THE WORLD BANK ECONOMIC REVIEW, VOL. 17, NO. 2 197–227

Child Farm Labor: The Wealth Paradox

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This article is motivated by the remarkable observation that children of land-rich households are often more likely to be in work than the children of land-poor households. The vast majority of working children in developing economies are in agricultural work, predominantly on farms operated by their families. Land is the most important store of wealth in agrarian societies, and it is typically distributed very unequally. These facts challenge the common presumption that child labor emerges from the poorest households. This article suggests that this apparent paradox can be explained by failures of the markets for labor and land. Credit market failure will tend to weaken the force of this paradox. These effects are modeled and estimates obtained using survey data from rural Pakistan and Ghana. The main result is that the wealth paradox persists for girls in both countries, whereas for boys it disappears after conditioning on other covariates.

Public Disclosure Authorized

This article is motivated to explain the remarkable observation that on average children in land-rich households are more likely to work and less likely to attend school than children in land-poor households. This phenomenon is referred to here as the wealth paradox. We observe this tendency in household survey data for rural areas of both Ghana and Pakista. Land is the most important store of wealth in agrarian societies and a substantial fraction of households do not own land; this challenges the commonly held presumption that child labor involves the poorest households (for example, U.S. Department of Labor 2000, Basu and Van 1998).

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DOI: 10.1093/wber/lhg017

Child labor in export industries, such as carpets, garments, and sports equipment, has captured public attention and stirred a debate on trade sanctions and international labor standards (see Basu 1999 for a survey). Yet, obscured from the public eye, the vast majority of working children in developing economies are engaged in agricultural labor, predominantly on farms operated by their families (see International Labour Organization [ILO] 1996).[1]

The available theoretical and empirical literature on child labor is not well equipped to explain the wealth paradox. The theoretical literature has emphasized credit market imperfections (e.g., Ranjan 1999, Jafarey and Lahiri 2002) to the relative neglect of labor market imperfections. Indeed, a well-functioning labor market is central to the seminal work on the economics of child labor by Basu and Van (1998). This article suggests that labor market failure may explain the wealth paradox. It argues that the effects of labor market imperfections are reinforced by ill-functioning land markets, whereas credit market failure creates an opposing effect.

Ownership of productive assets such as land can affect child labor in various ways. It can have a negative wealth effect, with large landholdings generating higher income, making it easier for households to forgo the income that child work brings. Capital market imperfections that result in lower interest rates for households that can offer land as collateral reinforce the wealth effect, allowing large landowners to borrow more to meet insurance needs or finance their children's education.

In the absence of perfect labor (and land) markets, land ownership can also have the opposite effect. Owners of land who are unable to productively hire labor on their farms have an incentive to employ their children. Because the marginal product of labor is increasing in farm size, this incentive is stronger among larger landowners. The value of work experience will also tend to increase with farm size, an especially relevant factor if the child stands to inherit the family farm. This dynamic effect will reinforce the current-period effect. Overall, if incentive effects are large enough to overwhelm the wealth effect, what appear to be paradoxical patterns in the data may emerge, that is, asset-rich households may have more children in work than asset-poor households.

Let us look more closely at the nature of these market imperfections. Given perfect markets, landowners would be expected to hire adult labor and send their own children to school. However, the problem of moral hazard with hired labor may generate a preference for family labor. Weather variability makes agricultural output stochastic, and (often unobservable) differences in soil quality make it difficult to use the output of neighboring farms as a yardstick, making it relatively easy for agricultural workers to shirk. The distinction

1. This is an important difference between child labor today and child labor in, for example, industrializing Britain. Britain had few small family farms by the time child labor became prevalent (Humphries 2002).

between hired and family labor aside, children may be easier to supervise and discipline, mitigating moral hazard.

What is the evidence? Deolalikar and Vijverberg (1987) present evidence that family and hired labor are not perfect substitutes. Direct evidence of moral-hazard in the rural labor market is found in Foster and Rosenzweig (1994). Futher evidence of imperfections in the rural labor market arises from analysis of data from the Peruvian Sierra, which shows that the marginal product in own-farm work (for adults) is not equal to the market wage (Jacoby 1993).

Another problem with hiring workers is that landowners may face periodic labor shortages, because labor needs in agriculture tend to be seasonal and geographically concentrated. The wage labor market is not very well developed in most village economies; in Sub-Saharan Africa (including Ghana), it is incipient. An active land market would mitigate the effects of labor market imperfections: large landowners that could not productively hire labor could sell their land rather than employ their children on it. If land could easily be bought and sold, the incentive to gain specific work experience would be weaker. In these ways, land market failure reinforces labor market failure.[2]

Recognition of the dual role that land plays as a source of wealth and an opportunity for productive employment is crucial. It makes clear that the effects on child labor of land redistribution may be very different from the effects of income redistribution.

The empirical model presented here was motivated by the need to separate the wealth effect from the other (substitution) effects of farm size. It departs from most other specifications in the literature by including both land size in acres and a measure of permanent income. Although the data do not permit the labor market, credit market, and inheritance effects (through experience and education) of farm size to be disentangled, separation of the wealth effect from the various substitution effects is an important step forward. The empirical specification also improves on existing work in controlling for alternative forms of land tenancy and in instrumenting both of the key variables of interest, income and farm size.

The article is organized as follows. Section I briefly surveys the relevant literature. Section II presents the theoretical model. Section III describes the data by gender and country. It presents the remarkable data on child work and school participation rates by land ownership. An empirical specification is discussed in section IV. The results are presented in section V, and section VI concludes.

2. The Panos Institute in London commissioned a journalist to interview farmers and government officials to gauge their reactions to a nontechnical summary of this article. There was some overall support for its claims. A landless agricultural worker said he sent his children to school because this was the only way they could earn their livelihood, given that he had no assets with which to support them. A landowner in the same province said he found it difficult to find hired labor at times and that his own children were more reliable workers and likely to benefit from the work experience.

I. Relevant Literature

Modeling: Causes of Child Labor

The literature on child labor has not devoted much attention to labor market failure. Basu and Van (1998) assume that subsistence poverty drives child labor, and the mechanics of their model depend on a well-functioning labor market. Basu (2000) extends this analysis to consider the effects of an adult minimum wage on child labor. These articles make an important contribution in highlighting the role of poverty and analyzing the effects of policies that have been much discussed. But these policies are of limited relevance to the majority of rural households, whose main income derives from self-employment (see Bhalotra 1999).[3] Other authors have emphasized that child labor can arise as a result of credit market constraints (Ranjan 1999, Jafarey and Lahiri 2002) or problems of intergenerational contracting (Baland and Robinson 2000). Eswaran (2000) and Cigno and others (1999) model child labor as codetermined with fertility.

Modeling: The Agricultural Household

The fact that the great majority of working children in developing economies work on household-run farms and enterprises motivates modeling decisionmaking in the peasant household. Although not focused on child labor, relevant models of the peasant household exist in the literature. Rosenzweig and Wolpin (1985) use an overlapping generations model incorporating returns to specific experience to show that the existence of extended families, the cost advantages of family relative to hired labor, and the weakness of the land market may all be manifestations of an optimal implicit contract between generations that maximizes the gains from farm-specific experientially obtained knowledge. The canonical model of the consuming and producing agricultural household is probably that of Strauss (1986). Benjamin (1992) extends that model to show that if consumption and production decisions are separable, total labor usage on the household farm will be independent of household composition. However, if labor markets are imperfect, separability is violated and farm labor usage is a function of household composition. Extending this idea, Cockburn (2000) and Bhalotra and Heady (1998) argue that, in the nonseparable case, child labor is a function of the stock of land and other assets. In his application to rural Ethiopia, Cockburn finds that land fertility decreases labor for girls, whereas land slope increases it. Boys' work is found to be decreasing in the number of oxen and bull, ploughs, and sickles owned by the household. Credit market failure and second-period relative returns are not considered.

