have pivotal ramifications for individual resource endowments and constraints, since rural African men and women typically have very different customary claims on household labour (Roberts, 1988).⁷

These broad idiosyncracies of rural household organisation raises a number of interesting questions. The first point is that the idea that children's productive contributions are pooled across household

⁵ An African version of Lundberg and Pollak's (1993) gendered spheres argument.

⁶ Insights into Institutions of labour exchange and obligations can aid and strengthen modelling of household behaviour in rural sub-Saharan Africa. For support of this argument, see Iversen (2000) and White (2002).

members becomes untenable for rural Africa.⁸ In a model focussing on the distribution of benefits from labour inputs, where disparities in land holdings and claims on household labour prevail, an immediate corollary is that household members will be asymmetrically affected by policy interventions to reduce child labour.⁹ It is now, and this is important, distinctly possible for a policy of laissez-faire (non-intervention) to be distributionally harmful to some household members. The idea that a policy restricting child labour input may accentuate or ameliorate existing intrahousehold inequalities raises important if not easily resolvable normative concerns.

In a seminal theoretical paper, Basu and Van (1998) show that removal of children from the work force can generate virtuous outcomes. The current paper shows that intrahousehold redistribution prompted by enforcement of primary school attendance may generate virtuous outcomes, too. Given the importance of this observation, it will remain a priority to examine the sensitivity to context and theoretical assumptions.

⁷ Richards (1983) argues that a critical reassessment of peasant agriculture in Africa involves the realisation that labour shortages are more important than land shortages. Gender dimensions to labour constraints are addressed by Guyer (1984a and b), Whitehead (1984 and 1994) and Guyers and Peters (1987).

⁸ Bradley (1994) is a conspicuous exception.

⁹ In a rural context, the policy reference is to stricter enforcement of educational attendance, which as noted by Basu (1999) and others, is easier to implement and monitor than direct child labour regulations.

The proposed theory adds other valuable insights to the existing body of knowledge and supports a precise individualisation of the opportunity costs of schooling, and provides an improved framework for evaluation of certain aspects of the fertility interests of African women and men. The former may contribute to explain why empirical analyses based on average measures of household wealth tend to produce small coefficients in rigorous investigations of the relationship between poverty and educational deprivation.

A focus on poor households is retained throughout the paper. A key assumption will be that adult female labour operates at a capacity level. Women in sub-Saharan Africa work longer hours than men, partly because of gendered differences in the claims on other household member's labour.¹⁰ A widespread emphasis on labour scarcity as a binding constraint on female farmers adds credence to the chosen analytical focus on claims on labour resources.

¹⁰ For an overview of evidence on work hours, see Andvig (1998). Whitehead (2000) argues that contemporary interpretations of existing evidence on time allocation in rural Africa confound stereotypes of "lazy" African men, and typically underestimate men's labour contributions.

Context

According to Rosenzweig (1981), semi-autarkic Chayanov households with limited access to external labour markets imitate rural sub-Saharan Africa well, despite of rapid and ongoing change.¹¹ Mott and Shapiro (1984), using data from Kenya labour force survey, report that between 60 and 70 % of women in rural Kenya worked on household holdings without engaging in extra-household economic activities.

The proposed theory portrays a Nash-bargaining, peasant household with multiple (here two) land plots, controlled by either husband or wife. Following Kanbur and Haddad (1994), I assume female responsibility for subsistence crop production and male responsibility for cash crop cultivation.¹² This dichotomy is stylised since in reality *“female farming systems, like their male counterparts, are based on a complex inter-relation of men’s and women’s work* (Whitehead (1994;36). The untangling this web of inter-relations becomes an important analytical challenge. The Kanbur-Haddad specification ensures that the threat points or fallback positions in the bilateral Nash-bargain are inside rather than exit options and reflect payoffs in the absence of cooperation in cash crop cultivation.

¹¹ See Thorner et al. (1966) and Ellis (1993) for more on Chayanov.

Outputs from both land plots are presumed tradable in the market, with prices equal to 1. The wife may work exclusively on her own plot or share her time in agricultural production between food and cash crop cultivation. The assistance to the husband in cash crop cultivation may be voluntary, a fulfilment of customary obligations or a combination of the two. When voluntary, the spouses are presumed to bargain over the sharing of the resulting surplus from cooperation (Jones, 1983; Balsvik, 1995).¹³ The combination of gendered inequalities in land holdings and thin female labour markets does, as noted, provide an incentive for cooperation.

In this paper, the children are presumed old enough to assist in agricultural and harvesting operations, but have no influence over their own labour time; parent(s) are thus assumed to have customary claims on and make decisions about allocation of child labour resources.¹⁴

Becker usually reflects on *parental* altruism towards offspring. In our model, the husband cares for himself, while the wife cares for the kids, too. Considerable gender differentials in the emphasis attached to child development have been uncovered in the empirical work on

¹² According to Doss (2001), the division between subsistence and cash crops may be unclear. For a crop like maize, it was rather common to treat high-yielding varieties as cash crops.

¹³ Allocation of productive resources including labour may not be friction-free. Jones (1983) argues that conflict over sharing of income from cash crop production could explain why land plots were left uncultivated in North Cameroon. Balsvik (1995) claims that spouses may not trust each other enough to engage in a cooperative game. Evidence on inefficiency is still scarce – Udry (1996) calculated a loss from inefficient allocation of resources across multiple plots in Burkina Faso to 6 % of agricultural output.

intra-household allocations. Variation in the intensity of altruism towards children is a way to integrate this observation in the theory, linking child well-being to the wife's economic performance and her aversion to child work.

As noted, men in sub-Saharan Africa have privileged access to labour of other household members, with child labour resources as a possible exception (Guyer, 1984a; Roberts, 1988). The evidence on child labour is ambiguous and thin on information-content. Using ICRISAT-data from 6 representative villages in Burkina Faso, Udry (1996:1018) found child labour input to be twice as high on husbands' as on wives' plots, with considerable child contributions. Moreover, child labour accounted for about 16 % of total labour input in smallholder production of the cash crops tea and coffee in Bukoba District, Tanzania (Moody, 1970). In contrast, Reynolds (1991) figures from the Zambesi-valley, based on a thoroughly researched miniature sample, showed that 80 % of children's labour time was spent on maternal plots and 20 % on the land holdings of the father.

Bradley (1994) argues that women are the principal beneficiaries of children's labour, cross-culturally, but her evidence may not quite support this claim.

