ORPHANS IN AFRICA: PARENTAL DEATH, POVERTY, AND SCHOOL ENROLLMENT*

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We examine the impact of orphanhood on children's school enrollment in 10 sub-Saharan African countries. Although poorer children in Africa are less likely to attend school, the lower enrollment of orphans is not accounted for solely by their poverty. We find that orphans are less likely to be enrolled than are nonorphans with whom they live. Consistent with Hamilton's rule, the theory that the closeness of biological ties governs altruistic behavior, outcomes for orphans depend on the relatedness of orphans to their household heads. The lower enrollment of orphans is largely explained by the greater tendency of orphans to live with distant relatives or unrelated caregivers.

In a follow-up to the 2001 United Nations General Assembly Special Session on HIV/AIDS, UNAIDS researchers noted that nearly 40% of the countries that are suffering from a generalized AIDS epidemic lack a national policy to support children "orphaned or made vulnerable by AIDS" (Joint United Nations Programme 2003:12). This is an important issue in sub-Saharan Africa, where the death of prime-aged adults from HIV/AIDS has led to pronounced concentrations of orphans. Recent Demographic and Health Surveys (DHS) have indicated that in Uganda, Malawi, Mozambique, Zambia, and Zimbabwe, nearly 15% of all children under age 15 have lost one or both parents, and more than 20% of 15-year-old children in these countries are orphans.

Are orphans more vulnerable than other poor children in sub-Saharan Africa? Understanding the risks that orphans face is important for policy: if extended families insure each other, then governmental policies may not need to target orphans specifically. Households could be singled out for help on the basis of other indicators (income poverty, for example).[1] On the other hand, if holding all else equal, orphans are at risk, then governments may be well advised to target orphans specifically when they design policies to improve such outcomes as school enrollment.

In this article, we examine the impact of orphanhood on the living arrangements and school enrollment of children in sub-Saharan Africa, using data from 19 DHS studies that were conducted in 10 countries between 1992 and 2000. We find that orphans in Africa are significantly less likely than nonorphans to be enrolled in school. We focus on school enrollment for several reasons. Education is crucial to development. Declines in school investments that result from parents' deaths have the potential to reduce the living standards of a large number of African children throughout their lives and to slow African growth further. In addition, because school enrollment is child specific, we sidestep

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1. Urassa et al. (1997) and Lundberg and Over (2000) argued against targeting on the basis of orphanhood. Urassa et al. stated that in rural Tanzania, many nonorphans live in poorer households than do orphans. Lundberg and Over contended that the "indiscriminate provision of assistance [to orphans] is both fiscally irresponsible and socially inefficient" (p. 13).

the problems associated with attributing expenditures that are recorded at the household level to the consumption of particular members (such as orphans). The use of data on school enrollment allows us to test for the differential treatment of orphans and nonorphans living in the same households.

There are several reasons why school enrollment may be lower for orphans than for nonorphans. Orphans may be more likely than nonorphans to live in poor households and, in the presence of credit constraints, lower household wealth may reduce investment in schooling. Alternatively, orphans may have lower returns to education than nonorphans. Furthermore, there may be intrahousehold discrimination against orphans that depresses investment, even with controls for household wealth and the return to education included.

The first of these hypotheses—that lower schooling among orphans is the result of poverty—has gained support in research. Foster et al. (1995) argued that orphans are not at any particular disadvantage over equally poor nonorphans. Lloyd and Blanc (1996:290) stated that, with a control for wealth, "the death of a parent appears to make relatively little difference to children's educational chances." Ainsworth and Filmer (2002) concluded that although generalizations across countries are difficult, gaps in enrollment between orphans and nonorphans are dwarfed by gaps in enrollment between poor and nonpoor children. A related line of research has examined whether orphans are well-insured against the death of their parents through kinship-based child-fostering systems (Isiugo-Abanihe 1985). Kamali et al. (1996:509) argued that orphans in southwestern Uganda are "generally well looked after" within the community and by extended family members. Lundberg and Over (2000) pointed to the role played by the network of family members and friends, suggesting that wealth within such networks is used as a form of insurance in times of crisis. In this view, the death of adults adversely affects resources available to all children in a kinship—nonorphans as well as orphans—but there are no additional effects on investments in orphans.

The second hypothesis—that orphans have lower returns to education than do nonorphans—is also plausible, although difficult to test. If deaths of adults are concentrated among poorer households, then the children who are "selected" into orphanhood may have experienced, on average, more deprivation in early childhood or be in worse health than nonorphans. Orphans may also be more likely than nonorphans to have HIV/AIDS because of maternal-child transmission, which could depress schooling. In addition, the returns to schooling could be reduced by the experiences surrounding the death of a parent, including time lost from school during the parent's illness and death and emotional scarring that may compromise the child's ability to learn. Although the effects of orphanhood on returns to education may be important, we know of no studies on Africa that have investigated this issue.[2] The lack of longitudinal data on the cognitive ability, health, and education of children who become orphans precludes direct tests of the hypothesis that the children who become orphans are less able.

The third hypothesis posits that there is discrimination within households against orphans. Specifically, we consider the argument that adult caretakers are less likely to invest in children who are more distantly related, holding both household wealth and the returns to schooling fixed. Adults may be willing to invest more in their own children, both because their affinity to their own children is greater and because they are more likely to receive transfers from their children later in life. The idea that parents invest more than nonparents is also consistent with arguments from evolutionary biology. Hamilton (1964a, 1964b) hypothesized that altruistic behavior between any two individuals is an increasing function of the degree of genetic relatedness between them, so that one's own children would be favored over grandchildren, nieces, or nephews, who, in turn, would be favored

2. See Foster and Rosenzweig (1996) for a discussion of the impact of returns to schooling on educational investment.

over more distant relatives and nonrelatives (see Daly and Wilson 1987 for a review). These issues are relevant to African orphans, since the death of even one parent often results in changes in living arrangements and the control of household resources. African children who continue to live with a surviving parent may be absorbed into households in which other adults control the available resources or may gain a stepparent who does not have the same incentives as the biological parent they lost. The death of a mother may leave children especially vulnerable, even among those who continue to live with their father and who experience no reduction in income. Research has indicated that household expenditures on child-related goods—particularly healthful foods—are lower when a child's birth mother is absent (Case, Lin, and McLanahan 2000) and that mothers invest more in children's health than do stepmothers (Case and Paxson 2001). Gertler, Levine, and Martinez (2003) found that the deaths of fathers and especially mothers result in worse education and health outcomes for Indonesian children, and Bishai et al. (2003) reported that biological relatedness is an important predictor of the quality of care offered to Ugandan children.

These different sources of disadvantage for orphans are relevant to the related question of whether orphanhood depresses investments more for female than for male orphans. There is a presumption in much of the literature that female orphans are at a disadvantage. A 2002 report from the World Bank (2002:21) stated that "girls are more likely than boys to be retained at home for domestic work when household income drops due to AIDS deaths or to care for sick relatives."[3] Another report (UNAIDS 2002:48–49) noted that "one of the more unfortunate responses to a prime-age-adult death in poorer households is that of removing the children (especially girls) from schools." To the extent that female orphans are at a disadvantage, it could be because the deaths of adults reduce household resources and girls in poorer households are generally less likely to attend school than are boys. Or, it could be that foster parents discriminate against female orphans more than male orphans.

In what follows, we examine the impact of orphanhood on school enrollment using data from 19 DHS studies that were conducted in 10 sub-Saharan African countries between 1992 and 2000. We first describe the data and present descriptive evidence on the prevalence rates of orphanhood and the living arrangements of orphans. We then discuss the ways in which orphanhood could affect school enrollment. We examine (and reject) the hypothesis that the reduced school enrollment of orphans is attributable to lower household wealth. Instead, after controlling for resources, we find that orphans are less likely to be in school than are nonorphans, including nonorphans with whom they live. Finally, we test the hypothesis that the lower schooling of orphans can be explained by the degree of relatedness of the orphan to the household head. We find that children who live in households that are headed by nonparental relatives fare systematically worse than those who live with parental heads and that those who live in households that are headed by nonrelatives fare worse still. Much of the gap between the schooling of orphans and nonorphans is explained by the greater tendency of orphans to live with distant relatives or unrelated caregivers. Because we have no information on the ability of orphans, either at the time of the survey or when the children first became orphans, we cannot rule out the hypothesis that orphans receive less investment because their returns to education are lower. However, unless orphaned children with lower returns to schooling are

3. However, this report was internally inconsistent in its stance on the effects of orphanhood on the school enrollment of girls versus boys; it stated elsewhere that "in most cases, the gender gap among double orphans is similar to the gender gap among children living with their parents" (World Bank 2002:18). Other studies have found no evidence that female orphans are systematically disadvantaged (Ainsworth and Filmer 2002; Lloyd and Blanc 1996).

systematically placed with less closely related caregivers, the evidence supports the hypothesis that there is within-household discrimination against orphans.

This article extends earlier research on the effects of orphanhood and schooling in Africa that returned mixed evidence. Lloyd and Blanc (1996), who used DHS data from seven African countries, found evidence that orphans in some countries were less likely to be in school than were nonorphans (after controlling for a large number of other household characteristics), although the differences in enrollment rates between orphans and nonorphans were often not significant. Lloyd and Blanc used several of the same data sets that we use in our study, but they worked with samples that contained only one randomly selected child from each household. The use of only one child per household results in smaller sample sizes and precludes the examination of whether orphans fare differently than nonorphans who are living in the same household. In addition, Lloyd and Blanc did not distinguish double orphans from those who lost one parent. Their regressions included separate indicators of whether the child's mother and father were deceased but did not include interactions of maternal and paternal death, implicitly restricting the effect of double orphanhood to be the sum of the effects of maternal and paternal orphanhood. Our results indicate that the effect of double orphanhood on schooling is typically greater than the sum of the effects of maternal and paternal death. The results presented here benefit from the use of more, and more recent, data and from techniques that enable us to examine the intrahousehold allocation of educational resources to different types of children.

More recently, Bicego, Rutstein, and Johnson (2003) and Ainsworth and Filmer (2002) have used African DHS data to examine the schooling of orphans. Our results are similar to those of Bicego et al., who used data from 17 countries and found, as we do, that orphanhood depresses schooling, especially for double orphans. The results in Ainsworth and Filmer are at odds with those presented in Bicego et al. and this article. Ainsworth and Filmer argued that there is a great deal of heterogeneity across countries in the effects of orphanhood on schooling and that in some countries, orphans are more likely to be in school than are nonorphans. However, their evidence was based on simple comparisons of the fractions of orphans and nonorphans in school. As we discuss later, their lack of adjustment for the child's age—which is correlated with both orphan status and schooling—resulted in underestimates of the (negative) effect of orphanhood on schooling. More generally, our research differs from both Bicego et al.'s and Ainsworth and Filmer's in that we examine different hypotheses for the source of the disadvantage that orphans face and specifically test for within-household discrimination against orphans and the role of living arrangements in orphans' disadvantage.