3. A separate problem is the difficulty of enforcing minimum wage or other legislation in a rural setting, where the legal infrastructure is underdeveloped and the political infrastructure may be captured by powerful groups in society, such as employers.

This article develops a theoretical model that clarifies the role of labor and land market failure as distinct from the role of credit market failure. It thereby integrates the different sorts of market failure into one model. Allowing two periods enables the effects on future wages of the current decision on whether to work or attend school to be analyzed and for those effects to be related to land size through inheritance. The roles of inheritance and the limitations of land markets appear not to have been previously discussed in the context of child labor. To the extent that inheritance laws favor sons over daughters, incorporation of this feature into a model of child labor holds the potential to explain the marked gender differentials in child labor and schooling evident in many developing economies. The main contributions, however, are to highlight the seemingly neglected fact that most working children are employed on family-run farms and enterprises and to identify the paradoxical pattern in data from two very different countries, Ghana and Pakistan, that appear to contradict the commonly held view that poverty drives child labor.

Evidence: Studies of Child Labor

Early empirical work on child labor consisted largely of case studies that interviewed working children. An advantage that large representative household surveys have over these studies is that they provide information on children who do and do not work, thereby making it possible to investigate the decision to work. Since these large survey data have become widely available in the past decade, economists have estimated participation equations for child work and schooling for a range of countries.[4]

Many of these studies include as a regressor a measure of household income or consumption, the adult wage rate, or assets. That the results have been mixed is not surprising, for the following reasons. Where the regressor is an index of assets, the net effect on child labor may be positive, negative, or zero, because it is a compound of wealth and substitution effects of opposite signs. Where the regressor is income or consumption, it is, in principle, endogenous, a problem that most previous studies have not addressed. The facts that the expected effect of income on child labor is negative and that simultaneity will tend to create a positive bias may explain the small or insignificant income effects obtained in many studies.

Another problem with the evidence on the effects of household living standards on child labor is aggregation bias. Most studies aggregate across age, gender, rural and urban regions, landowners and the landless, and types of child work. Aggregation may obscure negative income effects that affect some subgroups but not others.

4. For a partial review and assessment of the literature, see Bhalotra and Tzannatos (2002). More recent research includes Edmonds (2001), Edmonds and Pavcnik (2002), Emerson and Portela (2002), and Freije and López-Calva (2001).

To identify the effects of living standards on child labor, the empirical specification presented here addresses each of these three issues.[5] It includes measures of both permanent income and size of landholding, both of which are treated as potentially endogenous. Comparison of estimates with and without instrumental variables on the data underlines the importance of instrumental variables. Gender-specific models are estimated for each country, with the sample restricted to children in rural areas who live in households that own or operate land. Failing to select out the landless households would bias the coefficient on farm size. Indeed, every other variable in the equation was wiped out by the stunning explanatory power of farm size when the equation was estimated on a sample including landless households.

Previous work has concentrated on the participation decision. This model looks at hours, because these data exhibit substantial variation, with many children working less than 10 hours a week.

II. A Two-Period Model of Child Labor

The appendix sets out a model of the peasant household in an economy with imperfect markets for labor, land, and credit. Allowing two periods enables us to capture the impact of child work in period 1 on productivity in period 2. This effect arises through both the gain in work experience and the possible lowering of educational attainment. The model specifies the effects of farm size on child labor, which, in addition to a wealth effect, includes substitution effects arising from market imperfections.[6]

The model is solved to give an expression for the quantity of child labor supplied in period 1:

$$L_{c1} = h(A_0, K_0, w_{h1}, w_{h2}, p_{r1}, p_{r2}; Z, e), \tag{1}$$

where subscripts 1 and 2 refer to periods 1 and 2, L_c is child labor, A_0 is owned land, K_0 is initial financial wealth, w_h is the wage of hired labor, p_r is the price of rented land, Z refers to exogenous taste shifters, and e refers to unobservable characteristics and optimization errors. The first-order conditions can similarly be solved to describe other endogenous variables, such as period 1 consumption, X_1, in terms of the exogenous variables. Like equation 1 these will be demand equations that depend on prices and initial wealth (denoted by

5. Bhalotra (2001) takes the bolder approach of arguing that the question of whether poverty compels child labor cannot be addressed by estimating the income effect on child labor, because a negative effect would only indicate that child leisure (or schooling) is a normal good. This article proposes that the sign of the wage elasticity of child hours of work provides the more evident test of the poverty hypothesis. It is estimated on data for children in wage work in rural Pakistan.

6. To focus on the problem of market imperfections, the model presentation suppresses the important distinction between boys and girls, as well as other influences on child labor. The empirical model is, however, sensitive to these influences.

land [A_0] and other financial wealth [K_0]). Because estimation of equation 1 faces the problem that K_0 is unobservable, the demand equation for X_1 can be inverted to write K_0 as a function of X_1. Because X_1 is observable, it is convenient to substitute out for K_0 in equation 1 to obtain[7]

$$L_{c1} = h_2(A_0, X_1, w_{h1}, w_{h2}, p_{r1}, p_{r2}; Z, e). \tag{2}$$

Because information on the rental price for land (p_{r1}, p_{r2}) is lacking, the equation is conditioned on the quantity of rented land (A_r) to get

$$L_{c1} = h_2(A_0, X_1, w_{h1}, w_{h2}, A_{r1}, A_{r2}; Z, e). \tag{3}$$

This equation forms the basis of the estimates. Consumption (X_1) and rented land (A_r) are treated as potentially endogenous (see section IV). X is expected to capture (negative) income effects on child labor associated with both land and other financial capital. Land owned will generate the incentive and collateral effects described in the introduction.[8] Because these are of opposite signs, the sign of the coefficient on land is ambiguous a priori. The following section describes what can be learned about imperfections in different markets based on the estimated coefficient on land in equation 3.

The Role of Market Imperfections

The model allows imperfections in each of the labor, land, and credit markets. This section explores the role played by each in determining the level of child labor. In every case considered, the negative wealth effect of land is taken to be captured by X_1. Conditioning on X_1, the expected sign of the land coefficient will depend on which market imperfections dominate. If both land and labor markets are imperfect, households with land to farm will have an incentive to employ child labor. As this incentive is stronger the larger the plot of land, land size will have a positive effect on child labor. At the same time, land size will be associated with weaker credit constraints and, to that extent, less child labor.

Consider imposing the assumption of perfect land markets. The positive incentive effect of land disappears even if the labor market is imperfect, because land for which hired labor cannot be found can be rented out. The negative collateral effect of land persists as long as the credit market is imperfect. Hence the coefficient on

7. See Browning (1998), who introduces the term *m*-demands to describe equations in which the demand for one good depends on the demand for a reference good and all prices in the model. These can be derived directly from the marginal rate of substitution condition or from pairs of Marshallian demands by inverting the Marshallian demand for the reference good and using it to eliminate total expenditure from the Marshallian demand for the index good. As long as the reference good is normal, it serves as an adequate representation of utility. An early application of these ideas is found in Bhalotra (2002), where variations in child consumption are modeled as a function of adult consumption.

8. The dynamic inheritance effects referred to there will reinforce the incentive effect. For ease of exposition, these are not explicitly discussed in the next section, where the discussion is in terms of signs and not magnitudes.

land is zero if the credit market is perfect and negative if the credit market is imperfect. The case of perfect labor markets is analogous to that of perfect land markets. The positive incentive effect of land disappears because labor can be hired out. This holds whether or not land markets are perfect. The coefficient on land is therefore zero or negative, depending on whether the credit market is perfect or not. If credit markets are assumed to be perfect, there is no negative collateral effect of land. Land has a positive incentive effect if and only if both land and labor markets are imperfect. In this case the land coefficient is zero if either the land market or the labor market is perfect, and it is positive if both of these markets are imperfect.