¹⁴ This presumption of a lack of child agency conflicts with the observations by Reynolds (1991), and also starkly with my own previous work in Karnataka, India (Iversen (2002)).

Her strategy is to count the tasks that children do and label them male or female. The following analysis shows that the performance of female tasks does not guarantee women the benefits of children's labour input. In fact, subtle insights into the intrahousehold distribution of benefits from child labour are uncovered by the following analysis. For the two-plot case and a bilateral bargain, even the simple observation that children work in cash crop production support alternative interpretations and alternative intrahousehold distributions of benefits from child labour input.

The model

On a general form, the wife's utility function is given by (1):

$$U_w = U(C_w, C_c, l_w, l_c) \quad (1)$$

She has preferences over her own consumption (C_w) and derives satisfaction from child consumption (C_c), because of her altruism towards offspring. (1) explicitly values her own (l_w) and child leisure (l_c).

The wife spends her income on own and child consumption, so that:

$$C_w + C_c = Y_w^c \quad (2)$$

Where Y_w^c is maternal income, determined in a bilateral bargain. There are two time constraints with the wife's and total child time (T_i for $i=c,w$) divided between leisure (l_i), food crop production (L_i^z) and cash crop production (L_i^x), i.e.

$$T_i = l_i + L_i^x + L_i^z \quad (3)$$

Substituting (2) and (3) into (1) then gives:

$$U_w = U(Y_w^c - C_c, C_c, T_w - L_w^x - L_w^z, T_c - L_c^x - L_c^z) \quad (4)$$

To retain a strong intuitive appeal, further restrictions will be imposed on (4). Following Kanbur and Haddad (1994), a linear version of (4) ensures tractable payoff functions in a cooperative Nash-bargain. We shall therefore be working with:¹⁵

$$\begin{aligned} U_w &= Y_w^c - C_c + C_c + g(T_w - L_w^x - L_w^z) + h(T_c - L_c^x - L_c^z) \\ &= Y_w^c + g(T_w - L_w^x - L_w^z) + h(T_c - L_c^x - L_c^z) \end{aligned} \quad (4')$$

where g and h are the utilities of adult female and child leisure with $g' > 0$, $h' > 0$ and $g'' < 0$, $h'' < 0$.

¹⁵ Linear utilities imply risk-neutrality.

The following results are sensitive to the response of child consumption to maternal income, but are valid as long as child consumption is a normal good; we therefore adopt this assumption.¹⁶

Specification of maternal income requires a more detailed account of agricultural production. Let outputs and incomes from cash (X) and food (Z) crop production be given by $X=f^x(L_w^x,L_c^x,L_h)$ and $Z = f^z(L_w^z)$.¹⁷ The wife's income will then be given by:

$$Y_w^c = f^z(L_w^z) + (1-\alpha) \cdot (f^x(L_w^x + \gamma L_c^x, L_h) - f^x(\gamma L_c^x, L_h)) \quad (5)$$

Y_w^c consists of maternal income from food crop cultivation, f^z , and the maternal share of the surplus from cooperation in cash crop cultivation. The latter is given by the difference between cooperative cash crop cultivation, f^x , and the husband's non-cooperative cash crop cultivation, f^x . Notice that (5) allows for a discrepancy between the husband's claim on child labour input (\underline{L}_c^x) and actual input of child labour in cooperative cash crop cultivation (L_c^x). This distinction is important in practice since it allows for a dual interpretation of child labour – on the one hand, a claim (here the husband's claim) which is a resource endowment and impacts on his threat point and bargaining power. Actual child labour input, in contrast, is a choice variable.

¹⁶ If, instead, maternal utility was quasi-linear with risk-aversion in child consumption, the mother would spend her initial budget on the child, and the rest on herself. This would modify the reported results.

¹⁷ Reflects the special case where child work is confined to cash crop cultivation and follows Udry's (1996) assumption that a pre-marital contract determines land holdings, which is plausible in sub-Saharan Africa. The implication is that land is exogenous and can be suppressed in X and Z.

When the husband's claim and actual child labour input coincide, the notion of choice disappears, with child labour input entirely norm-driven.

Child and adult female labour are assumed to be substitutes in cash crop production. γ represents an adult equivalent productivity scaling, as proposed by Basu and Van (1998). When $\gamma=1$, children and adult females are equally productive and perfect substitutes.

(5) deliberately separates the labour input of wife and children from the husband's, to mirror that his contributions to the cooperative venture takes the form of land preparation operations such as ploughing. Male tasks are agricultural tasks with little or no scope for substitution with other household labour (Bøe, 1995). According to Migot-Adholla and John (1994;14), "*men clear the bush, fell the trees, and then break the hard virgin soil, and then women prepare the ground for sowing and do the weeding.*" Such male responsibilities are taken as given, implying that L_h can be suppressed. This facilitates a sharp analytical focus on the interaction between adult female and child labour in agricultural production. Finally, the agricultural production function is assumed linearly homogenous in land and labour. The husband's income is given by:

$$Y_h^c = f^x(\gamma L_c^x) + \alpha \cdot [f^x(L_w^x + \gamma L_c^x) - f^x(\gamma L_c^x)] \quad (6)$$

Y_h^c has two components; the husband's non-cooperative income, and his share of the cooperative surplus. In a bargaining problem, α could reflect the respective bargaining skills or bargaining powers of the two parties, or alternatively be determined by local fairness norms. Throughout, symmetric bargaining *skills* is assumed.¹⁸

Applications

Paternal claims on child labour resources

In the first example, it is assumed that the husband alone has a claim on child labour resources and that child labour is allocated exclusively to cash crop cultivation. This is empirically implausible, but expositionally appealing and will be relaxed to add more realism below. I also assume that $\gamma=1$. The maternal threat point, an inside option, has two arguments, e.g. her income under non-cooperative subsistence crop cultivation and the disutility generated by child work. Apart from labour resources, her threat point depends on soil quality, on her endowment of agricultural inputs, tools and so on.

¹⁸ Symmetric bargaining *skills* are interpreted to imply that $\alpha_1 = \alpha_2$ in $N = [U_1 - V_1]^{\alpha_1} [U_2 - V_2]^{\alpha_2}$, where N is the Nash-objective function. U_i for $i=1,2$ refer to utility under cooperation and V_i for $i=1,2$ are the threat points or fallback positions of two parties to a bilateral bargain. Bargaining *powers* are determined by the respective threat points.