Our research is also related to the large literature on child fostering in Africa, which has noted high rates of fostering even among nonorphans in Africa (see Bledsoe and Brandon 1987; Bledsoe, Ewbank, and Isiugo-Abanihe 1988; for a more recent summary of the literature on fostering, see Akresh 2003). An important question posed by this research is whether children who are raised by people other than their parents fare worse. The analysis of this issue is complicated by the fact that living but absent parents may strategically choose to have their children fostered by others to achieve specific objectives. For example, a child may be sent from home to work or to live in a location where it is possible to attend school. The joint nature of these decisions makes it difficult to identify the effects of fostering on child outcomes.

RATES OF ORPHANHOOD AND LIVING ARRANGEMENTS

Data and Definitions

We used information for children aged 14 and younger, collected in 19 DHS studies from 10 countries. We selected eight countries in East and Southern Africa because of the high prevalence rates of adult HIV/AIDS in these areas. For the purposes of comparison, we

Table 1. Rates of Orphanhood, DHS Data (all children aged 14 and younger whose parents were coded as being alive, deceased, or with unknown status)

Survey	Number of Children	Maternal Orphans	Paternal Orphans	Double Orphans	Orphans of Any Type
Ghana, 1993	10,395	0.017	0.042	0.018	0.077
Ghana, 1998	9,783	0.019	0.036	0.008	0.063
Kenya, 1993	18,420	0.014	0.051	0.014	0.080
Kenya, 1998	16,881	0.018	0.065	0.019	0.102
Malawi, 1992	11,172	0.030	0.046	0.017	0.092
Malawi, 2000	28,888	0.029	0.065	0.023	0.117
Mozambique, 1997	19,891	0.042	0.067	0.025	0.135
Namibia, 1992	11,123	0.015	0.050	0.030	0.095
Niger, 1992	16,061	0.027	0.037	0.007	0.071
Niger, 1998	17,701	0.020	0.033	0.013	0.066
Tanzania, 1992	20,851	0.019	0.046	0.023	0.088
Tanzania, 1996	17,930	0.023	0.055	0.017	0.095
Tanzania, 1999	8,339	0.022	0.053	0.016	0.091
Uganda, 1995	17,618	0.030	0.080	0.028	0.138
Uganda, 2000	18,449	0.029	0.072	0.027	0.127
Zambia, 1992	15,780	0.022	0.050	0.012	0.084
Zambia, 1996	18,107	0.029	0.074	0.023	0.126
Zimbabwe, 1994	13,244	0.019	0.065	0.016	0.100
Zimbabwe, 1999	11,999	0.026	0.093	0.034	0.153

Note: Rates were calculated using survey weights provided in the DHS.

added two West African countries—Ghana and Niger—where HIV/AIDS rates are lower. A complete list of country-years is included in Table 1.[4]

An advantage of using the DHS is that the surveys are largely identical across countries and over time within countries. The surveys collected data on household living arrangements, the quality of housing, the ownership of durable goods, years of completed education and current enrollment status for all children in the household, and the vital status of their parents. The sample in each country-year is typically a stratified random sample of all non-institutional households, which allowed us to assess the prevalence of orphanhood in non-institution-based populations. (In some country-years, sections of countries were excluded because of civil unrest or excessive violence. The DHS web site [see www.measuredhs.com] provides details.) Because the DHS does not include children who live in orphanages or on the street, the rates of orphanhood that we compute are likely

4. Nigeria has a high rate of AIDS and orphanhood and conducted a DHS in 1999 that contained information on the vital status of children's parents. We chose not to use this survey because of the apparent low quality of these data. The data collection for this survey was not supervised by Macro International, which conducted the other surveys, and we were concerned that the same protocols may not have been used by the data collectors as in other countries. South Africa also conducted a DHS, but we were unable to gain permission to use it at the time we were conducting our analyses. We did not include countries such as Chad and the Central African Republic, despite their relatively high rates of orphanhood, because recent civil conflict may have disrupted their educational systems.

to be too low (although some orphans may have been reported in error as the biological children of their adoptive or foster parents). There are no reliable national estimates of the number of African children who live in institutions or are homeless.

The surveys asked a responsible adult to list each household member and to indicate the vital status of each child's parents (living, deceased, or unknown). There is no information on the cause of parental death, so AIDS orphans cannot be separated from others. If a parent was noted to be living, the interviewer found out whether the parent lives in the household. If so, the parent's household identification number was recorded so that the child's record can be linked to that of the parent.

Children are classified into four mutually exclusive categories for our analysis: nonorphans, maternal orphans, paternal orphans, and double orphans. The use of these mutually exclusive categories allows us to identify more easily the impact of the death of one parent and to separate this impact from the impact of the loss of both parents. *Nonorphans* are defined as children with two living parents, *maternal orphans* as children whose mothers were deceased and whose fathers were known to be living, and *paternal orphans* as those whose fathers were deceased and whose mothers were known to be living. Defining *double orphans* is complicated by the fact that some children had parents whose vital statuses were unknown to the respondents: 1.16% of children had mothers whose vital statuses were unknown, and 1.94% had fathers whose vital statuses were unknown. Double orphans are defined as children for whom either both parents were deceased, or one parent was deceased and the other parent's vital status was unknown, or both parents' vital statuses were unknown. (Children with one living parent and another parent whose vital status was unknown are not classified as orphans or nonorphans: 0.86% of children fell into this category.) We prefer this broad definition of double orphans because if both parents' vital statuses were unknown or if one parent was deceased and the other's vital status was unknown, it was not likely that these parents (even if alive) would have exerted any influence on their children's care.

Rates of Orphanhood

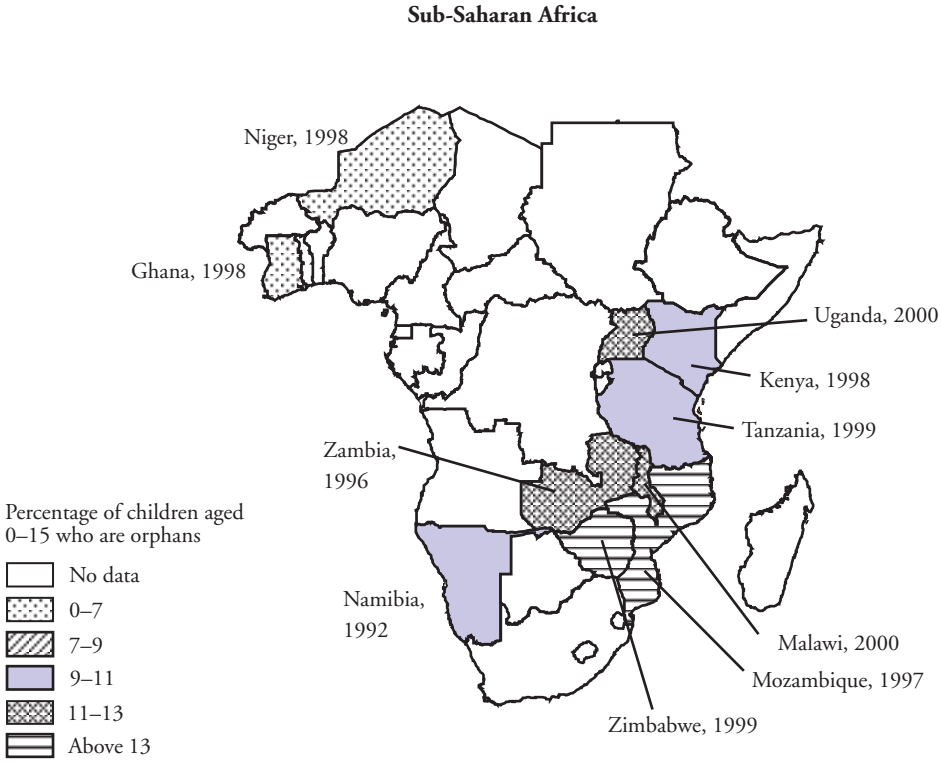
The countries we use are mapped in Figure 1. Altogether, these 10 countries account for approximately 27% of the children in sub-Saharan Africa and 50% of the AIDS orphans.[5] Seven of the 10 countries—Uganda, Kenya, Tanzania, Malawi, Mozambique, Zambia, and Zimbabwe—are in the "AIDS belt," which extends from East into Southern Africa. All these countries have orphan rates in excess of 9%, with Uganda (2000), Zambia (1996), and Zimbabwe (1999) in excess of 12%. In the countries we analyze in which the fraction of orphans is the lowest—the West African countries of Niger and Ghana—the adult AIDS rates are relatively low.

Figure 2 shows the rates of orphanhood, by the child's age, in each of the survey years we examine. A common characteristic across all countries is that rates of orphanhood increase with age, so that school-age children are at a higher risk of orphanhood than are younger children. In Mozambique (1997), Uganda (2000), Zambia (1996), and Zimbabwe (1999), a quarter or more of the 14 year olds had lost one or both parents. Interpretation of the graphs requires care because they necessarily confound age and cohort effects. In countries in which AIDS rates are climbing, rates of orphanhood among older children may be higher in 10 years than the rates shown on the graphs.

Countries differ in how rates of orphanhood have changed over time. For example, although the estimated rates of orphanhood in Uganda were high in both 1995 and 2000,

5. The fraction of AIDS orphans living in the 10 countries is based on data from UNAIDS (2000), which provides a measure of "cumulative orphans" for each country. "Cumulative orphans" are defined as the estimated number of children who lost their mother or both parents to AIDS by age 15, from the epidemic's onset to the end of 1999.

Figure 1. Rate of Orphanhood, DHS Data



the estimated rates remained stable. Uganda may have reached a saturation point in the spread of the disease. However, these results are also consistent with reports on the success of Ugandan prevention programs and the diminution of HIV prevalence rates there (see UNAIDS/WHO 2000 for a discussion). Ghana, Niger, and Tanzania also maintained steady rates of orphanhood, while in Kenya, Malawi, and, especially, Zambia and Zimbabwe, the fraction of children of each age who were orphans rose over the 1990s.