The preceding discussion suggests that the relative size of credit versus land and labor market imperfections can be discerned by observing the estimated coefficient on land. Consider the three possibilities:

- If the estimated coefficient on land size is zero, then either all markets are perfect or the credit market is perfect and either the land or labor market is perfect. Alternatively, it is possible that all three markets are imperfect, and the positive and negative land effects offset one another.
- If the estimated coefficient on land is positive, either all three markets are imperfect or the credit market is perfect but both land and labor markets are imperfect. In this case both the land and labor markets can be inferred to be imperfect.
- If the coefficient on land is negative, either all three markets are imperfect or credit markets are imperfect, and either the land or the labor market is perfect. In this case the credit market can be inferred to be imperfect.

III. Data and Descriptive Statistics

The data are drawn from the rural samples of the Ghana Living Standards Survey for 1991/92 and the Pakistan Integrated Household Survey for 1991. Both are large, nationally representative surveys collected by the respective national governments in cooperation with the Living Standards Measurement Study unit of the World Bank. The Ghana survey collects employment data on people 7 years old and older; the Pakistan survey collects data on people 10 years and older. The data structure and the definition of work are sufficiently similar across the two surveys to allow comparison of the data sets.

Activity Rates and the Work-School Tradeoff

In Ghana 41 percent of boys and 34 percent of girls work on the household farm (table 1). In Pakistan, the corresponding participation rates are 22 percent for boys and 28 percent for girls. Farm work is, on average, a half-time job for children, although there is wide dispersion in work hours around the mean (table 2).

In Ghana three-quarters of boys and two-thirds of girls who work on the household farm also attend school. In Pakistan just half the boys and 10 percent of girls employed on the household farm attend school. Combining farm work and school thus appears easier in Ghana than in Pakistan; it appears to be especially

TABLE 1. Participation in School and Work Activities by Boys and Girls in Pakistan and Ghana (percent)

Activity	Boys in Pakistan	Girls in Pakistan	Boys in Ghana	Girls in Ghana
Total participation rates				
Household farm work	22.1	28.1	40.5	34.4
Household enterprise work	2.3	1.6	1.8	2.5
Wage work	6.2	11.9	0	0
School	72.8	30.5	76.5	68.9
None of the above activities	14.0	42.4	12.7	20.1
Domestic work	n.a.	99.4	89.8	96.2
Participation in a single activity				
Farm work only	8.6	21.1	10.6	9.8
Enterprise work only	0.64	1.2	0.3	1.2
Wage work only	3.2	6.8	0	0
School only	61.3	27.6	45.0	43.3
Participation in more than one type of work				
Farm and enterprise work	0.91	0.09	0	0
Household farm wage work	2.1	4.1	0	0
Household enterprise and wage work	0.25	0.27	0	0
Participation in work and school				
Farm work and school	10.5	2.7	29.9	24.6
Enterprise work and school	0.50	0	1.5	1.3
Wage work and school	0.74	0.73	0	0
Number of children	1,209	1,096	1,718	1,542

n.a., Not applicable.

Note: Figures are percentages of relevant age group. Data are for rural areas only. They cover 7–14-year-olds in Ghana and 10–14-year-olds in Pakistan.

difficult (or not preferred) for Pakistani girls. A simple unconditional correlation of probabilities suggests that in Pakistan the probability of attending school is 0.4 lower for boys and 0.3 lower for girls if the child is engaged in farm work.[9] In Ghana the probability of being in school is 0.1 lower for boys and 0.006 lower for girls. These marginal effects are significant in every case except that of Ghanaian girls. Heady (2003) finds that working affects school performance in Ghana. His results are an important supplement to school attendance effects. The data required to investigate school performance in Pakistan were not available.

A striking difference between Ghana and Pakistan is that a significant fraction of children in Pakistan are engaged in work outside the household, whereas child participation in wage work in Ghana is close to zero. School attendance in Pakistan shows a much greater gender differential than in Ghana. In both countries a substantial proportion of children, especially girls, neither work nor go to school. If the main concern is with low educational attainment (and the

9. Although the effect of hours of farm work is negative and significant, it is small: a one-hour increase in farm work reduces the probability of school attendance by 0.03 for girls and 0.015 for boys.

TABLE 2. Weekly Hours of Child Farm Work in Ghana and Pakistan

Group	Household farm work	Wage work
Boys in Ghana	15.5 (13.3), $N = 696$	n.a.
Girls in Ghana	15.4 (12.9), $N = 531$	n.a.
Boys in Pakistan	22.5 (18.5), $N = 267$	44.9 (22.3), $N = 61$
Girls in Pakistan	13.3 (13.8), $N = 308$	30.9 (15.6), $N = 73$

n.a., Not applicable.

Note: Data are for rural areas only. They cover 7–14-year-olds in Ghana and 10–14-year-olds in Pakistan. Hours are values reported for the reference week, conditional on participation in the activity during the reference week. Figures in parentheses are standard deviations around the means. N is the number of working children.

gender gap in such attainment), policies designed to discourage child labor may be less important than policies that directly promote school attendance.[10]

Land Scarcity, Land Use, and Poverty

Land is scarcer in Pakistan than in Ghana. Likely related to this, the wage labor market is better developed in rural Pakistan, where 36 percent of adult men work for wages, in contrast to rural Ghana, where just 22 percent of adult men do so. These figures suggest both a higher marginal productivity of child labor and greater difficulty in hiring adult labor in Ghana. They lead us to expect more children to be employed on household farms in Ghana than in Pakistan, a prediction borne out by the data (table 1).

This does not imply that children are better off in Pakistan. Working children in Pakistan are less likely to be in school than child workers in Ghana (table 1). Compared with other developing economies, Pakistan has a relatively high rate of child wage employment, with 10 percent of 10–14-year-olds working. Households that send children to wage work are poorer on average than households that employ children on the family farm.

Pakistan has a higher incidence of poverty than Ghana.[11] The two countries also exhibit very different patterns of land use. Renting and sharecropping are more common in Pakistan; the use of communal land is more common in Ghana. A household in Ghana may own more than one plot of land, with ownership divided evenly between husbands and wives (see, for example, Udry 1996, Iversen 2000). Such land ownership patterns are uncommon in Pakistan.

The Wealth Paradox

In Pakistan, where 33 percent of households own land, the probability of working at all or working on a farm is substantially higher among landowners than among the landless (table 3). This pattern is reflected in school attendance rates of girls,

10. Ravallion and Wodon (2000) find support for this contention in Bangladesh.

11. Ray (2000) estimates that 27 percent of households in Pakistan and 14 percent in Ghana fall below the median income per adult equivalent.

TABLE 3. Participation Rates by Land Owned (Percent)

		School		Farm work		All work	
Land ownership	Percentage of households	Boys	Girls	Boys	Girls	Boys	Girls
Pakistan							
Own land = 1	33	76.7	27.6	31.0	36.4	33.0	43.9
Own land = 0	67	70.7	32.7	17.0	22.9	24.4	32.9
Marginal	9	77.8	24.6	29.1	36.5	31.6	47.8
Small	12	73.0	26.7	34.1	38.0	36.6	44.0
Large	9	79.1	29.6	31.1	36.5	31.8	39.7
Ghana							
Own land = 1	44	81.9	75.7	49.7	46.8	52.9	50.5
Own land = 0	56	73.5	66.7	55.6	48.8	57.6	51.4
Marginal	12	80.3	76.6	44.3	43.9	47.5	47.7
Small	19	83.7	79.7	45.9	47.1	50.7	51.2
Large	13	80.5	69.7	58.5	48.5	59.7	51.5

Note: Classification of land categories follows the system used by Indian census: marginal = less than 1 ha; small = 1–3 ha; large = more than 3 ha (1 ha = 2.7 acres). "All work" refers to participation in work on household farms, work on household enterprises, or work on the wage labor market. It is not the inverse of school attendance because some children neither work nor attend school.

which are higher among landless households. For boys the wealth effect appears to dominate, and school attendance is higher among landowning families.