For voluntary cooperation to ensue, her cooperative *utility* must strictly exceed her non-cooperative utility, e.g:

$$\left[f^z(L_w^z) + (1-\alpha) \cdot (f^x(L_w^x + L_c^x) - f^x(\underline{L}_c^x)) \right] + g(T_w - L_w^z - L_w^x) + h(T_w - L_c^x) \geq f^z(\underline{L}_w) + g(T_w - \underline{L}_w) + h(T_w - \underline{L}_c^x) \quad (7)$$

f^z is her non-cooperative food crop cultivation. A fixed amount of adult female labour, $\underline{L}_w = L_w^z + L_w^x$ is allocated between the two land plots, implying that the two expressions for female leisure in (7) cancel out. Notice that when actual child labour input and the child labour claim coincide, the expressions for child leisure vanish. The following analysis incorporates alternative assumptions about the relationship between parental claims on child labour and actual child labour input.

With symmetric bargaining *skills*, the solution to the husband-wife Nash-bargaining problem is determined by:

$$\begin{aligned} & \text{Max} \\ & N = \left\{ Y_w^c + h(T_c - L_c^x) - (f^z(\underline{L}_w) + h(T_c - \underline{L}_c^x)) \right\} \cdot \left\{ Y_c^h - f^x(\underline{L}_c^x) \right\} \quad (8) \\ & Y_w^c, Y_c^h, L_w^z, L_w^x \end{aligned}$$

$$\text{s.t. (i) } Y_w^c + Y_c^h = f^z(L_w^z) + f^x(L_w^x + \underline{L}_c^x)$$

$$\text{(ii) } \underline{L}_w = L_w^x + L_w^z$$

f^z and f^x are the two parties noncooperative incomes, the latter being the husband's threat point. The wife's threat point includes her disutility of child work under non-cooperation. As noted, (8) takes a

particularly simple form when $L_c^x = \underline{L}_c^x$, i.e. when *actual* child labour input coincides with the husband's claim. I will use $L_c^x = \underline{L}_c^x$ as my benchmark, and consider the alternatives $L_c^x < \underline{L}_c^x$ and $L_c^x > \underline{L}_c^x$ below. (8) is maximised subject to (i) and (ii).¹⁹ The cooperative incomes (payoffs) for husband, Y_h^c , and wife, Y_w^c will then be:

$$Y_w^c = \frac{1}{2}(f^z(\underline{L}_w) + f^z(L_w^z)) + \frac{1}{2}(f^x(L_w^x + \underline{L}_c^x) - f^x(\underline{L}_c^x)) \quad (9a)$$

$$Y_h^c = f^x(\underline{L}_c^x) + \frac{1}{2}(f^z(L_w^z) - f^z(\underline{L}_w)) + \frac{1}{2}(f^x(L_w^x + \underline{L}_c^x) - f^x(\underline{L}_c^x)) \quad (9b)$$

Considering the wife's cooperative income (9a), the first parenthesis is her share of the "surplus" from cooperative subsistence crop production; the second her share of the surplus from cooperation in cash crop cultivation. Under cooperation, adult female labour is allocated away from subsistence crop production which means that subsistence crop output is sacrificed. This imposes an opportunity cost on the wife. According to (9a), the parties split this cost down the middle. In the benchmark a policy to enforce school attendance will influence the husband's threat point and output in cash crop cultivation:

¹⁹ The first order conditions are relegated to appendix 1. Notice that although child labour is confined to cash crop cultivation labour allocation remains Pareto-efficient. The reason is that adult female and child labour are perfect substitutes in cash crop cultivation.

Proposition 1 : *When the wife is time-constrained and (i) child labour and adult female labour are perfect substitutes in cash crop cultivation; (ii) the spouses cooperate in cash crop cultivation; (iii) the husband has an exclusive claim on child labour resources and (iv) there is a mechanism to enforce child effort, a public intervention reducing child labour input will increase the income and consumption of wife and children.*

Proof: Total differentiation of the wife's payoff from 9 (a) gives:

$$dY_w^c = \frac{1}{2} \left(\frac{\partial f^z}{\partial \underline{L}_w^z} d\underline{L}_w^z + \frac{\partial f^z}{\partial L_w^z} dL_w^z \right) + \frac{1}{2} \left(\frac{\partial f^x}{dL_w^x} dL_w^x + \frac{\partial f^x}{d\underline{L}_c^x} d\underline{L}_c^x - \frac{\partial f^x}{\partial \underline{L}_c^x} d\underline{L}_c^x \right) \quad (11)$$

$d\underline{L}_w^z = 0$, since the wife's threat point is unaltered (her labour input is fixed). From the first-order conditions for labour allocation, $\delta f^x / \delta L_w^x = \delta f^z / \delta L_w^z$, and from the wife's time constraint, $dL_w^x = -dL_w^z$. The effect on maternal income from an increase (decline) in the husband's child labour entitlement simplifies to:

$$\frac{dY_w^c}{d\underline{L}_c^x} = \frac{1}{2} \left(\frac{\partial f^x}{d\underline{L}_c^x} - \frac{\partial f^x}{\partial \underline{L}_c^x} \right) \quad (12)$$

By concavity of the production function, (12) < 0. An increase (decline) in the husband's child labour entitlement reduces (increases) the wife's

income and consequently the material well-being of the wife-child nexus.

(figure 1- about here)

z and \underline{x} in figure 1 illustrate the respective threat points in food and cash crop production. A policy intervention increasing (reducing) the husband's claim on child labour resources reduces (increases) the gains from cooperation by strengthening (reducing) the husband's threat point. If a selfish husband utilises freely available child labour resources to the greatest possible extent, the outcome described in proposition 1 ensues. While removal of children from the labour force may increase adult wages and improve adult employment opportunities at a macro-level,²⁰ intrahousehold mechanisms may, under patriarchal conditions, produce virtuous outcomes as well.