Table 1 presents the fractions of children who were maternal, paternal, and double orphans during the study period. A (nonpopulation weighted) average over all country-years indicates that 2.4% of the children aged 14 or younger were maternal orphans and that more than twice that percentage (5.7%) were paternal orphans.[6] Roughly 2% of the children lost both parents (either deceased or vital status unknown), and 10% of children lost one or both parents. The fractions of children who were maternal, paternal, or double orphans at each age (for the most recent year of data available) can be seen in Figure 3. In some countries, particularly Kenya, Namibia, Tanzania, Uganda, Zambia, and Zimbabwe,

6. Throughout the article, we treat the results for each country-year as one observation; for this reason, we do not population weight our cross-country summary statistics. However, our results are robust to population weighting. (The statistics reported for each country-year, taken individually, are population weighted to make them nationally representative.)

Figure 2. Rates of Orphanhood, by Child's Age and Year, DHS Data

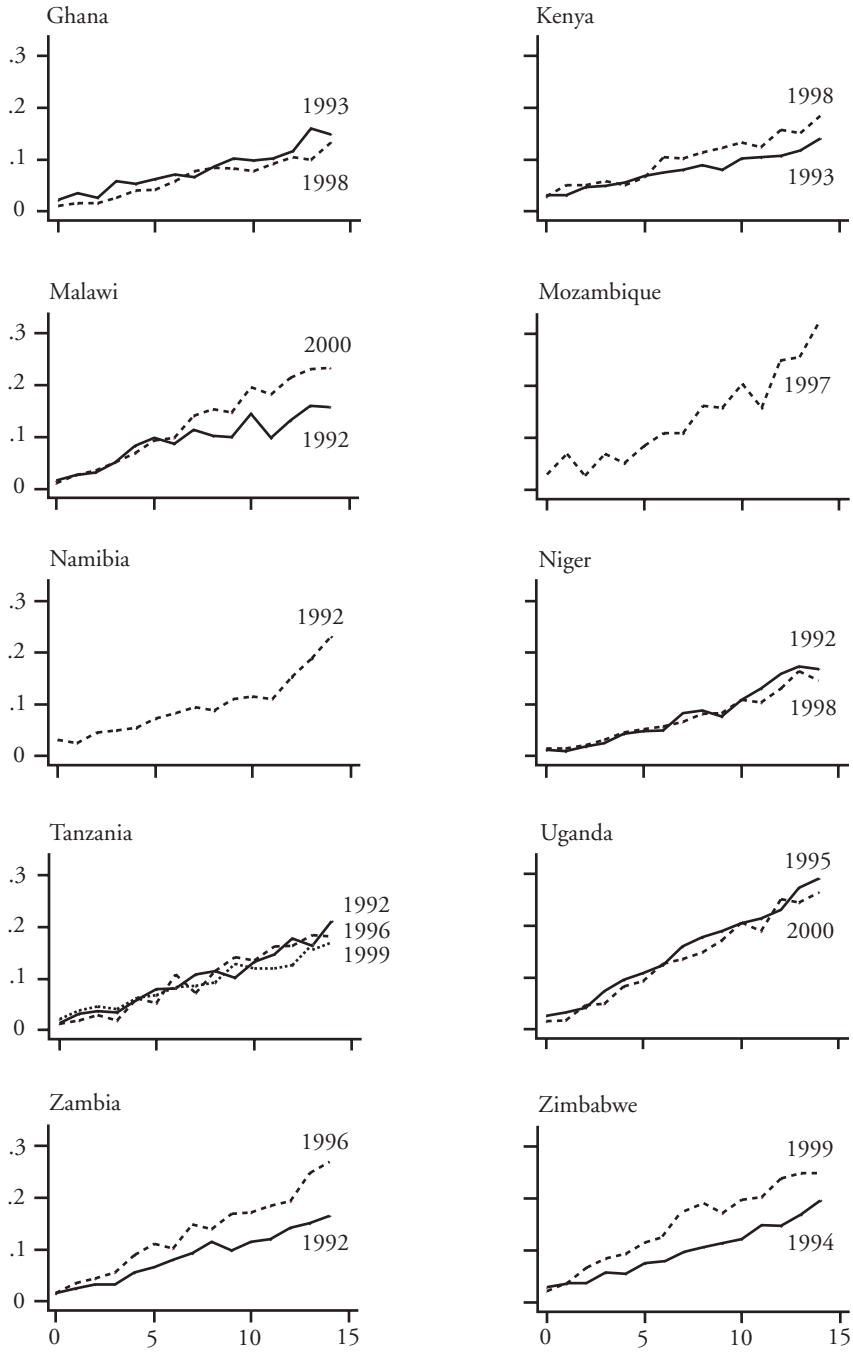


Figure 3. Rates of Paternal, Maternal, and Double Orphans, by Child's Age

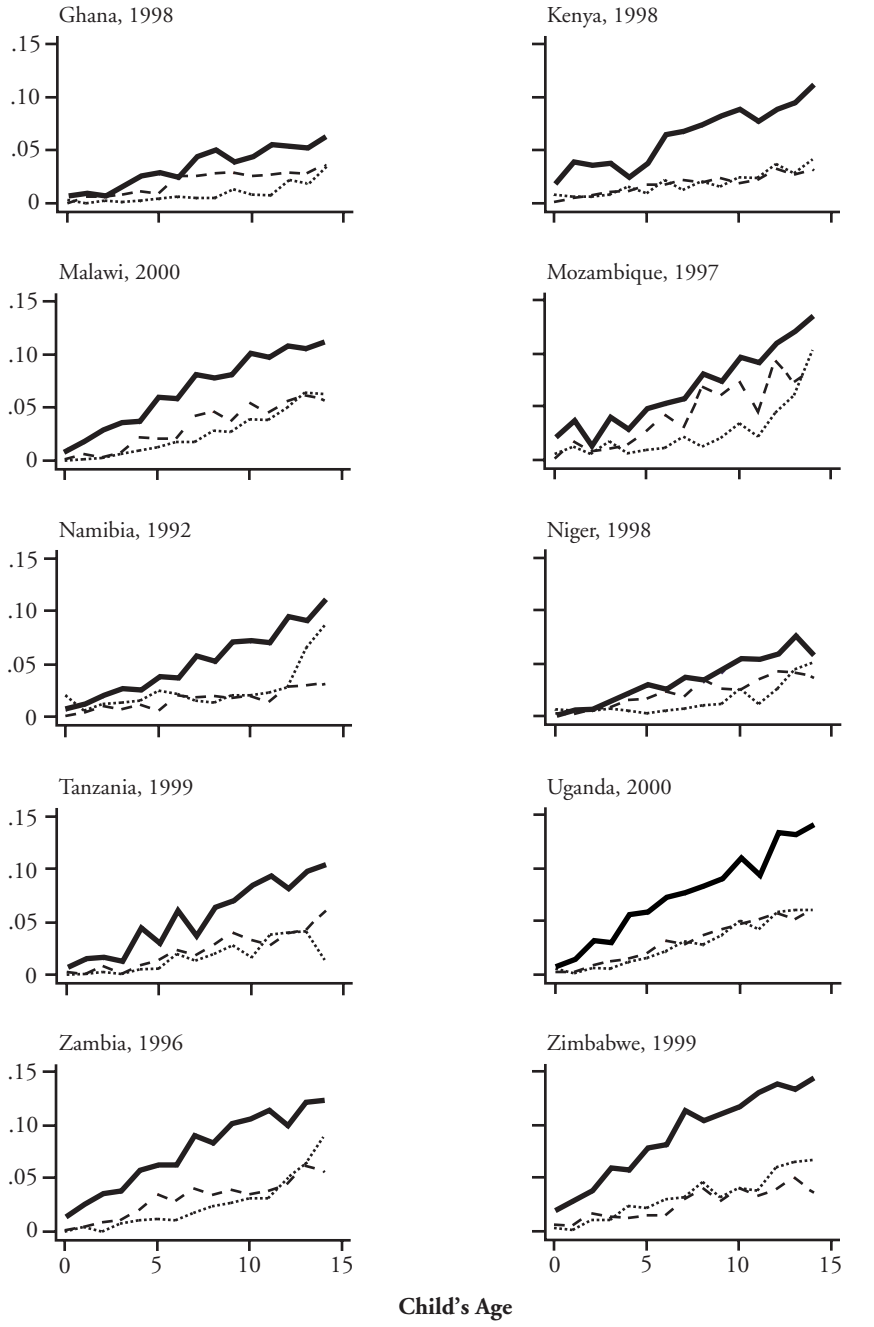


Table 2. Living Arrangements of Orphans and Other Children Aged 0–14, DHS Data

	Proportion Who Live With Their Mothers		Proportion Who Live With Their Fathers	
Survey	Nonorphans	Paternal Orphans	Nonorphans	Maternal Orphans
Ghana, 1993	0.823	0.705	0.593	0.610
Ghana, 1998	0.810	0.674	0.576	0.528
Kenya, 1993	0.900	0.849	0.661	0.707
Kenya, 1998	0.895	0.849	0.687	0.540
Malawi, 1992	0.879	0.768	0.699	0.466
Malawi, 2000	0.874	0.719	0.702	0.278
Mozambique, 1997	0.864	0.776	0.733	0.580
Namibia, 1992	0.688	0.549	0.441	0.174
Niger, 1992	0.871	0.554	0.841	0.607
Niger, 1998	0.878	0.595	0.815	0.597
Tanzania, 1992	0.842	0.735	0.748	0.543
Tanzania, 1996	0.853	0.719	0.734	0.511
Tanzania, 1999	0.849	0.642	0.742	0.430
Uganda, 1995	0.827	0.591	0.732	0.601
Uganda, 2000	0.840	0.655	0.744	0.493
Zambia, 1992	0.848	0.671	0.755	0.398
Zambia, 1996	0.860	0.697	0.745	0.413
Zimbabwe, 1994	0.814	0.678	0.576	0.388
Zimbabwe, 1999	0.804	0.637	0.597	0.463

Note: Sample weights were used to compute rates.

the fractions of children who lost their fathers were markedly larger than the fractions of children who lost their mothers. In other countries, including the two West African countries in which HIV/AIDS rates are thought to be lower (Ghana and Niger), the differential loss of fathers was small.

Living Arrangements

Children who lose a parent through death often experience additional changes in the set of adults who provide them with care. Many maternal and paternal orphans are "virtual" double orphans, who lost the care of both parents when one died. Traditions of patrilineage may dictate that paternal orphans remain with paternal relatives, rather than with their mothers; remarriage and migration among widows and widowers may also result in the separation of children from their surviving parents (see Foster 1996; Monk 2000; Ntozi and Nakayiwa 1999).