In Ghana, where 44 percent of households own land, the children of landowning households are more likely to attend school and less likely to work than the landless. There is thus no apparent paradox, although the difference in probabilities is smaller than might have been expected.

Once the size of landholdings is examined to allow for likely nonlinearities arising from the fact that the sizes of both the wealth and the substitution effects are a function of land size, the wealth paradox is apparent in Ghana as well (table 3). In Pakistan nonlinearity is evident: most of the increase in work participation with land owned occurs in moving from marginal to small landholdings. After that, there is a small decrease, leaving work participation rates in the large landowning class similar to those in the marginal landowning class. For boys this is mirrored in school attendance. For girls farm labor participation is bell-shaped in land size (like that of boys), but wage labor participation is decreasing in land size. Their total work participation decreases monotonically with land size (and their school attendance increases). This is consistent with the finding that income effects for girls are typically larger than for boys (e.g., Ravallion and Wodon 2000, Behrman and Knowles 1999).

In Ghana the probability of both working at all and working on a farm increases steadily with land size for boys and girls. School participation increases from marginal to small but then, surprisingly, decreases from small to large farms. The fact that school participation does not mirror work participation in Ghana as well as it does in Pakistan is consistent with the fact that it is easier to combine work and school in Ghana.

Farm households often operate land without owning it. In Pakistan this is done by leasing land or sharecropping. In Ghana farmers can also use "free farms" or village farms. Work and school participation rates of children who work on farms operated by their families differ from those of children who work on farms owned by their families (table 4). It is convenient to think of land used as reflecting opportunities in the way that land owned does but without the corresponding wealth (and inheritance) effect. In line with this, the paradoxical patterns are stronger than in table 3. The farm employment rates of Pakistani girls are higher on large farms than on small farms. For all work, girls' employment displays a bell-shaped relation with land size similar to that observed for boys. This effect is mirrored in school attendance. Remarkably, school attendance rates of girls and boys in large-farm households are lower than in marginal-farm households. In Ghana participation rates are similar to those for land owned, but school attendance decreases steadily as the size of land operated rises.

Overall, there is considerable support for the notion that landholdings, whether owned or operated, increase the probability that children work and decrease the probability that they attend school. This wealth paradox seems more evident for girls than for boys. These data are truly remarkable, given that poverty in rural economies is associated with low levels of landownership and child labor is associated with poverty. Because child labor on the household-run farm is easily the most common form of child labor, these data deserve investigation.

TABLE 4. Participation Rates by Land Operated (Percent)

		School		Farm work		All work	
Land operated	Percentage of households	Boys	Girls	Boys	Girls	Boys	Girls
Pakistan							
Use land = 1	43	72.0	25.2	32.9	39.1	35.0	46.5
Use land = 0	57	73.5	35.7			20.7	28.0
Marginal	9	74.5	28.3	24.5	39.0	28.6	51.0
Small	20	71.0	21.9	34.8	35.7	36.3	42.9
Large	15	72.0	27.6	34.4	43.1	36.2	48.7
Ghana							
Use land = 1	90	77.8	71.1	52.4	47.5	55.1	50.7
Use land = 0	10	89.2	76.3	n.a.	n.a.	9.6	15.8
Marginal	27	84.3	79.1	44.8	42.7	48.8	46.7
Small	40	77.0	71.0	54.2	48.3	57.0	51.4
Large	23	72.7	62.8	57.4	51.4	58.6	53.2

n.a., Not applicable.

Note: Classification of land categories follows the system used by the Indian census: marginal = less than 1 ha; small = 1–3 ha; large = more than 3 ha (1 ha = 2.7 acres). "All work" refers to participation in work on household farms, work on household enterprises, or work on the wage labor market. It is not the inverse of school attendance because some children neither work nor attend school. Land operated includes land owned and land used under rental or sharecropping arrangements. For Ghana the data also include free or village land farmed.

IV. Empirical Model and Estimation Issues

It is unusual to have data that span an individual's childhood (period 1) and adulthood (period 2), making it difficult to obtain structural estimates of a dynamic model. The analysis here is limited by the single cross-section of data used for each country. Separate equations are estimated for boys and girls in each country, giving four sets of estimates. All reported standard errors are robust (see White 1980, for example) and adjusted to permit observations within clusters (primary sampling units) to be correlated (see Deaton 1997, for example).

The dependent variable is hours of child work on the family farm. Because there is considerable variation in hours, this measure is preferable to the participation measure used in most previous research. Because many children do not participate in farm work, the tobit estimator is used.[12] If data on all rural households are used, a dummy for land ownership has such enormous explanatory power that all other regressors are completely insignificant. Because land ownership is a very significant determinant of child labor in rural areas of both countries, the models are run on the subsample of households that own or operate a family farm. These households constitute 46 percent of households in Pakistan and 90 percent of households in Ghana. Farm size is then included among the regressors, and dummy variables are used for type of land tenancy.

Main Variables

The key regressor, land size (A_t), is defined as acres of farm land owned or operated by the household. A quadratic term is included to allow the sizes of the wealth and substitution effects to vary with land size. The theoretical model distinguishes land owned (A_0) from rented land (A_r). In the empirical model, dummy variables distinguish the two. A further distinction is made in the empirical model between sharecropping land (Pakistan and Ghana), use of free or village land (Ghana) and number of plots of land (Ghana). No previous study has considered the effects of the mode of operation of land on child labor, so the coefficients on these variables are of interest.[13] Household consumption (X_1) is proxied by food expenditure per capita, which includes the imputed

12. Tobit estimates are often sensitive to deviations from normality. The benefits of using the hours variation in the data seemed to outweigh this potential problem, but the results are subject to this caveat. To investigate the sensitivity of the results to alternative estimators, we estimated probit models as well as OLS models of hours of work conditional on participation (with a selection correction term from the probit). The main results were qualitatively similar.

13. One rationalization for having tenants sharecrop the land rather than renting the land out or hiring wage labor is that it improves the landlord's access to labor by making available the labor of the tenant's family in addition to the labor of the tenant (see Basu 1997).

value of home-produced consumption.[14] This measure is expected to be relatively smooth (see Altonji 1986).[15] All equations include a set of province dummies, which are expected to capture any effects of interprovince differences in wages and prices. The wage of hired labor (w_h) is proxied by the going agricultural wage rate for men in the community, a statistic provided by village leaders identified as respondents in the community questionnaires of both surveys.

Instrumental Variables

If decisions about consumption (X_1) and labor supply (for example, L_c) are made simultaneously, then X_1 is endogenous in the equation for L_c. Moreover, child labor contributes to resources available for consumption. Most previous studies ignore this problem. Because the data do not offer a relevant natural experiment, X_1 is instrumented. It is difficult to find a valid instrument for income in a model of (child) labor supply. In the wider literature, commonly used instruments for income are education or occupation. Because this study looks at farming households, there is little variation in occupation in the sample. Although there is sufficient variation in the educational attainments of adults in the sample, this is too restrictive an exclusion restriction: parental education has a significant influence on child labor, holding household resources constant. Previous studies that have used education as an instrument assume no effect of education on (own) tastes for work, which seems unreasonable (see Pencavel 1986, for example). Here, household consumption is instrumented using the unemployment rate at the community level together with indicators of the level of infrastructural development of the community (for example, the presence of a railway line, a market, electricity, piped water). So as not to lose the within-community variation in income, interactions of these variables with the education of the household head are also included.