It is important that the message of Proposition 1 is clearly understood. While a reduction in child labour input will be advantageous, a policy of non-intervention *undermines* the basic needs of the wife-child nexus. It is evident that a focus on household income and total labour inputs to assess child contributions to household well-being, oblivious to intrahousehold distribution, can produce elusive

²⁰ e.g. Basu and Van (1998).

conclusions. This example displays a sharp conflict of interest between the spouses. The separation of costs and benefits of child rearing also epitomises a gender difference in fertility interests. Husbands would have a strong incentive to procreate, while wives should be expected to resist. This benchmark illustrates the case when child labour claims and actual child labour inputs coincide. Does proposition 1 survive a more subtle theorising of choice? The answer is yes, but to see why, it is necessary to pay more attention to the wife's altruism and to how her aversion to child work affects the intrahousehold distribution of well-being. Suppose instead that actual child labour input is different from the husband's claim. The wife's payoff function will now be given by:

$$Y_w^c = \frac{1}{2}(f^z(\underline{L}_w) + f^z(L_w^z)) + \frac{1}{2}(f^x(L_w^x + L_c^x) - f^x(\underline{L}_c^x)) + \frac{1}{2}(h(T_c - \underline{L}_c^x) - h(T_c - L_c^x)) \quad (13)$$

The payoff function is analogous to (9a) with one important modification. The new term captures an adjustment of the wife's income prompted by her aversion to child effort. Consider, first, the case where $L_c^x < \underline{L}_c^x$. Cooperation grants the wife a non-pecuniary bonus since child leisure is higher than under non-cooperation. Both household income and the wife-child nexus' share of household income is lower than in the benchmark.

How does a policy intervention impinge on the wife's payoff? When $L_c^x < \underline{L}_c^x$, the policy is likely to have a stronger impact on the husband's claim than on actual child labour input. The resulting weakening of the husband's threat point benefits the wife-child nexus. Moreover, the strengthening of the wife's threat point generated by the decline in non-cooperative child effort reinforces this effect. For the wife-child nexus, the negative effect of the decline in output will be strictly dominated by the gain from the decline in the paternal threat point. Proposition 1 thus holds when $L_c^x < \underline{L}_c^x$.

What if $L_c^x > \underline{L}_c^x$? A policy reform is now likely to reduce total household income, with adverse effects on all parties. At the same time, the wife's cooperative disutility of child labour declines. This reinforces the negative effect on her cooperative income. The effect of the policy intervention on the wife's income will therefore, in this case, be unambiguously negative.

Generalisations

To add realism and partially endorse Roberts (1988) and Bradley's (1994) arguments, the assumption that the husband enjoys exclusive claims on children's labour resources will now be relaxed. The following examples seek to illustrate how alternative customary

claims on child and household labour, intrahousehold disparities in land holdings, and the relative productivity of child labour in alternative agricultural tasks impact on the effects of policy interventions on intrahousehold distribution.

The payoffs can now be written:

$$Y_w^c = \frac{1}{2}(f^z(\underline{L}_w + \varepsilon \underline{L}_c^z) + f^z(\underline{L}_w^z + \varepsilon \underline{L}_c^z)) + \frac{1}{2}(f^x(\underline{L}_w^x + \gamma \underline{L}_c^x) - f^x(\gamma \underline{L}_c^x)) \quad (9)$$

$$Y_h^c = f^x(\gamma \underline{L}_c^x) + \frac{1}{2}(f^z(\underline{L}_w^z + \varepsilon \underline{L}_c^z) - f^z(\underline{L}_w + \varepsilon \underline{L}_c^z)) + \frac{1}{2}f^x((\underline{L}_w^x + \gamma \underline{L}_c^x) - f^x(\gamma \underline{L}_c^x)) \quad (b)$$

where ε is the adult female equivalent scaling of child labour productivity in food crop production. \underline{L}_c^z represents the wife's customary claim on child labour. In (9') customary claims and actual child labour inputs are presumed to coincide which explains the absence of expressions for the wife's disutility of child work. The effects of the wife's valuation of child leisure will be taken up below. For a start, let $\varepsilon = \gamma = 1$. Moreover, in the initial cooperative equilibrium, let $Y_w = Y_w^*$. Using the wife's payoff, consider the effects of a policy that marginally augments the claims on child labour:

$$dY_w^* = \frac{1}{2} \left(\frac{\partial f^z}{\partial \underline{L}_c^z} + \frac{\partial f^z}{\partial \underline{L}_c^z} \right) d\underline{L}_c^z + \frac{1}{2} \left(\frac{\partial f^x}{\partial \underline{L}_c^x} - \frac{\partial f^x}{\partial \underline{L}_c^x} \right) d\underline{L}_c^x \quad (14)$$

where $d\underline{L}_c^x$ and $d\underline{L}_c^z$ are interpreted as policy instruments. Alternative scenarios about the distribution of claims and the impacts

of policies on these claims and on actual child labour inputs will now be explored.

Consider the counterfactual to the benchmark that claims on children's labour resources are confined to the wife alone. The policy intervention is thus presumed to affect her claim on child labour. From (14), a unilateral decrease in her claim will reduce maternal and child well-being. The husband is adversely affected too. Thus,

Proposition 2 a): *When assumptions (i), (ii) and (iv) from Proposition 1 are intact, an intervention unilaterally reducing the wife's claim on child labour reduces the income and consumption of wife, children and husband.*

Why should the husband lose from a decline in the wife's claim on child labour when the wife-child nexus gain from a decline in the husband's claim ? From his payoff in (9b'), two relevant effects with opposite sign appear. Firstly, the reduction in the wife's threat point makes him better off. This positive effect on the husband's well-being is, however, dominated by the negative effect of child labour input in food crop production, which reduces the opportunity costs of cooperation (split equally). The latter corresponds to a fall in the *collective* benefits generated by child labour input. When cooperative

subsistence crop cultivation is below the wife's reservation level, the husband will always be a net-loser from a decline in her access to child labour. Notice, though, that the wife and children face heavier losses than the husband.

In the benchmark model, the wife-child nexus gained materially from a decline in the husband's claim on child labour resources. The husband, in contrast, is prone to lose from a decline in the wife's claim on child labour. This gendered asymmetry in well-being effects is generated by gendered disparities in land holdings. Recall that the model displays an intrahousehold distribution of land holdings which prompts voluntary collaboration. Notice also that when the wife's land is relatively unproductive, her threat point gain from access to additional labour resources will be limited. As the effect on her threat point approaches zero, the distribution of costs from a decline in *her* child labour endowment approaches an equal split. Notice this delicate twist to Bradley's (1994) argument; although child labour is assigned to the wife, works in subsistence crop cultivation on her plot, and apparently provides benefits exclusive to the wife-child nexus, the husband benefits, too.

Proposition 2b): *With assumptions (i), (ii) and (iv) from Proposition 1 a) intact, the husband always benefits from an increase in household access to child labour. This is not true for wife and children.*

The wife's altruism and aversion to child work muddles this conclusion somewhat. Consider the situation when $L_c^z < \underline{L}_c^z$. A policy reform is now likely to impact more strongly on the wife's claim than on actual child labour input. Her threat point is weakened by the fall in non-cooperative income, but strengthened by the decline in the disutility of child effort. The effect on her bargaining power depends on the relative strength of these two effects. At the same time, total household income is prone to decline with adverse impacts on both parties.