Table 2 provides evidence of the importance of "virtual" double orphans. Columns 1 and 2 show the fraction of nonorphans and paternal orphans who live with their mothers, and columns 3 and 4 show the fractions of nonorphans and maternal orphans who live with their fathers. The results highlight the importance of child fostering in Africa: consistent with other research, we find that the fraction of nonorphans who do not live

with their mothers ranges from 10% to more than 30% (Bledsoe and Brandon 1987). However, orphanhood elevates the risk of living apart from parents. In all the country-years we examine, paternal orphans (who, by definition, have mothers who are alive) are less likely to live with their mothers than were nonorphans. In many countries, such as Tanzania, these differences are large and are more pronounced in the later survey years. The relative differences in living arrangements between orphans and nonorphans are even larger for children who lost their mothers (columns 3 and 4). For example, in Zambia, only 41.3% of maternal orphans live with their fathers in 1996, compared with 74.5% of nonorphans. In some countries, such as Malawi and Tanzania, these differences became larger with time.

DETERMINANTS OF SCHOOL ENROLLMENT

The impact of a parental death on children's school enrollment depends on the ways in which orphanhood affects three determinants of schooling: the children's economic circumstances, school readiness, and relationships to adult decision makers.

The effect of a death on living standards depends on whether the deceased adult was a high earner within his or her household, whether transfers increase in response to the death, whether the household responds by placing children in foster care, and whether the households into which orphans are placed are richer or poorer than the household of origin. Although there is great interest in the extent to which investments in children are insured against the death of the children's parents, models of insurance cannot be tested without longitudinal data on children and their extended families.

Even if households provide equal treatment to all children, it is not the case that orphans and nonorphans in the population experience the same levels of investment. To the extent that the deaths of adults produce declines in household living standards, orphans will be more likely than nonorphans to experience such declines. However, the living standards of orphans relative to nonorphans will also be affected by the correlation between household income and adults' probability of survival across households within the population. Evidence from Africa indicates that, at least early in the AIDS crisis, infection rates may have been higher among richer and better-educated individuals (see Ainsworth and Semali 1998). If so, it would not be surprising to find that orphans were, on average, wealthier than nonorphans. If AIDS is becoming more of a poor person's disease—which could happen if prevention measures are more quickly adopted by wealthy persons—we would expect to see the relative living standards of orphans decline over time.

The basic assumption that investments in orphans and nonorphans who live in the same households are identical can be tested. Because many of the children who were represented in the DHS surveys lived in "blended" households that contained both orphans and nonorphans, we can use household fixed-effects models to examine whether orphans are disadvantaged relative to the nonorphans with whom they live. A finding that orphans receive lower schooling investments than nonorphans in the same household would provide evidence against the hypothesis that the "orphan disadvantage" is due solely to lower levels of household resources. The results of these tests are presented in the following section.

If the loss of a parent leaves a child less able to benefit from schooling, then even if adult decision makers treated orphans and nonorphans with similar academic promise identically, we should expect to see a smaller fraction of orphans enrolled in school. We cannot rule this factor out as a determinant of enrollment. Indeed, the DHS data do not contain information on the health or cognitive ability of children, which made it impossible for us to construct direct tests of the hypothesis that orphans face lower returns to education. However, we can examine this hypothesis indirectly, using the pattern of school enrollment we find in our data.

Finally, there may be within-household discrimination against orphans: consistent with Hamilton's rule, investments in a child may decrease as the relationship between the child and the decision-making adult in the child's household becomes more distant. However, Hamilton's rule yields clear, testable predictions on the patterns of investments we should find between orphans and the nonparental adults with whom they live. These predictions are not obvious implications of a model in which investment decisions are driven by differences in returns to education across orphans and nonorphans. We present evidence in support of this hypothesis in the final section of this article.

ORPHANS, HOUSEHOLD WEALTH, AND SCHOOL ENROLLMENT

Household Wealth

Because schooling may be related to household resources, we begin by documenting differences in household wealth between orphans and nonorphans. The DHS surveys do not contain information on income or financial wealth, but they do collect information on the number of household durables, which serves as a proxy for household wealth. The measure of durables we use is constructed from information on ownership of up to seven durable goods, including items such as refrigerators, radios, and bicycles.[7]

For each country-year, we regress the durable-goods index on an indicator that the child is an orphan and indicators for the child's age and gender. Because in subsequent sections we focus on school-aged children, we estimate these regressions using samples of children aged 6–14. The regression equation is expressed as

$$D_{ih} = \alpha_0 + \alpha_1 I(female) + \sum_{j=7}^{14} \beta_j I(age = j) + \delta I(orphan) + \varepsilon_{ih}\ , \qquad (1)$$

where D_{ih} is the durable-goods index for child i in household h, the coefficient α_1 measures the difference in durables between girls and boys, and the coefficients β_j measure the difference in durable goods between children of age j and age 6. The age indicators are important to include because age is positively related to orphanhood and may also be related to wealth. Eq. (1) is estimated by ordinary least squares (OLS), with each observation weighted by the sampling weight provided in the DHS surveys. Standard errors are corrected for heteroskedasticity within clusters.[8]

The parameter of interest here is the coefficient on the indicator for orphanhood, δ, which measures the difference between orphans and nonorphans in household durables, holding the age and gender of the child fixed. Estimates of δ, together with confidence intervals (at the 90% level), are graphed in the top left-hand panel of Figure 4. The results are summarized in the top panel of Table 3, which shows the average value of δ and its associated standard error over all country-years. On average, orphans live in poorer households than do nonorphans of the same age and gender. With the exception of Niger in 1998, the coefficient on the indicator for orphanhood is significantly less than zero in every country. Its mean value of –0.170 implies that, when age and sex are controlled, orphans live in households with 0.17 fewer durable goods, on average, than do nonorphans.

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7. The list of durables varies slightly across surveys. In most cases, information is obtained on six durables: a radio, television, refrigerator, bicycle, motorcycle, and car. The index of durables is simply the sum of the number of kinds of durables the household owned. An alternative approach was taken by Filmer and Pritchett (1999) and Ainsworth and Filmer (2002), who used the first principal component of an index created from the DHS household durables and characteristics of housing. We prefer to use the count of household durables because the units are clearly defined, which makes it possible to compare the results across countries.

8. The results are similar if the data are not weighted. The heteroskedasticity-corrected standard errors are approximately 40% larger than those with no correction.

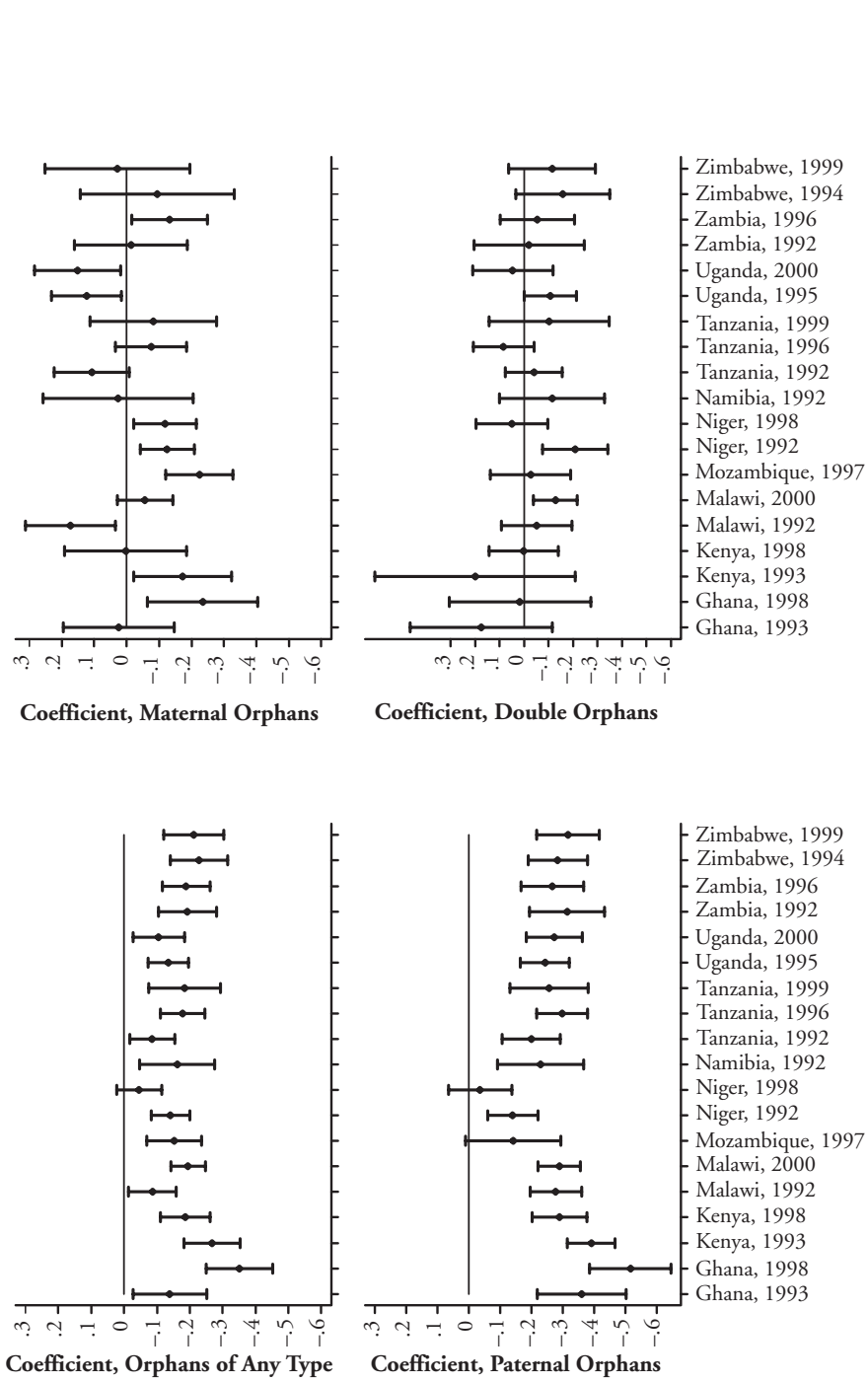


Figure 4. Regressions of Household Durable Goods on Indicators for Orphanhood and Child's Age and Sex: Coefficient Estimates and Confidence Intervals for Indicators for Orphanhood

Note: See Table 3 for details.