Total land operated (A_t) is endogenous by virtue of including A_r (land rented or sharecropped). If land owned (A_0) is assumed to be exogenous, as is typically the case, then A_0 is a valid instrument for A_t. Land owned is usually inherited, the buying and selling of land being limited by a weak land market (see, for example, Swain 2001, Rosenzweig and Wolpin 1985). An index of inequality in land distribution within the community is used as another instrument for A_t. Communities in which there is greater inequality in land ownership are expected to have more rental arrangements over land.

The generalized residuals procedure is used as this has been shown by Smith and Blundell (1986) to give consistent estimates when the dependent variable is

14. There is no need to assume an equivalence scale because size and detailed household composition variables are included in the equations. Food expenditure is preferred to total expenditure, because total expenditure includes expenditures on durables, which are not as smooth.

15. Although we expect that the rural economies analyzed are characterized by imperfect capital markets, some evidence suggests that poor households achieve a degree of consumption smoothing (see Townsend 1994).

censored. Suppressing individual subscripts, let the main equation, for hours of work (H), be written as

$$H^* = Z\beta + X\gamma + e, \tag{4}$$

where hours (H) is a censored endogenous variable, Z is a vector of exogenous variables, and X is the endogenous variable. The auxiliary equation describing Y in terms of exogenous variables Z_1 (Z_1 includes Z) is

$$Y = Z_1\pi + u. \tag{5}$$

The error terms e and u are assumed to be jointly normally distributed. Let $e = u\alpha + \varepsilon$. Substituting for e in equation 4 gives the conditional model

$$H^* = Z\beta + X\gamma + u\alpha + \varepsilon, \tag{6}$$

where u is an estimate obtained by ordinary least squares (OLS) estimation of equation 5 and equation 6 can be estimated by the standard tobit procedure. A test of $\alpha = 0$ is a test of the null hypothesis that X is exogenous.

Other Variables

Because the incentive to put a child to work on the farm depends on the size of the farm relative to the size of the available pool of family labor, household size and composition appear as regressors. Given farm size, household size is expected to have a negative impact on child work. The educational level of each parent is expected to affect preferences over child labor, although if household resources are not fully represented by X_1 then the educational variables will also capture resource effects. These variables may also have direct effects if the marginal benefit of educating a child is increasing in the education of the parents or if parental education has a positive effect on the child's job opportunities (which will affect the dynamic returns to education versus work). To the extent that womens' education reflects their bargaining power (by virtue of being an asset that they can take with them if they leave the household), inclusion of mothers' education as distinct from fathers' education goes some way toward relaxing the common preference assumption implicit in equation 1. For this reason, and also as a measure of household insecurity, an indicator is also used for whether the household has a female head. The fraction of households headed by women is substantially larger in Ghana than in Pakistan; in both countries they exhibit different characteristics from households headed by men. Religion and ethnicity of the household are included to capture attitudinal differences in the valuation of school and work. This is expected to be especially relevant for girls, toward whom attitudes tend to reflect greater heterogeneity.

Turning from household-specific to child-specific characteristics, the equations include a quadratic in child age. The simplicity of the theoretical structure is relaxed by allowing parents to have preferences over children that depend on the relationship of the child to the household head and on birth order. For

evidence of birth order effects, see Das Gupta (1987) and Butcher and Case (1994). As for the relation of the child to the household head, there is recent evidence that adult altruism has a biological or genetic basis (see Bishai and others 2003, Case and McLanahan 2000). Other relationships include niece, nephew, grandchild, and sibling; in addition, in Ghana, it is not unusual to find foster children in the household.

The surveys contain some useful information at the community level. As a proxy for school costs (C: see model in the Appendix), dummy variables are introduced for whether primary, middle, and secondary schools are present in the community in which the child lives. Also included is an indicator for public transportation in the community, because it may affect access to school. A comparison of means across these subsamples and a comparison of means across the two countries can be found in Bhalotra and Heady (2001).

V. Results

Estimates of a parsimonious model corresponding to equation 3, in which the only variable in the vector Z is household size, are presented in table 5. Estimates of marginal effects for a model with a larger set of control variables are presented for the probability of working (table 6) and for the hours of work conditional on working (table 7). The standard marginal effects are multiplied by 0.1 for per capita food expenditure (X_1) because it is in logarithms and for household composition variables because these are proportions; as a result, the effects of a 10 percent change in these variable can be read directly off the table.

For landholdings (A_t) the Smith-Blundell test did not reject exogeneity, and there was no significant difference between the instrumental variable and OLS estimates. Exogeneity was rejected for food consumption (X_1) in each of the samples except that of boys in Ghana (the residual term is significant in columns 1, 2, and 4; see section IV). The first-stage regression explains 31 percent of the variation in consumption in Pakistan and 29 percent in Ghana, and the instruments are jointly significant at 1 percent and 10 percent, respectively. The results change significantly (and in the expected direction) in the absence of instruments, underlining the importance of using instrumental variable methods in studying the impact of household resources on child work.

Farm Size and Consumption Effects

Consider first the parsimonious model in table 5. In Ghana farm size has a highly significant positive effect for both boys and girls. The effect for girls is linear and, for a range of households, 50 percent larger than for boys. The effect for boys is weakly quadratic. Boys from larger households work significantly more, whereas girls' farm labor is independent of household size. Per capita household consumption has an unexpectedly positive effect on child work, even after correcting for its endogeneity.

These coefficients become more plausible once other controls are introduced (tables 6 and 7). The effects of farm size, consumption, and household size

TABLE 5. Child Work on the Household Farm: Marginal Effects of the Parsimonious Model

Variable	Boys in Pakistan	Girls in Pakistan	Boys in Ghana	Girls in Ghana
Participation probabilities				
Log consumption	−0.026***	−0.010	0.012***	0.0095**
Acres × 10^2	0.026	0.15**	0.41***	0.60***
Acres^2 × 10^4			−0.31*	−0.30
Household size	−0.021***	−0.013***	0.0098***	−0.0069
Residual (log consumption)	0.022***	0.017**	−0.006	−0.000053
Hours conditional on work				
Log consumption	−0.68***	−0.18	0.22***	0.16**
Acres × 10^2	0.68	2.70**	7.40***	10.20***
Acres^2 × 10^4			−5.50*	−5.10
Household size	−0.54***	−0.25***	0.18***	−0.12
Residual (log consumption)	0.59***	0.030**	−0.11	−0.0009
Sample size	513	473	1272	1127
Log likelihood	−969.82	−901.27	−2,895.3	−2,278.3

*Significant at the 12 percent level.

**Significant at the 10 percent level.

***Significant at the 5 percent level.

Note: Marginal effects evaluated at sample means based on tobit estimates. Dependent variable is hours of child labor on the household farm. "Participation probabilities" refers to marginal effects for the probability of being censored; "hours conditional on work" refers to marginal effects conditional on censoring. Regressions included region, religion, and ethnicity dummies. Some regions in Ghana were dropped because they coincided with ethnic groups. If the *t*-test on the residual of log consumption is significant, the null of exogeneity of consumption is rejected. Blank cells indicate that the variable was insignificant and was dropped from the equation in the specifications that are reported.

become insignificant for boys. For girls a significant positive effect of farm size persists, and consumption and household size both take the expected negative sign and are significant. The coefficients on land size should be read together with the coefficients on the indicator variables for the mode of operation of land, many of which are significant. The number of farms operated has a strong positive effect on hours of work of similar magnitude for boys and girls. Because this result is obtained when controlling for acres of land operated by the household, it suggests not a size effect but an effect associated with the subdivision of land, an effect that merits further microlevel research.