Equality in customary claims – disparities in land holdings

Do customary claims on child labour reinforce or compensate for disparities in land holdings ? The following example shows why insights into this matter should interest policy makers. In this example, I assume that spouses have identical customary claims on children's labour resources and first consider the case where claims and child labour input coincide. I presume that the policy has symmetric negative effects on these claims. The policy can be

mimicked by a symmetric increase (reduction) in the access to child labour, i.e. let $d\underline{L}_x^c = d\underline{L}_z^c = 1$. The wife-child nexus will now be adversely affected by a symmetric increase in child labour claims if $dY_w^* < 0$. From (14) the condition becomes:

$$\frac{1}{2} \left(\frac{\partial f^z}{\partial \underline{L}_c^z} + \frac{\partial f^x}{\partial \underline{L}_c^x} \right) < \frac{1}{2} \left(\frac{\partial f^x}{\partial \underline{L}_c^x} - \frac{\partial f^z}{\partial \underline{L}_c^z} \right) \quad (15)$$

From the first-order conditions for allocation of adult female labour, the marginal productivity of labour is equated across food and cash crop production. Hence,

$$\frac{\partial f^z}{\partial \underline{L}_c^z} = \frac{\partial f^x}{\partial \underline{L}_c^x} \quad (16)$$

and maternal income, maternal and child consumption will decline whenever:

$$\frac{\partial f^z}{\partial \underline{L}_c^z} < \frac{1}{2} \left(\frac{\partial f^x}{\partial \underline{L}_c^x} - \frac{\partial f^z}{\partial \underline{L}_c^z} \right) \quad (17)$$

The left hand side of (17) is the wife's share of the collective benefits from the symmetric increase in child labour claims. The right hand side displays the difference in the threat point effects. The likelihood that the wife-child nexus will be adversely affected is strongly influenced by the distribution of land holdings. Consider,

first, an egalitarian land distribution as manifested by identical threat point effects. Adversity requires $\delta f^z / \delta L_c^z < 0$; a contradiction.

Let us fix the husband's land holding and increase inequality in the wife's disfavour. Collective benefits decline, and the gap between bargaining power effects in (17) widens. Both effects aggravate the risk of an adverse outcome for the wife-child nexus. If land is unequally distributed, claims on child labour resources egalitarian, and spouses bargain, a *laissez faire* policy will favour the interests of the resilient party (the male) and harm the weaker party (the wife-child nexus).²¹ A policy prompting a symmetric reduction in the access to child labour would then improve the well-being of the wife-child nexus.

Proposition 2c) *With assumptions, (i), (ii) and (iv) from Proposition 1 intact and egalitarian claims on child labour resources, a policy of laissez faire can harm the well-being of the wife-child nexus, also in the very short term.*

Recall that proposition 2c), which is a stronger result than proposition 1) rests on the assumption that child labour claims and actual child labour inputs coincide. As before, this eliminates the effects of

²¹ The use of the terms “resilient” and “weak” refer entirely to differences in access to productive resources, eg. land.

maternal altruism and valuation of child leisure on the intrahousehold distribution of income.

Suppose, in contrast, that actual child labour input is lower than the respective claims. It is now plausible to expect the policy to mainly impinge on threat points. For the wife-child nexus the positive effect of the fall in the husband's threat point will outweigh the negative effect on her threat point caused by the reduction in her non-cooperative income. The latter is reinforced by the positive effect on her threat point of the decline in the noncooperative disutility of child effort. Proposition 2c) thus survives a relaxation of the condition that claims and actual child labour inputs coincide.

Individualising opportunity costs of schooling

Proposition 2c) conveys a profound message and has further, interesting implications. The theoretical framework provides a novel foundation for evaluation of the opportunity costs of schooling, which now will vary distinctly across husbands and wives. These individualised opportunity costs of children's education are determined by the respective claims on child labour, the intrahousehold distribution of land holdings and the precise nature of intrahousehold labour exchange. In the above example, the opportunity cost of child

schooling will be *negative* for the wife and positive for the husband. For the wife-child nexus, schooling would thus produce material benefits even in the short term. In this case women should, accordingly, be expected to demonstrate a keen interest in schooling.

The idea that policy interventions to reduce child labour has negative short-term effects on household well-being (before labour market effects a la Basu and Van (1998) are taken into account) is firmly rooted in the child labour literature. The above analysis confronts policy makers with a more intriguing possibility. If conflicts of interest are characteristic features of rural household organisation, non-intervention will invariably weight some interests over others, also in the very short term. This raises intriguing normative questions. In the above example, non-intervention would harm the wife-child nexus and strengthen the interests of the party with the most generous land endowment.

Sensitivity analysis 1 – Productivity differentials

So far, the productivity parameters ε and γ were suppressed and child labour assumed on par with adult female labour productivity in both subsistence and cash crop production. It is, of course, distinctly possible for the relative productivity of child labour to vary across

crops and agricultural production systems. Let $\varepsilon = 1 > \gamma$, so that child labour productivity is relatively higher in subsistence crop production. For a symmetric reform, the condition in (17) now becomes:

$$\frac{\partial f^z}{\partial L_c^z} < \frac{1}{1+\gamma} \left(\gamma \frac{\partial f^x}{\partial L_c^x} - \frac{\partial f^z}{\partial L_c^z} \right) \quad (18)$$

As before, there are two effects of interest. The husband's threat point and collective benefits both decline. The first effect dominates the second and the likelihood of an adverse outcome for the wife-child nexus is, as expected, reduced.

Sensitivity analysis 2 - Bargaining, obligations or both ?

How sensitive are these results to the assumptions about labour claims and obligations ? This section considers the coexistence of customary labour obligations (unremunerated) with voluntary, remunerated labour exchange. Remuneration of voluntary contributions will, as before, be determined through bargaining. In contrast to the preceding section, the husband will now be assumed to have a claim on *family* labour. This modest modification of the

husband's customary entitlement turns out to have important ramifications.

Notice that this claim on family labour is presumed exogenous.²² Notice also that the empirical observations of children's economic activities are identical to the benchmark – with children working on their father's cash crop plot. As before, adult female and child labour are substitutes in cash crop cultivation, but now in the provision of free family labour. Let \underline{L}_D represent the husband's claim on family labour. Labour supply to cash crop cultivation in excess of \underline{L}_D is a manifestation of voluntary collaboration between husband and wife.