Table 3. Summary of the Results in Figures 4–6: Coefficients on Indicators for Orphanhood

	All Orphans	Maternal Orphans	Paternal Orphans	Double Orphans
Average Coefficients From Figure 4:	–0.170	–0.036	–0.270	–0.029
Durable Goods, No Household Controls	(0.051)	(0.095)	(0.064)	(0.122)
Average Coefficients From Figure 5:	–0.055	–0.048	–0.038	–0.121
School Enrollment, No Household Controls	(0.019)	(0.036)	(0.024)	(0.042)
Average Coefficients From Figure 6:	–0.067	–0.038	–0.049	–0.152
School Enrollment, Household Fixed Effects	(0.023)	(0.039)	(0.034)	(0.048)

Notes: This table contains unweighted means of the coefficients shown in Figures 4–6. The numbers in parentheses are the square roots of the averaged variances of these estimates. All the underlying regressions are of an outcome (either the number of household durable goods or an indicator for school enrollment) on an orphan indicator and indicators for the age and sex of the child. The results in Figure 6 are from regressions that included a set of household fixed effects. All regressions were weighted using survey weights provided by the DHS surveys. The regressions shown in Figures 4 and 5 (without household fixed effects) have standard errors that are corrected for heteroskedasticity at the cluster level.

Although orphans as a group live in poorer household than do nonorphans, this is not true of all types of orphans. The remaining three panels of Figure 4 separate orphans by type. The top right-hand panel shows regression results using samples of children who are either nonorphans or maternal orphans, with paternal and double orphans excluded. For each country-year in the top right panel, estimates of δ reveal whether, on average, children with living fathers and deceased mothers live in households with significantly fewer durable goods than do children with two living parents. The lower left-hand panel repeats this exercise for paternal orphans, and the lower right panel, for double orphans. These panels reveal that the lower living standards of orphans' households can be attributed primarily to paternal orphans. For maternal and double orphans, there is no systematic difference in the age- and gender-adjusted number of household durables for orphans and nonorphans. However, in every country-year except Niger in 1998 and Mozambique in 1997 (both of which have estimates of δ that are negative but not statistically significant), children whose fathers died live in households with significantly fewer durable goods.

Although orphans, on average, live in poorer households than do nonorphans, we find no evidence of a systematic deterioration or improvement over time in the living standards of households containing orphans. For example, the number of durable goods fell in the households of paternal orphans in Ghana, Uganda, and Zimbabwe (although not significantly), whereas the number of durable goods rose for paternal orphans in Kenya, Niger, and Zambia (again, not significantly). Among double orphans, who, by definition, have been absorbed into households that do not contain their parents, we find no systematic change in the ownership of durable goods by the households that absorbed such orphans among the rounds of the surveys.

In summary, we find that orphans—particularly paternal orphans—live, on average, in poorer households than do nonorphans. Whether orphans' schooling suffers and, if so, whether it is due to orphans' living arrangements, their relative poverty, or both, are the focus of the next sections.

School Enrollment

We use current school enrollment as our measure of investments in schooling. In Africa, enrolling children in school is costly. In addition to the forgone income of the child, schooling entails expenditures for school uniforms, supplies, and (often) school fees. We analyze school enrollment, rather than educational attainment, because the former reflects current

investments in a child, whereas attainment reflects the history of enrollment over the child's life. It is possible that children who are orphans moved through school more slowly in the years prior to becoming orphaned—for example, while a parent was dying—and that their attainment does not reflect investments made by current caregivers.

To begin, we estimate equations of the following form for each country-year:

$$S_{ih} = \alpha_0 + \alpha_1 I(female) + \sum_{j=7}^{14} \beta_j I(age = j) + \zeta I(orphan) + \varepsilon_{ih}, \quad (2)$$

where S_{ih} is an indicator that child i in household h is enrolled in school. We estimate Eq. (2) using weighted OLS and compute standard errors that are corrected for cluster-level heteroskedasticity.[9] Estimates of ζ, the coefficient on the indicator for orphanhood, are presented in Figure 5 and are summarized in the second panel of Table 3. For all but three cases (Mozambique in 1997 for maternal orphans and Namibia in 1992 and Tanzania in 1996 for paternal orphans), estimates of ζ are negative, indicating that orphans are less likely to be in school than are nonorphans of the same age and sex. The importance of age adjustment should be highlighted. Age is positively correlated with both orphanhood and schooling in all country-years we examine, so omitting age indicators from the regression is likely to yield estimates of the effects of orphanhood on schooling that are biased upward.[10] For example, when we estimate Eq. (2) excluding both age and gender indicators, we find *positive* effects of orphanhood on schooling in 8 of 19 country-years for paternal orphans, in 5 of 19 country-years for maternal orphans, and in 7 of 19 country-years for double orphans. These positive coefficients reflect the fact that orphans are, on average, older, and older children are more likely to be in school.

It is interesting to note that paternal orphans, who were found to live in the poorest households, are not the group that is the least likely to be in school. Rather, the largest negative values of ζ are observed for double orphans, who do not live in systematically poorer households than do nonorphans. This comparison suggests that it is unlikely that lower school enrollment among orphans is driven by wealth.

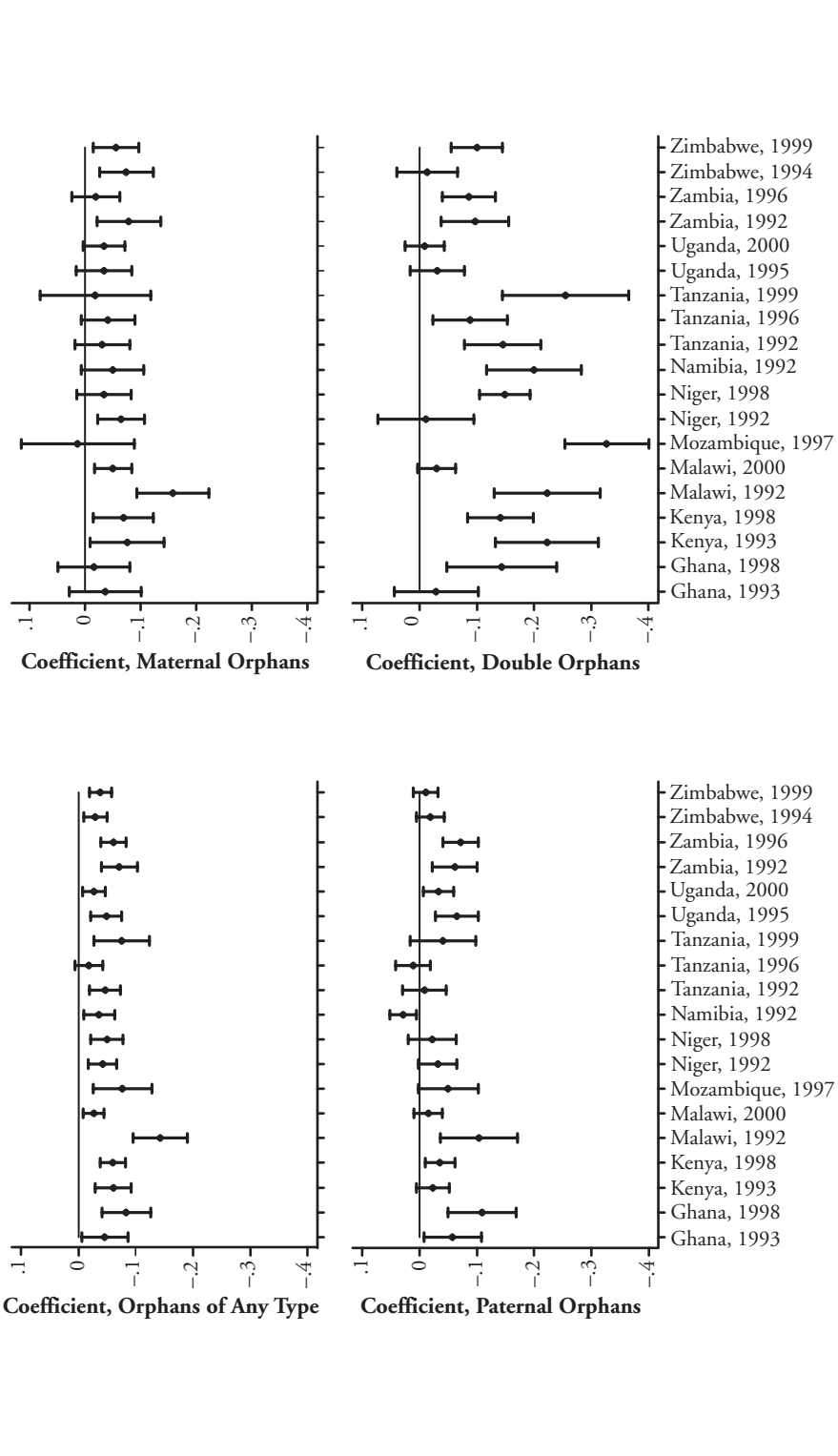
We examine the school enrollment of orphans relative to nonorphans in more detail by regressing an indicator of school enrollment on a complete set of age indicators, a sex indicator, and a set of indicators for whether the child is an orphan in a "blended" household (one containing both orphans and nonorphans), an orphan in a nonblended household (one containing no nonorphans aged 6–14), or a nonorphan in a blended household. The excluded category is nonorphans who live in nonblended households (with no orphans aged 6–14). When all surveys are pooled, 36.4% of orphans and 8.8% of nonorphans live in blended households. All regressions include indicators for urbanization (capital or large city, small city, town, countryside); the number of persons in the household; the fraction of household members who are children younger than age 15; the fraction of household members who are adults aged 55 and older; and the age, education (in years), and sex of the household head. We show the results only for the most recent year of data available for each country.

The results, shown in Table 4, indicate that orphans are less likely to be enrolled in school even after household characteristics are controlled and regardless of whether they are members of blended households. There is no systematic difference in the enrollment

9. We also estimated probit models to see if they differed from the results of the linear probability models presented here. The marginal effects of orphanhood on schooling from the probit models are nearly identical to those shown in Figure 5. We prefer the use of the linear probability models because the inclusion of household fixed effects (discussed later) is more straightforward.

10. The main results for education in Ainsworth and Filmer (2002) were based on comparisons of the fractions of orphans and nonorphans who were enrolled in school. This is equivalent to estimating Eq. (2) without controls for either age or gender.

Figure 5. Regressions of School Enrollment on Indicators for Orphanhood and Child's Age and Sex: Coefficient Estimates and Confidence Intervals for Indicators for Orphanhood



Note: See Table 3 for details.