For Pakistan the parsimonious equations in table 5 show a positive linear effect of farm size on girls' work. Farm size takes a positive sign for boys' work, but the effect is insignificant. Household consumption has the expected negative effect on child work, but it is significant only for boys. The absence of an income effect on girls' work is somewhat surprising. It may be related to the

TABLE 6. Child Participation on the Household Farm: Marginal Effects

Variable	Boys in Pakistan	Girls in Pakistan	Boys in Ghana	Girls in Ghana
Child characteristics				
Age	0.081***	0.033***	0.15***	0.15***
Age squared			−0.0041	−0.0047*
Child of head	0.12*	0.15**	−0.066**	−0.006
Household resources				
Ln per capita food expenditure	−0.051***	−0.017	0.0048	−0.021***
Acres $\times 10^2$	0.069	0.20*	−0.071	0.36***
Acres$^2 \times 10^4$			−0.00015	−0.014**
Farm organization				
Number of farms			0.046***	0.048***
Rent	−0.031	0.12**	0.14***	0.14***
Sharecrop	0.11***	0.06	−0.040	0.011
Free farm	n.a.	n.a.	0.14***	0.16***
Village farm	n.a.	n.a.	0.031	0.20***
Household structure				
Household size	−0.024***	−0.011	−0.0055	−0.020***
Female head	0.39***	0.22**	0.036	0.080*
Males <5–7	−0.079***	−0.031	−0.0041	−0.038***
Males 5–9	−0.059*	−0.090***		
Males 15–19	−0.049	−0.051	−0.0065	−0.016
Males 20–59	0.0043	−0.077**	−0.0057	0.024
Males >60	−0.014	0.062	0.026	0.030
Females <5–7	−0.037	0.011	0.022	−0.029**
Females 5–9	0.015	−0.014		
Females 15–19	−0.13***	−0.054	−0.013	−0.0084
Females 20–59	0.019	0.003	0.00014	0.0006
Females >60	−0.079	−0.25***	0.0086	0.17
Parents' education				
Mother middle/secondary	−1.55***	−2.17***	−0.093***	−0.028
Father secondary	0.12	−0.52***	−0.039	0.029

Community variables				
Primary school, girls	0.11	−0.17	−0.043	−0.064
Primary school, boys	0.040	0.39***		
Middle school			−0.093***	−0.067*
Secondary school			−0.099**	−0.128***
Public transport	−0.048	−0.095**	−0.030	−0.12***
Ln male wage	0.008	−0.010	0.004	0.020***
Residual (log consumption)	0.041***	0.028*	0.0017	0.034***
Sample size (number of censored observations)	471 (323)	436 (284)	1,263 (720)	1,122 (702)
Log likelihood	−847.78	−776.32	−2,694.92	−2,129.33

*Significant at the 12 percent level.

**Significant at the 10 percent level.

***Significant at the 5 percent level.

n.a., Not applicable.

Note: Tobit marginal effects for probability of being censored. Regressions included region, religion, and ethnicity dummies. Marginal effects are evaluated at sample means based on tobit estimates. Dependent variable is hours of child labor on the household farm. "Participation probabilities" refers to marginal effects for the probability of being censored; "hours conditional on work" refers to marginal effects conditional on censoring. Regressions included region, religion, and ethnicity dummies. Some regions in Ghana were dropped because they coincided with ethnic groups. If the *t*-test on the residual of log consumption is significant, the null of exogeneity of consumption is rejected. Blank cells indicate that the variable was insignificant and was dropped from the equation in the specifications that are reported.

TABLE 7. Hours of Child Farm Work Conditional on Participation: Marginal Effects

Variable	Boys in Pakistan	Girls in Pakistan	Boys in Ghana	Girls in Ghana
Child characteristics				
Age	1.86***	0.46***	2.33***	2.25***
Age squared			−0.063	−0.069*
Child of head	2.70*	2.09**	−1.02**	−0.083
Household resources				
Ln per capita food expenditure	−1.16***	−0.24	0.073	−0.31**
Acres $\times 10^2$	1.60	2.90*	1.10	5.40***
Acres$^2 \times 10^4$			−0.0024	−0.20**
Farm organization				
Number of farms			0.71***	0.70***
Rent	−0.70	1.74**	2.09***	2.14***
Sharecrop	2.62***	0.78	−0.62	0.15
Free farm	n.a.	n.a.	2.22***	2.32***
Village farm	n.a.	n.a.	0.47	2.96***
Household structure				
Household size	−0.54***	−0.16	−0.085	−0.30***
Female head	9.02***	3.06**	0.55	1.18*
Males <5–7	−1.8***	−0.44	0.063	−0.56***
Males 5–9	−1.35*	−1.27***		
Males 15–19	−1.11	−0.71	−0.10	−0.24
Males 20–59	−0.098	−1.09**	0.088	0.36
Males >60	−0.32	0.88	0.39	0.44
Females <5–7	−0.86	0.16	0.34	−0.43**
Females 5–9	0.35	−0.20		
Females 15–19	−2.86***	−0.76	−0.20	−0.12
Females 20–59	0.43	0.045	0.0021	0.0096
Females >60	−1.81	−3.53***	0.13	0.25
Parents' education				
Mother middle/secondary	−35.45***	−30.58***	−1.43***	−0.41
Father secondary	2.75	−7.26***	−0.6	0.43

Community variables				
Primary school, girls	2.43	−2.41	−0.67	−0.94
Primary school, boys	0.90	5.43***		
Middle school			−1.43***	−0.98*
Secondary school			−1.53**	−1.88***
Public transport	−1.11	−1.34**	−0.46	−1.72***
Ln male wage	0.19	−0.14	0.06	0.30***
Residual (log consumption)	0.95***	0.40*	0.027	0.49***
Sample size (number of censored observations)	471 (323)	436 (284)	1,263 (720)	1,122 (702)
Log likelihood	−847.78	−776.32	−2,694.92	−2,129.33

*Significant at the 12 percent level.

**Significant at the 10 percent level.

***Significant at the 5 percent level.

n.a., Not applicable.

Note: Tobit marginal effects conditional on censoring. Regressions included region, religion, and ethnicity dummies. Marginal effects are evaluated at sample means based on tobit estimates. Dependent variable is hours of child labor on the household farm. "Participation probabilities" refers to marginal effects for the probability of being censored; "hours conditional on work" refers to marginal effects conditional on censoring. Regressions included region, religion, and ethnicity dummies. Some regions in Ghana were dropped because they coincided with ethnic groups. If the *t*-test on the residual of log consumption is significant, the null of exogeneity of consumption is rejected. Blank cells indicate that the variable was insignificant and was dropped from the equation in the specifications that are reported.

fact that boys work considerably longer hours than girls on average (table 2). For both boys and girls, hours of work fall significantly with household size. When additional regressors are included (tables 6 and 7), all of these effects persist except the effect of household size on girls' work, which becomes insignificant. For both boys and girls, the significant coefficients take signs consistent with our theoretical framework. As in Ghana, the distinction between renting or sharecropping and ownership is significant.

Discussion of Results

The main result is that the hypothesis that farm size has a positive effect on child labor cannot be rejected. That these results hold for both Ghana and Pakistan is striking. The effect is statistically significant for girls. With a larger data sample, it may be significant for boys' work: the interpretation of a coefficient for boys that is not significantly different from zero is ambiguous.