Let

$$\underline{L}_D = L_w^{xd} + \underline{L}_c^x \quad (19)$$

where L_w^{xd} represents the wife's labour obligation in cash crop production. For simplicity, let \underline{L}_c^x and \underline{L}_D be exogenous, and $\underline{L}_c^x < \underline{L}_D$, by assumption. The implication is that the wife is obliged to supply the difference between \underline{L}_c^x and \underline{L}_D to cash crop cultivation. The labour constraint for the time-constrained wife is then:

$$\underline{L}_w = L_w^z + L_w^x + L_w^{xd} \quad (20)$$

²² Alternatively, the claim on family labour could adjust to the husband's labour needs, which typically could be perturbed by development policy. According to Whitehead (1994), such adjustments are partly responsible for the adverse effects of agricultural development projects on women's well-being in sub-Saharan Africa. The possibility of adjustments will be discussed at some length below.

Substituting (19) into (20) gives:

$$\underline{L}_w = L_w^z + L_w^x + \underline{L}_D - \underline{L}_c^x \quad (21)$$

The solution to the Nash-bargaining problem is given by:

$$\begin{aligned} & \text{Max} \\ & N = \left\{ Y_w^c - f^z(\underline{L}_w - \underline{L}_D + \underline{L}_c^x) \right\} \cdot \left\{ Y_h^c - f^x(\underline{L}_D) \right\} \\ & Y_w^c, Y_h^c, L_w^z, L_w^x \\ & \text{st. (i) } Y_w^c + Y_h^c = f^z(L_w^z) + f^x(L_w^x + \underline{L}_D) \\ & \quad \text{(ii) } \underline{L}_w = L_w^z + L_w^x + \underline{L}_D - \underline{L}_c^x \end{aligned} \quad (22)$$

Notice that the husband's threat point now depends on his claim on *household* labour. Moreover, the wife's threat point is the value of what she can produce on her plot *after* meeting her labour obligations. Her labour obligation is the residual of household labour obligations net of child labour input. Substituting (ii) into (i) gives:

$$\begin{aligned} & \text{Max} \\ & N = \left\{ Y_w^c - f^z(\underline{L}_w - \underline{L}_D + \underline{L}_c^x) \right\} \cdot \left\{ Y_h^c - f^x(\underline{L}_D) \right\} \\ & Y_w^c, Y_h^c, L_w^x \\ & \text{st. (i) } Y_w^c + Y_h^c = f^z(\underline{L}_w - L_w^x - \underline{L}_D + \underline{L}_c^x) + f^x(L_w^x + \underline{L}_D) \end{aligned} \quad (23)$$

and the wife's payoff becomes:

$$Y_w^c = \frac{1}{2} \left(f^z(\underline{L}_w - \underline{L}_D + \underline{L}_c^x) + f^z(\underline{L}_w - L_w^x - \underline{L}_D + \underline{L}_c^x) \right) + \frac{1}{2} \left(f^x(L_w^x + \underline{L}_D) - f^x(\underline{L}_D) \right) \quad (24)$$

Let us now compare the current and the benchmark model. A reduction in child labour availability for cash crop cultivation does not, anymore, influence the husband's threat point. Substitution between female and child labour in cash crop cultivation relieves the wife of duties, and allows her to pursue other economic activities. Reduced availability of child labour for cash crop cultivation does not influence the husband's threat point, but weakens the wife's threat point. As before, child labour produces collective benefits.

A reduction in child labour availability will now adversely affect wife and children, a stark contrast to Proposition 1, which was based on an entirely analogous empirical observation, e.g. children working in cash crop cultivation. For the husband, as before, the gain from the decline in the wife's threat point is strictly dominated by the loss in collective benefits. The policy-induced reduction in child labour availability will thus adversely affect everyone, but most strongly the wife-child nexus.

Opportunity costs of schooling revisited

In this example, the collective benefits of child labour input represent the opportunity costs of child time to the *household*. This is equivalent to the returns to maternal labour in economic activities

after labour obligations have been met.²³ Individual opportunity costs for husband and wife continue to be dissimilar since child labour input *in cash crop cultivation* in this case strengthens the wife's threat point. In this example, the opportunity costs of schooling are relatively higher for the wife, but positive for the husband as well. The individual opportunity costs of schooling are determined by the total productive resources available to the household (governing the economic opportunities available to the wife), the intrahousehold distribution of land holdings, and the precise content of household labour obligations. The focus on the intrahousehold effects of educational policy reforms illustrates that the short-term effects of such reforms may be much more severe for some household members than for others. The prevalence and nature of indigenous institutions for remunerated and unremunerated exchange of household labour can aggravate the distributional disadvantage of reforms and therefore contribute to explain why rural household response to initiatives to boost schooling and raise standards of living may be slower in some areas than others. The following section looks more closely at this particular argument.

²³ Kanbur and Grootaert (1995) point out that the opportunity cost of child time can reflect the mother's wage rate.

Obligations, bargaining and policy

The focus on the impacts of child labour policies on the well-being of different household members has produced some important and intriguing insights. This section explains why the focus on claims and labour obligations can provide a useful correction to conventional analysis of household response to economic stimuli. Let us revisit the example where the wife alone has claims on children's effort. I will also include a case where the husband can respond to policy change by adjusting his claims on household labour so that customary claims accommodate the husband's labour needs. Whitehead (1994) and others blame such adjustments for unintended adverse effects of agricultural projects on rural women in sub-Saharan Africa. Consider now a "development contract" which aims to (1) enforce primary education and (2) to raise the standard of living of the household, the latter with a view to buffer the household against its loss of children's labour power. (2) may take the form of a technology improvement which raises agricultural productivity. Suppose that (2) provides an incentive to increase labour input in cash crop cultivation. If the husband can recover the resulting labour deficit by adjusting his claim on household labour, the development contract will deal a material blow to the wife-child nexus for the following reasons: Firstly, the wife

is deprived of child labour resources which weakens her threat point and consequently her bargaining power. The increase in household labour obligations will reinforce this effect. The husband's threat point is strengthened by the increase in productivity and by the adjustment in his claim on household labour. The net effect on the cooperative surplus is ambiguous.