Table 4. Effects of Coresident Orphans on School Enrollment of Orphans and Nonorphans

	Coefficients and Standard Errors (in parentheses)			*F* Tests and *p* Values	
Survey	Orphans, Nonblended Households (1)	Orphans, Blended Households (2)	Nonorphans, Blended Households (3)	Column 1 = Column 2	Column 2 = Column 3
Ghana, 1998	–0.117	–0.015	0.047	4.21	2.76
	(0.031)	(0.039)	(0.034)	(0.041)	(0.098)
Kenya, 1998	–0.038	–0.105	0.006	3.74	9.34
	(0.015)	(0.033)	(0.018)	(0.054)	(0.002)
Malawi, 2000	–0.017	–0.039	0.036	1.01	15.76
	(0.014)	(0.017)	(0.015)	(0.315)	(0.000)
Mozambique, 1997	–0.074	–0.048	–0.009	0.23	0.73
	(0.034)	(0.050)	(0.036)	(0.635)	(0.394)
Namibia, 1992	–0.087	–0.005	0.010	5.49	0.69
	(0.033)	(0.016)	(0.018)	(0.020)	(0.407)
Niger, 1998	–0.045	–0.040	0.028	0.05	8.79
	(0.018)	(0.021)	(0.019)	(0.828)	(0.003)
Tanzania, 1999	–0.048	–0.055	0.015	0.02	2.71
	(0.035)	(0.040)	(0.036)	(0.875)	(0.102)
Uganda, 2000	–0.028	–0.024	0.035	0.03	9.63
	(0.016)	(0.020)	(0.015)	(0.853)	(0.002)
Zambia, 1996	–0.037	–0.071	0.019	1.65	17.96
	(0.018)	(0.020)	(0.017)	(0.200)	(0.000)
Zimbabwe, 1999	–0.026	–0.062	–0.014	2.13	4.10
	(0.014)	(0.022)	(0.022)	(0.146)	(0.044)

Notes: Each row represents coefficients from a single regression of school attendance on a set of orphan measures and other controls. Regressions were weighted using sample weights, and standard errors were corrected for cluster-level heteroskedasticity.

rates of orphans in nonblended and blended households.[11] In two countries (Ghana 1998 and Namibia 1992), orphans in nonblended households are significantly less likely to be in school than are orphans in blended households; in one country (Kenya in 1998), they are significantly more likely to be in school; and for the rest of the country-years, the difference is not significant. (*F* tests of equality of these coefficients are presented in column 4.) The presence of orphans also appears to make little difference in whether nonorphans are in school. The difference between nonorphans in blended and nonblended households is significantly different from 0 in only a handful of countries (this finding can be read from the coefficients and associated standard errors in column 3), and, in these cases, nonorphans in blended households have *higher* school enrollment than do nonorphans in nonblended households.

11. These results are broadly consistent with the results of some of the research based on case studies from small regions in Africa. Data from the Masaka district of Uganda and from rural Tanzania revealed lower school attendance among orphans, but only at older ages (Kamali et al. 1996; Urassa et al. 1997).

For children living in blended households, we can push our comparison further, by estimating versions of Eq. (2) that include household-level fixed effects.[12] The estimates of ζ and associated confidence intervals are graphed in Figure 6, and their averages are presented in the third panel of Table 3. When household fixed effects and controls for age and gender are included, the estimates of ζ measure the difference in the probability of school enrollment between orphans and nonorphans living in the same household. For example, an estimate of ζ of –0.10 would imply that, when controls for age and gender are included, orphans are 10 percentage points less likely to be enrolled in school than are nonorphans from the same household. Because orphans are being compared to children with whom they live, any orphan disadvantage in schooling that we estimate cannot be attributed to lower household wealth.

The results indicate that orphans of any type are less likely to be in school than are the nonorphans with whom they live. All estimates of ζ that are shown in the top left-hand panel of Figure 6 are negative, 13 of 19 are significant, and the average estimate is –0.067. These effects are large, given that school enrollment is low in many of these countries. Overall, 66% of children aged 6–14 in these country-years are enrolled in school, so that a 6.7-percentage-point decline in school enrollment is equivalent to a 10% reduction in the chance of being in school.

The estimates for maternal and paternal orphans, shown in the top-right and bottom-left panels, are also generally negative, with average values of –0.038 for maternal orphans and –0.049 for paternal orphans. However, these effects are not precisely estimated and are significantly different from zero in only 10 of the 19 country-years for paternal orphans and in 7 country-years for maternal orphans. The largest effects are for double orphans. In all but two cases (Niger 1992 and Zambia 1992), double orphans are significantly less likely to go to school than are the children with whom they live. For the majority of countries, double orphans are estimated to be between 10 and 30 percentage points less likely to be in school. The average value of these coefficients across country-years is –0.152.

Discussion

Overall, the results in Tables 3 and 4 and in Figure 6 provide evidence that orphans are at significant risk of lower school enrollment and that this risk is not due solely to their relative poverty. Orphans are less likely than nonorphans to be enrolled, whether we consider nonorphans as a group and control for household characteristics (as in Table 4) or whether we compare orphans with the nonorphans with whom they live using household fixed effects. The effects of orphanhood on schooling are the largest for double orphans. Before we turn to possible explanations for the lower school enrollment of orphans, we use our data and framework to address outstanding questions on the school enrollment of orphans.

Are girls at a special disadvantage? In contrast to statements made by the World Bank (2002) and UNAIDS (2002), we find that lower school enrollment for orphans is equally severe for boys and girls. For each country-year, we estimated a fixed-effects model of school enrollment that included indicators for children's ages and sex, an indicator that the child is an orphan, and an interaction term between indicators that the child is an orphan and the child is female. If female orphans are at a special disadvantage, the coefficient on this interaction term should be negative. In several country-years (Ghana in 1993 and 1998, Malawi in 1992 and 2000, Mozambique in 1997, Niger in 1992 and 1998, and Uganda in 1995), girls are at a significantly greater risk of not being enrolled in school. However, with two exceptions (Kenya in 1998 and Mozambique in 1997), female

12. These regressions are weighted using sampling weights provided by DHS. Because household fixed effects are included, it is not necessary to adjust standard errors for within-cluster heteroskedasticity.

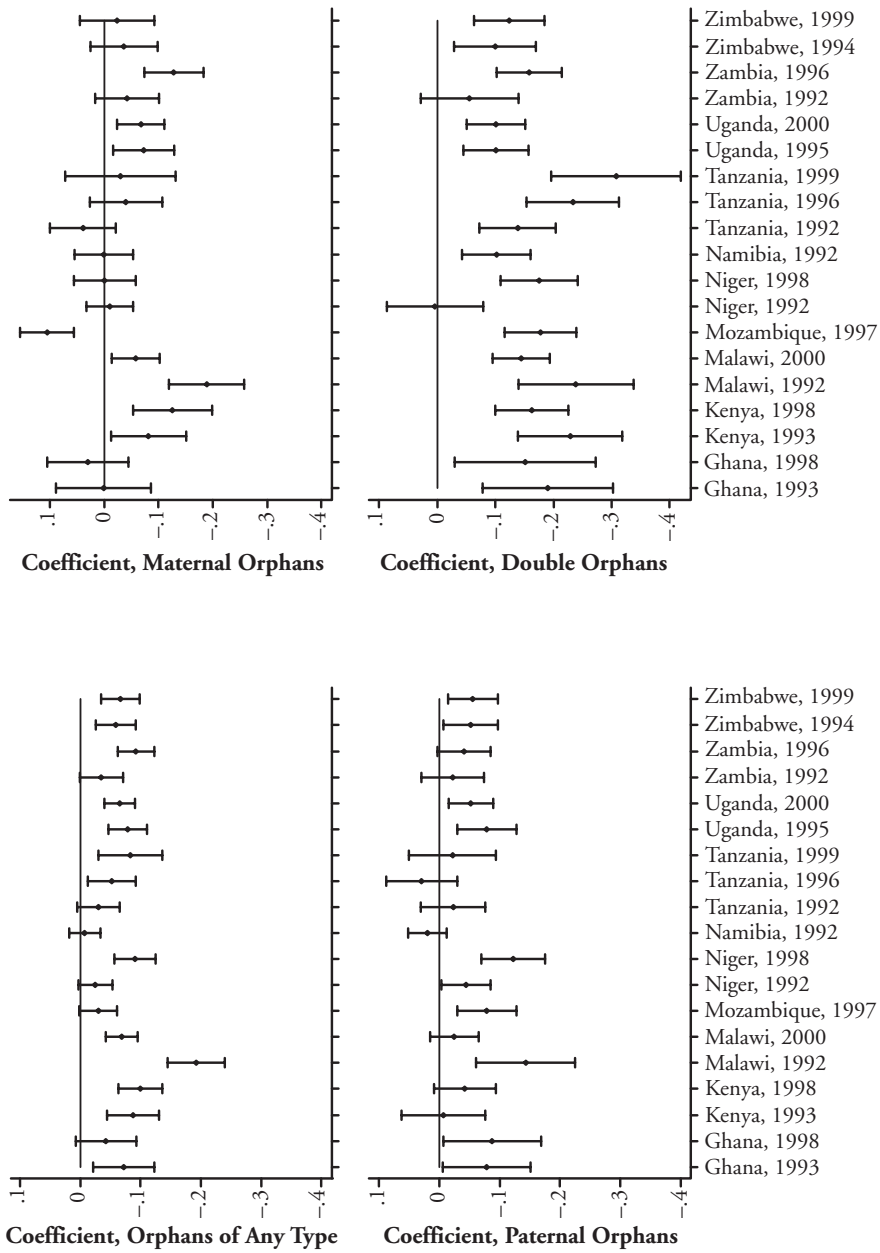


Figure 6. Regressions of School Enrollment on Indicators for Orphanhood and Child's Age and Sex, and Household Fixed Effects: Coefficient Estimates and Confidence Intervals for Indicators for Orphanhood

Note: See Table 3 for details.

orphans are at no greater risk of not being enrolled than are male orphans. In roughly half the cases (8 of 19 country-years), the interaction between orphanhood and being female is *positive* (although significantly different from zero in only one case, Tanzania in 1999). Neither do we find increased discrimination among orphaned girls when we limit our analysis to older children aged 11–14. Estimates of fixed-effect models for samples of older children reveal only one country-year in which the orphan-female interaction is negative and (marginally) significant. In two cases (Tanzania in 1999 and Uganda in 2000), older female orphans are significantly more likely to be enrolled than are older male orphans.