The finding that girls' hours of work are increasing in farm size signals imperfections in land and labor markets. It is consistent with imperfect credit markets, the effects of which are overwhelmed by land and labor market effects. Why is the result stronger for girls than for boys? One possibility is that girls are less of a perfect substitute for hired workers than are boys. Another explanation is that the returns to education for boys are more favorable than for girls, with the gender difference in education returns overwhelming any gender difference in experience returns.[16] This effect may be reinforced by social attitudes toward girl's work, which often harden with status in rural areas, land being an important correlate of status. A third possibility is that parents prefer to invest in sons because boys traditionally look after their parents in their old age (except, possibly, among the Akan in Ghana).

Substitution effects are often larger for girls (and women) than for boys (and men). In member countries of the Organisation for Economic Cooperation and Development, for example, female labor supply appears to be more elastic than male labor supply (see Killingsworth and Heckman 1986).

The other key variable in the analysis is household consumption, X_1, which is insignificant for two of the four samples and has the expected negative effect on child work for boys in Pakistan and girls in Ghana (the elasticities are -0.66 for Pakistani boys and -0.20 for Ghanaian girls). Consider the marginal effects reported in tables 6 and 7. In Pakistan an increase in consumption of 10 percent is associated with a reduction in the probability of boys' work of 5 percentage

16. The greater the returns to work experience relative to the returns to school, the greater the probability that a child works, other things being equal. If the relative return to experience is increasing in farm size (for example, because the child who works in period 1 inherits the farm in period 2), the coefficient on farm size may be positive. In this sense these dynamic effects reinforce the incentive effect, having the same sign. Returns to experience would be expected to be larger for boys if they are more likely than their sisters to inherit the farm. The fact that the farm size coefficient is more positive for girls indicates that the returns to education are even more favorable for boys than for girls.

points. Conditional on working, the same change in expenditure is expected to reduce hours of work by 1.2 per week (average hours are 15 per week). The corresponding effects for girls in Ghana are 2 percentage points and 0.3 hours per week. (Weaker income effects would have emerged had simultaneity bias not been accounted for.)

Effects on Schooling and Wage Work

The equations were reestimated with the dependent variable defined as school attendance (probit) and school hours (tobit). In Ghana there is no wealth paradox in schooling: acreage of farm land is insignificant in the equations for both boys and girls (table 8).[17] In Pakistan, however, the wealth paradox is evident for school attendance just as for farm labor, for girls and not boys. Girls in households with larger farms are less likely to attend school and, conditional on attendance, more likely to spend fewer hours at school. Land tenancy type has significant effects in both countries. The measure of income is positive and statistically significant in the schooling equations for boys and girls in Ghana and Pakistan. Thus income effects on school attendance and school hours are larger and more precisely determined than income effects on child labor. This is a fairly pervasive finding in the data for developing economies (see Bhalotra and Tzannatos 2002, for example).

Children in Ghana do not engage in wage labor. A substantial fraction of children in Pakistan do. Is the increase in farm work associated with increasing farm size observed for girls associated with a reduction in wage work, or does it reflect an increase in total work? To investigate this, the equations for Pakistan were reestimated with the dependent variable defined as the sum of hours in wage and farm work.

A table of results is available from the authors; only the main finding is reported here. Total hours of work of girls increases with increasing farm size. Indeed, the marginal effect on farm size is larger. These results are consistent with the results for schooling: the evidence is unambiguous that other things equal, girls in Pakistan are more likely to work and less likely to attend school when they come from land-rich households.

Other Covariates

Children from larger households are not more likely to work or to work harder than other children (tables 6 and 7). Land tenure type (mode of operation) has significant effects on child labor for a given acreage. No other study of child labor appears to have investigated this variable. Female headship significantly increases child labor in every case except that of boys in Ghana. The size of this effect is much larger in Pakistan than in Ghana, although the proportion of

17. The tobit results are discussed but not reported herein; they are available from the authors.

TABLE 8. Child Participation in School: Marginal Effects

Variable	Boys in Pakistan	Girls in Pakistan	Boys in Ghana	Girls in Ghana
Child characteristics				
Age	−0.045***	−0.022**	0.128***	0.284***
Age squared			−0.005***	−0.014***
Child of head	−0.074	−0.135*	−0.031	−0.009
Household resources				
Ln per capita food expenditure	1.163***	0.83***	0.321***	0.239***
Acres $\times 10^2$	−0.001	−0.002***	0.001	−0.002
Acres$^2 \times 10^4$			0.00	0.00
Farm organization				
Number of farms			−0.007	0.001
Rent	0.007	0.133**	−0.032	−0.11*
Sharecrop	0.024	−0.013	0.008	0.06
Free farm	n.a.	n.a.	0.09***	0.026
Village farm	n.a.	n.a.	−0.163***	−0.198***
Household structure				
Household size	0.036***	0.015**	0.007	0.012*
Female head	−0.251		−0.031	0.058
Males <5–7	0.812***	0.066	−0.065	−0.208
Males 5–9	0.327	−0.058		
Males 15–19	−0.356	−0.434	−0.451***	−0.215
Males 20–59	0.305	0.009	−0.729***	−0.813***
Males >60	0.118	−0.507	−0.756***	−0.254
Females <5–7	0.947***	0.412	−0.089	−0.24
Females 5–9	0.362	0.043		
Females 15–19	0.408	0.859***	0.065	−0.401*
Females 20–59	−0.659	−0.486	−0.683***	−0.713***
Females >60	−0.051	0.143	−0.848***	−0.695***
Parents' education				
Father primary education	0.049	0.024	0.104***	0.187***
Father middle school education	0.189***	0.341***		

Father secondary school education	0.108	0.354***	0.15***	0.232***
Mother middle or secondary education	−0.245	0.321**	0.111***	0.11***
Community variables				
Primary school girls	0.022	−0.457***	0.177***	0.046
Primary school boys	−0.018	0.12		
Middle or secondary school	0.003	−0.028	0.029	0.041
Public transport	0.09*	0.002	−0.064*	−0.086*
Ln male wage	−0.411***	−0.087	0.041	−0.023
Residual (log consumption)	−1.144***	−0.856***	−0.277***	−0.172*
Sample size (observed probability)	462 (0.73)	420 (0.26)	1373 (0.76)	1230 (0.67)
Log likelihood	−209.69	−161.31	−573.38	−613.78

*Significant at the 12 percent level.

**Significant at the 10 percent level.

***Significant at the 5 percent level.

n.a., Not applicable.

Note: Probits with dependent variable defined as unity if the child is in school and as zero otherwise. Estimates are marginal effects. Standard errors are suppressed to conserve space. Regressions include region, religion, and ethnicity dummies (not shown). Blank cells indicate that the variable was insignificant and was dropped from the equation in the specifications that are reported.

households headed by women is much larger in Ghana (30 percent versus less than 3 percent).

In Pakistan the age–gender composition of the household has some interesting and large effects; the corresponding effects in Ghana are weak. Father's secondary education significantly reduces girls' work in Pakistan but has no effect on the labor of the other three groups. Mother's secondary education tends to reduce child hours of work in both countries. In Ghana this effect is restricted to boys; in Pakistan it is significant for boys and girls and of similar magnitude. These findings reinforce a growing literature on the importance of female education in achieving positive outcomes for children across a range of countries (see Sen 1999, Bhalotra and Tzannatos 2002, for example).