For comparison, consider the case where the husband's customary claim on household labour is fixed, and spouses bargain over the residual surplus from cash crop cultivation. In this case, the husband's threat point is strengthened by the technological improvement alone. This negative effect on the wife-child nexus is strictly dominated by the positive effect on collective benefits. *Ceteris paribus*, the wife-child nexus will be unambiguously better off than for the case of adjustable customary labour obligations.

The contrast to a model of pure bargaining is even more striking. When the spouses bargain over the entire surplus from cash crop cultivation, the "development contract" will strengthen the husband's threat point, but less than before. At the same time, the cooperative surplus increases more than before. The net effect on the well-being of the wife-child nexus does, as above, depend on the impact of her threat point of the decline in child labour availability (the same in all three cases).

These examples demonstrate why the precise content of claims on labour resources in rural in sub-Saharan Africa may lead the same policy in three different contexts to generate distinctly different well-being outcomes within otherwise similar households. Moreover, per capita measures of household expenditure may conceal increases in the absolute deprivation of some household members, which may contribute to explain why child labour in rural households responds rather slowly to average improvements in standards of living, as illustrated by the unexpectedly small coefficients on poverty indicators in empirical work testing the “Luxury Axiom”.

Conclusion

Child nurturing involves costs and benefits, and this paper has argued that children's labour resources may be more valuable to some household members than to others; the assumption that child contributions are pooled across household members is simply untenable for rural sub-Saharan Africa. Through the prism of a stylised theory, some intriguing new insights into the intrahousehold distribution of benefits from children's labour contributions have been uncovered.

Proposition 2 c) suggests that a policy of laissez faire may be distributionally harmful for the wife-child nexus even in the short term, and therefore that enforcement of school attendance may provide a win-win scenario for the wife and kids both with regard to improving short term basic needs satisfaction and in the long term through the conventional route of human capital accumulation. The fact that laissez-faire in this case would protect the interest of the party with the lion's share of household land holdings would not make the argument for intervention any less palatable. Without further and more detailed evidence, it is both premature and irresponsible to advocate decisive policy conclusions on the basis of this theoretical result. More and better data are needed.

The focus on labour claims, obligations and intrahousehold conflicts of interest has shown that a bargaining model can provide novel insights into considerable individual variation in interests and the costs and benefits of children's schooling and fertility decisions. Indeed, the benefits and costs of schooling and child rearing may vary conspicuously across women and men. This has a number of important implications, and may contribute to explain why rural households in some areas respond rather slowly to improvements in average levels of well-being.

There is currently little available evidence on the rules or norms governing claims on child labour resources. Studies by Reynolds (1991) and Udry (1996) shed some light on children's time-use across maternal and paternal land plots, but as the preceding analysis shows, even such observations fail to satisfy the informational requirements of even a simple theory. A more cautious delineation of claims and labour obligations, featuring prominently in the anthropological literature, may, as this paper has shown have crucial bearings on how policy interventions impact on the intrahousehold distribution of well-being.

Literature

Agarwal, B., 1997. "Bargaining" and Gender Relations: Within and Beyond the Household. *Feminist Economics* 3, 1-51.

Alderman, H., Chiappori, P. A., Haddad, L., Hoddinott, J., Kanbur, R., 1995. Unitary vs. Collective models of the household: Is it time to shift the burden of proof? *World Bank Research Observer* 10, 1-19.

Andvig, J. Chr., 1998. Child labour in sub-Saharan Africa – An Exploration. *Forum for Development Studies*, 2.

Baland, J. M. and J. A. Robinson, 1998. A Model of Child Labour, mimeo, Facultes Universitaires Notre-Dame de la Paiz, Namur, Belgium.

Basu, K., 1999. Child Labour: Cause, Consequence and Cure, with Remarks on International Labour Standards. *Journal of Economic Literature* 37, 1083-1119.

_____, 2001. Gender and Say: A Model of Household Behaviour with Endogenously Determined Balance of Power, mimeo, Cornell University.

_____, Van, P. H., 1998. The Economics of Child Labour. *American Economic Review* 88, 412-27.

Behrman, J. (1997): Intrahousehold distribution and the family, in: Rosenzweig, M. R., Stark, O. (eds.), *Handbook of Population and Family Economics*, Elsevier Science.

Bhalotra, S. and Attfield, C., 1998. Intrahousehold Resource Allocation in Rural Pakistan: A Semi-Parametric Analysis. *Journal of Applied Econometrics* 13, 463-480.

Bradley, C., 1994. Women's Power, Children's Labour. *Cross-Cultural Research* 27, 70-96.

Bøe, T., 1995. Share tenancy within the household unit, Paper presented at The Development Economics Conference, Norwegian School of Economics and Business Administration.

Carter, M. R., Katz, E., 1997. Separate spheres and the conjugal contract: Understanding the impact of gender-biased development, in: Haddad, L., Hoddinott, J., Alderman, H., (eds.), *Intrahousehold resource allocation in developing countries: Methods, models and policy*, John Hopkins University Press.

Dey-Abbas, J., 1997. Gender Asymmetries in Intrahousehold Resource Allocation in Sub-Saharan Africa: Some Policy Implications for Land and Labour Productivity, in: Haddad, L., Hoddinott, J. and Alderman, H. (eds), *Intrahousehold Allocation in Developing Countries: Methods, Models and Policy*, John Hopkins University Press.

Doss, C. 2001. Designing Agricultural Technology for African Women Farmers: Lessons from 25 Years of Experience, *World Development*. Vol. 29, No. 12, 2075-92.

Ellis, F., 1993. *Peasant Economics – Farm households and agrarian development* (Second edition), Cambridge University Press, Cambridge.

Fapohunda, E. R., 1978. Characteristics of women workers in Lagos - Data for consideration by labour market theorists. *Labour and Society* 3, 158-71.

Grootaert, C and Kanbur, R. 1995. Child labour: an economic perspective. *International Labour Review* 134, 187-203.

_____, 1988. The non-pooling household: A challenge to theory, in: D. Dwyer, Bruce, J. (eds), *A Home Divided: Women and Income in the Third World*, Stanford University Press.