Are younger orphans at a greater disadvantage? We also analyzed the impact of orphanhood on school enrollment separately for children aged 6–8, 9–11, and 12–14. As with the other findings, we included in each regression a complete set of age indicators, an indicator for the child's gender, and a set of household fixed effects. We find that the effects of orphanhood on education increase with age. Estimates of ζ for 6- to 8 year olds are negative and significant in only 8 of 19 country-years, with an average value across country-years of –0.040. The number of country-years with negative and significant values of ζ rises to 13 of 19 (with an average value of –0.063) for 9- to 11 year olds and to 16 of 19 (with an average value of –0.088) for 12- to 14 year olds. Most of this effect for older children is driven by double orphans, who are, on average, 18.3 percentage points less likely to be enrolled than are the nonorphaned children with whom they live.

These results are in direct contrast to those found in northern Tanzania by Ainsworth, Beegle, and Koda (2002), who argued that Tanzanian households cope with the deaths of adults by delaying the enrollment of younger children while protecting the enrollment of older children. We find the opposite pattern, both in the results averaged over all the country-years presented here, and in the Tanzania 1999 DHS, where the fixed-effect estimate of the effect of orphanhood on school enrollment is 0.6 of a percentage point for 6- to 8 year olds, 9.1 percentage points for 9- to 11 year olds, and 13.8 percentage points for 12- to 14 year olds, with the latter two estimates significantly different from zero.[13]

These findings are also not consistent with the hypothesis that orphans with pediatric HIV/AIDS that is due to maternal-child transmission are withheld from school because of their own illness. Evidence suggests that the majority of African children with HIV/AIDS die before age 5 (Spira et al. 1999). However, if those who survive longer are kept out of school, we would expect to see the largest school-enrollment gaps between orphans and nonorphans to appear among the youngest school-age children, when more children born with HIV/AIDS are still alive. The finding that the gap in enrollment increases with age runs counter to this hypothesis.

Does poverty leave orphans at a greater disadvantage? Although poverty may not be the sole cause of reduced enrollment among orphans, it may be that discrimination against orphans within households is exacerbated by poverty. We examined whether the gap in enrollment between nonorphans and orphans is larger among poorer households, when wealth is measured by the number of household durable goods. We estimated models with household fixed effects identical to those presented earlier, but with the addition of the "orphan" indicator interacted with the durable-goods index. (The durable-goods index itself does not vary across children in a household, and its effect is absorbed in the household fixed effect.) If wealthier households are less likely to discriminate against orphans relative to nonorphans, or if orphans who are more capable are placed with wealthier families, then the coefficient on the orphan/durable-goods interaction will be positive. However, the results indicate that the within-household gap in enrollment

13. We estimate similar models using educational attainment, rather than current school enrollment, and find that the gap between orphans and nonorphans in years of completed education increases with age.

Table 5. Orphanhood and the Relationship to Household Head

Relationship to the Head	Nonorphans	Maternal Orphans	Paternal Orphans	Double Orphans
Son or Daughter	77.82	47.61	48.17	0.00
Grandchild	11.75	23.48	20.06	32.02
Brother or Sister	1.21	4.25	6.09	9.37
Other Relative	6.50	18.42	16.42	29.26
Adopted or Foster Child	1.72	4.15	7.23	25.24
Nonrelative	0.99	2.08	2.03	4.10

Notes: 164,689 observations. The data are for all children aged 6–14 whose orphan status could be determined. Data are pooled across all countries and years and are not weighted.

between orphans and nonorphans does not decrease with wealth. For orphans of any type, the coefficient on the interaction between the durable-goods index and the indicator for orphanhood is significant in only 5 of 19 cases and is *positive* and significant in only 1 of 19. The average value of the coefficient on the interaction is –0.012 (with a standard error of 0.028). The results are similar for orphans of specific types.

It is indeed the case that children in wealthier households are more likely to go to school. We estimated cross-sectional regressions that include a set of household controls, the durable-goods index, an indicator for orphanhood, and an interaction of the indicator for orphanhood and the durable-goods index. The results for orphans of any type indicate that more durable goods are significantly associated with higher school enrollment in 17 of the 19 country-years. However, consistent with the fixed-effects estimates, the gap in enrollment between orphans and nonorphans does not become smaller as the durable-goods index rises.

We take this finding as additional evidence that although poverty does result in lower school enrollment, orphans face an additional risk of nonenrollment that is not accounted for by household wealth. In the next section, we explore the extent to which the risk that orphans face is related to their relationships to their adult caregivers.

HAMILTON'S RULE AND THE ROLE OF CAREGIVERS

The living arrangements of children who have lost one or both parents differ from those of children with two living parents. Table 5 shows that nearly 80% of children with two living parents are the children of household heads and that less than 1% of nonorphans live in households headed by nonrelatives. In contrast, only 50% of maternal and paternal orphans are the children of household heads. These children are twice as likely as nonorphans to live in households headed by grandparents and three times as likely to live in households headed by "other relatives." The living arrangements of double orphans differ even more from those of children with two parents. Roughly 30% of double orphans live in households headed by other relatives, and over 4% live in households headed by nonrelatives. About 25% of double orphans are adopted or foster children of the household heads, that is, they are classified as sons or daughters of the heads, rather than as an "other relatives" or "nonrelatives," which may signal a greater degree of caring or expectation of permanence of the children in the home.

That the relationship of the child to the household head accounts for the lower school enrollment of orphans can be seen in Table 6, which shows the results of regressions that include an indicator for orphanhood, together with indicators for the relationship between the child and the head of the household. These regressions control for age and gender and

Table 6. School Enrollment, Orphanhood, and the Relationship to the Household Head (household fixed effects included)

	Ghana, 1998	Kenya, 1998	Malawi, 2000	Mozambique, 1997	Namibia, 1992	Niger, 1998	Tanzania, 1999	Uganda, 2000	Zambia, 1996	Zimbabwe, 1999
Panel A										
Orphan	–0.043	–0.100[a]	–0.069[a]	–0.030	–0.007	–0.091[a]	–0.084[a]	–0.065[a]	–0.092[a]	–0.066[a]
	(0.031)	(0.022)	(0.016)	(0.019)	(0.016)	(0.021)	(0.032)	(0.015)	(0.018)	(0.019)
Panel B										
Grandchild	0.005	–0.035	–0.058[a]	–0.060[a]	–0.033	–0.032	–0.019	0.010	–0.044[a]	–0.041
	(0.034)	(0.025)	(0.020)	(0.032)	(0.020)	(0.026)	(0.039)	(0.024)	(0.026)	(0.024)
Brother or sister	–0.029	–0.122[a]	–0.142[a]	–0.182[a]	–0.011	–0.101[a]	–0.064	–0.037	–0.104[a]	–0.128[a]
	(0.088)	(0.065)	(0.044)	(0.050)	(0.056)	(0.059)	(0.078)	(0.055)	(0.050)	(0.055)
Other relative	–0.068[a]	–0.106[a]	–0.067[a]	–0.185[a]	–0.037[a]	–0.101[a]	–0.034	–0.097[a]	–0.157[a]	–0.090[a]
	(0.030)	(0.024)	(0.022)	(0.024)	(0.017)	(0.026)	(0.036)	(0.019)	(0.021)	(0.025)
Adopted or foster child	–0.009	–0.063[a]	–0.029	–0.010	0.035	–0.074[a]	–0.106[a]	0.007	0.009	–0.042
	(0.046)	(0.039)	(0.039)	(0.031)	(0.050)	(0.026)	(0.064)	(0.029)	(0.037)	(0.044)
Nonrelative	–0.326[a]	–0.790[a]	–0.762[a]	–0.597[a]	–0.073[a]	–0.182[a]	–0.532[a]	–0.432[a]	–0.433[a]	–0.496[a]
	(0.076)	(0.039)	(0.041)	(0.062)	(0.025)	(0.042)	(0.101)	(0.045)	(0.096)	(0.080)
Orphan	–0.026	–0.005	–0.032[a]	0.038[a]	–0.003	–0.047[a]	–0.059[a]	–0.037[a]	–0.043[a]	–0.041[a]
	(0.031)	(0.023)	(0.017)	(0.020)	(0.016)	(0.023)	(0.033)	(0.016)	(0.020)	(0.020)
F test (*p* value): Grandchild = other relative	2.89 (0.089)	4.63 (0.031)	0.09 (0.762)	11.41 (0.001)	0.04 (0.834)	4.07 (0.044)	0.11 (0.745)	13.60 (0.000)	13.03 (0.000)	2.44 (0.119)
F test (*p* value): Other relative = Nonrelative	10.14 (0.002)	245.93 (0.000)	240.20 (0.000)	45.65 (0.000)	1.90 (0.168)	2.91 (0.088)	22.35 (0.000)	51.31 (0.000)	8.23 (0.004)	23.88 (0.000)
Observations	5,585	9,797	16,109	10,377	5,310	9,012	4,702	10,053	9,951	6,922

Notes: Panel A shows the coefficient on an indicator that the child is an orphan (of any type) from a regression of school enrollment on an orphan indicator, an indicator for the age and sex of the child, and a set of household fixed effects. The regressions shown in Panel B add a set of indicators for the relationship of the child to the household head. All regressions are weighted using sample weights. Standard errors are in parentheses. The sample is of all children aged 6–14 who lived in households in which all children in this age group could be identified as "orphans" or "nonorphans."

[a]Estimates are significant at the 10% level or better.

include household fixed effects, so the effects of relationship to the head are identified by within-household variation. Panel A shows the coefficients on an indicator for orphanhood when no indicators for the relationship to the head are included. These coefficients are identical to those graphed in Figure 6 and are repeated here for purposes of comparison with the results in Panel B, which include relationship indicators.

Adding controls for the relationship to the household head dramatically reduces the coefficients on the indicators for orphanhood. For Kenya in 1998, for example, the "effect" of being an orphan declines from –0.100 to –0.005 when the relationship indicators are included. For other countries, such as Tanzania, Uganda, Zambia, and Zimbabwe, the relationship indicators account for between 30% and 60% of the lower school enrollment of orphans.

As a general pattern, the probability of school enrollment is inversely proportional to the degree of relatedness of the child to the household head—whether the child is an orphan or not. Children who are listed as grandchildren or as adopted or foster children are generally at the smallest disadvantage. Children who live in households headed by "other relatives" are less likely to be enrolled than are children who live with parents or grandparents, and children with the lowest rates of school enrollment are those who live in households that are headed by nonrelatives. In many cases, the level of disadvantage associated with having a nonrelative for a household head is close, in absolute terms, to the average school-enrollment rate in the country. For example, 87.5% of all Kenyan children are enrolled in school, and Kenyan children who live with nonrelatives are estimated to be 79.0 percentage points less likely than other children to be enrolled.