VI. Conclusions and Policy Implications

In both Ghana and Pakistan the daughters of land-rich households are more likely to work than the daughters of land-poor households, even after controlling for household resources and other relevant household, child, and community characteristics.[18] Introducing control variables mitigates the paradoxical patterns in the data for boys. The estimates are consistent with the hypothesis that the wealth paradox can be explained in terms of imperfections in land and labor markets. This effect appears to dominate any effect of credit market imperfections.[19]

The analysis has significant implications for public policy:

- Given that the majority of working children in developing economies work on family-run farms, some of the policies that have recently received attention from economic theorists and journalists interested in child labor (minimum wage legislation, trade sanctions) have limited direct relevance to the problem.
- The results highlight the gender differential in work and school participation and identify gender differences in the determinants of child labor. They are a useful guide to interventions designed to close the gender gap. In Pakistan, where the gender gap is enormous, closing the gap would substantially reduce overall child work participation rates.
- In a dynamic model of child labor, the decision to send a child to work today depends not only on current considerations, such as the marginal productivity of child work on the farm, but also on expected returns to work compared with alternatives, such as school attendance. The finding

18. In Pakistan (but not in Ghana) girls' school attendance is also decreasing with acreage of farmland.

19. Recall that the estimates are based on a sample of households that own or operate land. Incorporating landless households into the analysis may strengthen the wealth paradox at the same time as it enhances the opposing effect of liquidity constraints.

that farm size increases child labor suggests that at given levels of household income, the return to work relative to the return to school is a significant determinant of child labor, especially among girls. A natural policy implication is therefore to invest in raising the returns to education. For girls, in addition to general investments in improving school supply, such measures may include providing subsidies to parents conditional on girls attending school, reducing labor market discrimination against women and girls, and raising awareness to reduce inhibiting social norms.

- Policies that improve the functioning of labor and land markets in rural areas will reduce child labor, especially that of girls. Given the recent expansion of microcredit programs, it is pertinent to note that developing rural financial markets may have positive spillover effects, encouraging development of land and labor markets.[20] The growth of rural factor markets will not only counter the substitution effects highlighted here, it may also generate overall income growth and reduce rural inequalities.
- The marginal effects associated with acreage of farmland are small. Though the effects of land tenancy type are larger, it is difficult to see how policy interventions can directly affect land contractual forms. The largest marginal impact in the estimated equations is associated with post-primary education of mothers (remarkably, this is the case for both boys and girls in both Pakistan and Ghana). Policy resources are most effectively directed here. Research conducted using representative household survey data from developing economies suggests that educated women have fewer children and invest more in their quality (or human capital). Investing in women's education would not only directly reduce child labor and increase schooling of the current generation, it would also have beneficial impacts on the next generation of children. Other variables that have relatively large marginal effects on child labor include female headship, fathers' education (secondary and higher), and household income.

Appendix. Model Specification

Consider a peasant household containing parents and children. Assume for simplicity that parents always work and that the household does not hire out labor. Assume, as is common in the human capital literature, that children do not bargain with their parents.[21] Divide the life span of the household into two

20. Credit may facilitate lumpy purchases, such as purchases of land. By creating alternative ways of storing wealth, it may encourage land sales. On the more general subject of interlocked factor markets and rural power structures, see, for example, Basu (1997) and Ray (1998).

21. Young children's only fallback option would seem to be to run away from home. This may be thought especially unlikely among land-owning households because children may expect to inherit the land if they remain attached to the household.

periods. In the first period, parents produce output on the farm using land, their own labor, and possibly their children's labor. During this period the children may also attend school. In the second period, the children have grown up and may even have left the family home, but incomes continue to be pooled and the household continues to value their consumption as part of the household's total.

In the first period, subscripted 1, household income (Y) is given by a farm production function:

$$Y_1 = f_1(A_0, A_{r1}, L_{p1}, L_{c1}, L_{h1}) - w_{h1}L_{h1} - p_{r1}.A_{r1}, \tag{A1}$$

where A is land, L is labor, w is a wage, and p is a price. Subscripts o and r distinguish owned and rented land area; subscripts p, c, and h denote parents, children, and hired-in labor. Under imperfect labor markets, hired labor is not a perfect substitute for family labor. Similarly, under imperfect land markets, owned and rented land are not perfect substitutes. For this reason the types of land and labor appear as distinct arguments in the production function in equation A1.

In the second period, the children may have left home, and their contribution to family income is separate from household farm production. Household income is then given by

$$Y_2 = f_2(A_0, A_{r2}, L_{p2}, L_{h2}) + w_{c2}(S, L_{c1}).L_{c2} - w_{h2}.l_{h2} - p_{r2}.A_{r2}, \tag{A2}$$

where w does not have to be an explicit wage: if the child grows up to work on his or her own farm, w is the marginal product. In the second period the child's wage is allowed to be a function of his or her first-period labor supply (L_{c1}) and schooling (S). Equation A2 therefore captures the dynamic effects of child labor on both the accumulation of work experience and the reduction in educational capital.

The household utility function is assumed to be time separable:

$$U = U_1(X_1, L_{p1}, L_{c1}, S) + U_2(X_2, L_{p2}, L_{c2}), \tag{A3}$$

where X is consumption. The household inherits some (positive or negative) financial wealth, K_0, from a period zero that is not modeled. Financial wealth in period 1, K_1, is then given by

$$K_1 = K_0 + Y_1 - X_1 - C(S), \tag{A4}$$

where $C(S)$ is the cost of schooling, and the price of consumption is normalized to unity. The financial wealth available to the household in period 2, K_2, will depend on K_1, but it will also depend on the household's access to financial services. Under imperfect capital markets, the interest rate facing the household, r, will depend on its wealth. For households with negative financial wealth (debt), the interest rate will also depend on characteristics that affect their perceived

creditworthiness, including personal characteristics (Z) and ownership of land (A_O).[22] The interest rate, r, is therefore a function of A_O, K_1, and Z, implying the following budget constraint for period 2: $X_2 = Y_2 + K_1.(1 + r[K_1, A_o; Z])$, which can be written as

$$X_2 = Y_2 + g(K_1, A_o; Z). \tag{A5}$$

The household attempts to maximize the utility function A3, subject to the technological and financial constraints described in A1, A2, A4, and A5. This gives equation 1 in the text.

First-Order Conditions

The first-order conditions relevant to the child labor decision are as follows:

$$\partial U_1/\partial X_1 - \lambda_1 = 0 \tag{A6}$$

$$(\partial g/\partial K_1).\lambda_2 - \lambda_1 = 0 \tag{A7}$$

$$(\partial U_1/\partial L_{c1}) + (\partial F_1/\partial L_{c1}).\lambda_1 + \lambda_2.(\partial W_{c2}/\partial L_{c1}).L_{c2} \leq 0 \tag{A8}$$

$$(\partial U_1/\partial S) - (dC/dS).\lambda_1 + \lambda_2.(\partial W_{c2}/\partial S).L_{c2} \leq 0 \tag{A9}$$

where λ_1 and λ_2 are the Lagrange multipliers on A4 and A5, and the inequalities in A8 and A9 become equalities when child labor and schooling, respectively, are positive. The work–leisure choice is made with reference to equation A8, which states that the value of the marginal product of child labor in the first period plus the value of the wage increase in the second period (arising from work experience) must be less than or equal to the marginal (dis)utility of work. Equation A9 has a similar interpretation for the choice between leisure and school attendance. Combining equations A8 and A9 gives

$$\begin{aligned}([\partial U_1/\partial L_{c1}] - [\partial U_1/\partial S]) + \lambda_1.([\partial F_1/\partial L_{c1}] + [\partial C/\partial S]) \\ = \lambda_2.L_{c2}.([\partial W_{c2}/\partial S] - [\partial W_{c2}/\partial L_{c1}]),\end{aligned} \tag{A10}$$

which is the relevant condition if hours of child leisure are fixed and one is interested in the reallocation of an hour of child time from work to school. Note that child labor supply in period 1 will be zero if equation A8 is satisfied by an inequality when evaluated at zero hours. This would be equivalent to the implicit wage being below the reservation wage.

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