- _____, Todaro, M., 1988: Family structure, implicit contracts and the demand for children in Southern Nigeria. *Population and Development Review* 14, 571-594.
- Guyer, J.I., 1984a. Naturalism in Models of African Production. *Man* 19.
- _____, 1984b. Family and Farm in Southern Cameroon, *African Research Studies* No. 15, Boston University.
- _____, 1997. Endowments and Assets: The Anthropology of Wealth and the Economics of Intrahousehold Allocations, in Haddad, L., Hoddinott, J., and Alderman, H., (eds), *Intrahousehold Allocation in Developing Countries: Methods, Models and Policy*, John Hopkins University Press.
- _____, Peters, P. E., 1987. Introduction. *Development and Change* 18, 197-214.
- Haddad, L., Hoddinott, J., Alderman, H., 1997. *Intrahousehold Allocation in Developing Countries: Methods, Models and Policy*, John Hopkins University Press.
- ILO, 1996. *Child Labour – Targeting the Intolerable*, International Labour Office, Geneva.
- Iversen, V. (2000): *Child labour and theories of the family*, Ph.D-dissertation, Faculty of Economics and Politics, University of Cambridge.
- _____ (2002): *Autonomy in Child Labor Migrants*, *World Development* 30, 817-34.
- Jensen, P, Skyt-Nielsen, H. , 1997. Child Labour or School Attendance ? Evidence from Zambia. *Journal of Population Economics* 10, 407-24.
- Jones, C. W. , 1983. Mobilisation of women’s labour for cash crop production: a game theoretic approach. *American Journal of Agricultural Economics* 65, 1049-1054.
- Kanbur, R., Haddad, L., 1994. Are Better Off Households More Unequal or Less Unequal ? *Oxford Economic Papers* 46, 445-58.
- Lloyd, C. B., Blanc, A. K., 1996. Children’s Schooling in Sub-Saharan Africa: The Role of Fathers, Mothers and Others. *Population and Development Review* 22, 265-298.
- Lundberg, S, Pollak, R. A. 1993. Separate bargaining spheres and the marriage market. *Journal of Political Economy* 101, 988-1010.
- Maharatna, A., 1997. Children’s Work Activities, Surplus Labour and Fertility –Case Studies of Six Villages in Birbhum *Economic and Political Weekly*, 363-69.
- Manser, M. , Brown, M. , 1980. Marriage and Household Decision-Making: A Bargaining Analysis. *International Economic Review* 21, 31-44.
- McElroy, M, Horney, M. J., 1981. Nash-Bargained Household Decisions: Toward a generalisation of the theory of demand. *International Economic Review*, 22.
- Migot-Adholla, S. and John, M – E. 1994. Agriculture production and women’s rights to land in sub-Saharan Africa. *Development Anthropology Network* 12, 14-24.
- Moehling, C., 1997. *The Impact of Children’s Income on Intrahousehold Resource Allocation*, mimeo, Department of Economics, The Ohio State University.
- Monsted, M., Kongstad, P., 1980. *Family, Labour and Trade in Western Kenya*, Publications from the Centre for Development Research, Copenhagen, No. 3.

- Moody, A.A., 1970. A Report on Farm Economic Survey of Tea Smallholders in Bukoba District, E.R.B Working Paper 70.8, Dar es Salaam.
- Mott, F. L., Shapiro, D., 1984. Seasonal Variation in Labor-Force Activity and Intrahousehold Substitution of Labor in Rural Kenya. *The Journal of Developing Areas* 18, 449-63.
- Ranjan, P., 2001. Credit Constraints and the Phenomenon of Child Labour. *Journal of Development Economics* 64, 81-102.
- Reynolds, P., 1991. *Dance Civet Cat*, Baobab books, Harare.
- Roberts, P. A., 1988. Rural Women's Access to Labour in West-Africa, in: Stichter, S.B., Parpart, J. L., (eds), *Patriarchy and Class: African Women in the Home and Workforce*, Westview Press, Boulder, Colorado.
- Rosenzweig, M. R., 1981. Household and Non-household Activities of Youths: Issues of Modelling, Data and Estimation Strategies, in: G. Rodgers, Standing (eds), *Child Work, Poverty and Underdevelopment*, ILO, Geneva.
- Strauss, J., Thomas, D., 1995. Human Resources: Empirical Modeling of Household and Family Decisions, in: Behrman, J., Srinivasan, T. N., (eds), *Handbook of Development Economics*, Vol 3 A, Elsevier Science C. V.
- Thorner, D, B. Kerblay and R. Smith, 1966. *Chayanov on the Theory of Peasant Economy*, R. D. Irwin, Illinois.
- Udry, C., 1996. Gender, agricultural production and the theory of the household. *Journal of Political Economy* 104, 1010-46.
- Ulph, D., 1988. *A General Non-Cooperative Model of Household Behaviour*, mimeo, University of Bristol.
- White, H. 2002. Combining Quantitative and Qualitative Approaches in Poverty Analysis. *World Development* 30, 511-22.
- Whitehead, A., 1984. Men and Women, Kinship and Property in: Hirschon, R. (ed): *Women and Property, Women as Property*, Croom Helm, London.
- _____, 1994. *Wives & Mothers: Female Farmers in Africa*, in: Adepaju, A., Oppung, C. (eds): *Work & Population in Sub-Saharan Africa*, ILO, London.
- _____, 2000. Continuities and discontinuities in political constructions of the working man in rural sub-Saharan Africa: The "lazy" man in African agriculture. *European journal of development research* 12, 23-52.
- Woolley, F., 1988. A non-cooperative model of family decision-making, Working Paper TIDI/125, London School of Economics.

APPENDIX 1

Max

$$N = \{Y_w^c - f^z(\underline{L}_w)\} \cdot \{Y_c^h - f^x(\underline{L}_c^x)\} \quad (A1)$$

$$Y_w^c, Y_h^c, L_w^z, L_w^x$$

$$st. (i) Y_w^c + Y_h^c = f^z(L_w^z) + f^x(L_w^x + \underline{L}_c^x)$$

$$(ii) \underline{L}_w = L_w^x + L_w^z$$

The first-order conditions for this problem are:

$$(i) Y_w^c : (Y_h^c - f^x) - \lambda = 0$$

$$(ii) Y_h^c : (Y_w^c - f^z) - \lambda = 0$$

$$(iii) L_w^z : \lambda \cdot \frac{\partial f^z}{\partial L_w^z} = \gamma$$

$$(iv) L_w^x : \lambda \cdot \frac{\partial f^x}{\partial L_w^x} = \gamma$$

$$(v) \lambda : Y_w^c + Y_h^c - f^x - f^z = 0$$

$$(vi) \gamma : \underline{L}_w - L_w^z - L_w^x = 0$$

Using (i), (ii) and (v), we solve for Y_w^c and Y_h^c to get the payoffs. (iii)

and (iv) secure efficiency in allocation of female labour across the two

plots.

Fig 1