At the bottom of Table 6, we provide the results of tests of whether the child's relationship to the household head correlates with school enrollment in the way predicted by Hamilton's rule. Children who live with "other relatives" are less likely to be enrolled than are children who live with parental heads of households, a difference that is statistically significant at the 10% level for all but one country-year. And children who live with "other relatives" are less likely to be enrolled than are those living with household heads who are grandparents. In 6 of the 10 country-years presented, the difference between living with a grandparent and living with "other relatives" is significant at the 10% level. Moreover, children who live with nonrelative heads are even less likely to be enrolled in school. With the exception of Namibia in 1992, children who live with "nonrelative" heads are less likely to be enrolled than are children who live with "other relative" heads.

Although the finding that children who live with nonrelatives are most at risk of low enrollment is consistent with Hamilton's rule, we have no direct evidence against the hypothesis that investment decisions are based on the children's returns to education. The type of caregiver who is chosen for an orphan could be systematically related to the child's return to schooling, with grandparents selected for the children who are most able, other relatives for children who are less able, and nonrelatives for the children who are least able. Alternatively, children whose grandparents are alive and able to care for them may be healthier, on average. Although these specific selection patterns are possible, we have no reason to think that they are likely.

Our results indicate that the lower school enrollment of orphans can be explained, in part, by the greater tendency of orphans to live with less closely related caregivers. However, they do not provide information on whether orphans fare worse than nonorphans who are fostered by the same types of nonparental caregivers. Nonorphaned foster children may receive better treatment if their living (albeit absent) parents provide financial support for their schooling, choose "better" foster care givers, or monitor the activities of foster care givers. In addition, in some cases, foster children may be fostered out specifically for the purpose of attending school.

To examine this issue, we selected (for each of the country-years shown in Table 6) a sample of children who were either double orphans or nonorphans who lived apart from

both parents. We regressed school enrollment on a complete set of interactions between indicators for the type of child (orphan or nonorphan foster child) and indicators for the relationship between the child and the head of the household.[14] The results provide support for the hypothesis that orphans are less likely to be enrolled in school than are nonorphans with the same living arrangements. In 9 of the 10 country-years we examine, orphans who live with grandparents are less likely to be in school than are nonorphans who live with grandparents. In 4 cases, this difference is statistically significant. Similar results are found for children who live with "other relatives" and nonrelatives. Among children who live with "other relatives," orphans are less likely to be in school than are nonorphans in 9 of 10 countries (in 4 cases significantly so). Among children who live with nonrelatives, orphans are less likely to be in school than are nonorphans in 7 of 10 countries (in 6 cases significantly so) and are significantly more likely to be in school in only 1 country. Coefficient averages across the 10 countries indicate that orphans who live either with grandparents or "other relatives" are 11 percentage points less likely to be in school than are nonorphans with the same living arrangements. Orphans who live with nonrelatives are 16.5 percentage points less likely to be in school than are nonorphans who live with nonrelatives. Although these results do not provide evidence of the selection processes through which orphans and nonorphans are placed in different types of living arrangements, they do indicate that orphans and foster children with living parents often have different patterns of school enrollment.

CONCLUSIONS

In at least one important dimension—school enrollment—orphans are significantly disadvantaged. The results presented in this article indicate that although poorer children in Africa are less likely to attend school, the lower enrollment of orphans is not accounted for solely by their lower wealth. Furthermore, contrary to previous studies, we do not find that female orphans are disadvantaged relative to male orphans. Instead, our results suggest that the special disadvantage that orphans face is primarily due to their living arrangements. Across 10 sub-Saharan African countries, we find, consistent with Hamilton's rule, that the degree of relatedness between orphans and their adult caregivers is highly predictive of children's outcomes. The reduced enrollment of orphans will have long-term consequences both for these children's lives and for the long-term prospects for the countries in which they are being raised.

These results are different from some previous findings on this topic and have different implications for policies that are designed to increase the living standards and educational attainment of children in areas where orphanhood is prevalent. One issue that has been actively debated is whether policies should specifically target orphans or instead target poor children. Ainsworth and Filmer (2002) and Lundberg and Over (2000), for example, argued that the disadvantage that orphans face is driven by poverty and that there is no rationale for directing resources in favor of orphans over equally poor nonorphans.

Our findings, that orphans are less likely to be in school than are nonorphans with whom they live and that the lower within-household enrollment of orphans does not decline as household wealth rises, call for a more nuanced approach. If the goal of policy is to increase educational investments in poor children—either on equity grounds or because it is thought that credit constraints preclude poor families from making optimal investments—then targeting policies toward poor families makes sense. At the same time,

14. The regressions also include age and gender indicators. Because few households contain both double orphans and foster children with living parents, we did not include household fixed effects in these regressions, but instead included the set of household characteristics that are listed in the note to Table 4. All regressions are weighted, and standard errors are corrected for cluster-level heteroskedasticity.

if there is intrahousehold discrimination against orphans, policies that result in optimal investment levels in nonorphans will leave orphans at less-than-optimal investment levels. Correcting any bias against orphans requires policies that are directed toward orphans. Furthermore, policies that provide income support to households that contain orphans may do little to increase investments in orphans. Instead, policies that are aimed at reducing the bias against orphans should operate by reducing the price of investments in orphans relative to nonorphans, for example, through educational subsidies or nontransferable vouchers for schooling that are earmarked for orphans.

Our finding that investments are higher among orphans who are cared for by "closer" relatives may suggest that policies that are aimed at keeping orphans with close kin may be beneficial. However, too little is known about the processes that determine orphans' living arrangements to draw firm conclusions on this issue.

REFERENCES

Ainsworth, M., K. Beegle, and G. Koda. 2002. "The Impact of Adult Mortality on Primary School Enrollment in Northwestern Tanzania." Africa Region Human Development Working Paper Series. World Bank, Washington, DC.

Ainsworth, M. and D. Filmer. 2002. "Poverty, AIDS and Children's Schooling: A Targeting Dilemma." Policy Research Working Paper 2885. World Bank, Washington, DC.

Ainsworth, M. and I. Semali. 1998. "Who Is Most Likely to Die of AIDS? Socioeconomic Correlates of Adult Deaths in Kagera Region, Tanzania." Pp. 95–110 in *Confronting AIDS: Evidence From the Developing World,* edited by M. Ainsworth, L. Fransen, and M. Over. Washington, DC: World Bank.

Akresh, R. 2003. "Risk, Network Quality and Family Structure: Child Fostering Decisions in Burkina Faso." Working paper. Economic Growth Center, Yale University, New Haven, CT. Available on-line at http://www.econ.Yale.edu/~rsa7/Papers/Akresh_JobMarketPaper.pdf

Bicego, G., S. Rutstein, and K. Johnson. 2003. "Dimensions of the Emerging Orphan Crisis in Sub-Saharan Africa." *Social Science and Medicine* 56:1235–47.

Bishai, D., E.D. Suliman, H. Brahmbhatt, F. Wabwire-Mangen, G. Kigozi, N. Sewankambo, D. Serwadda, and R. Gray. 2003. "Does Biological Relatedness Affect Child Survival?" *Demographic Research* 8(9). Available on-line at www.demographic-research.org/volumes/vol8/9/8-9.pdf

Bledsoe C. and A. Brandon. 1987. "Child Fostering and Child Mortality in Sub-Saharan Africa: Some Preliminary Questions and Answers." Pp. 287–302 in *Mortality and Society in Sub-Saharan Africa,* edited by E. Van der Walle. New York: Oxford University Press.

Bledsoe, C., D. Ewbank, and U. Isiugo-Abanihe. 1988. "The Effect of Child Fostering on Feeding Practices and Access to Health Services in Rural Sierra Leone." *Social Science and Medicine* 27:627–36.

Case, A., I-F. Lin, and S. McLanahan. 2000. "How Hungry Is the Selfish Gene?" *Economic Journal* 110(466):781–804.

Case, A. and C. Paxson. 2001. "Mothers and Others: Who Invests in Children's Health?" *Journal of Health Economics* 20:301–28.

Daly, M. and M. Wilson. 1987. "The Darwinian Psychology of Discriminative Parental Solicitude." *Nebraska Symposium on Motivation* 35:91–144.

Filmer, D. and L. Pritchett. 1999. "The Effect of Household Wealth on Educational Attainment: Evidence From 35 Countries." *Population and Development Review* 25(1):85–120.

Foster, A. and M. Rosenzweig. 1996. "Technical Change and Human Capital Returns and Investments: Evidence From the Green Revolution." *American Economic Review* 86:931–53.

Foster, G. 1996. "AIDS and the Orphan Crisis in Zimbabwe." *AIDS Analysis Africa* 6(3):12–13.

Foster, G., R. Shakespeare, F. Chinemana, H. Jackson, S. Gregson, C. Marange, and S. Mashumba. 1995. "Orphan Prevalence and Extended Family Care in a Peri-urban Community in Zimbabwe." *AIDS Care* 7:3–17.

Gertler, P., D. Levine, and S. Martinez. 2003. "Losing the Presence and Presents of Parents: Do Parents Matter for More Than Their Money?" Unpublished manuscript. Haas School of Business, University of California at Berkeley. Available on-line at http://www.economics.pomona.edu/ccConrad/GertleretalPresenceandPre.pdf

Hamilton, W.D. 1964a. "The Genetical Evolution of Social Biology." *Journal of Theoretical Biology* 7:1–16.

———. 1964b. "The Genetical Evolution of Social Biology." *Journal of Theoretical Biology* 7: 17–52.

Isiugo-Abanihe, U.C. 1985. "Child Fosterage in West Africa." *Population and Development Review* 11(1):53–73.

Joint United Nations Programme on HIV/AIDS (UNAIDS). 2003. *Follow-up to the 2001 United Nations General Assembly Special Session on HIV/AIDS, Progress Report on the Global Response to the HIV/AIDS Epidemic 2003*. Available on-line at http://www.unaids.org/ungass/en/global/UNGASS_Report_2003_en.pdf

Kamali, A., J.A. Seeley, A.J. Nunn, J.F. Kengeya-Kayondo, A. Ruberantwari, and D.W. Mulder. 1996. "The Orphan Problem: Experience of a Sub-Saharan Africa Rural Population in the AIDS Epidemic." *AIDS Care* 8:509–15.

Lloyd, C.B. and A.K. Blanc. 1996. "Children's Schooling in Sub-Saharan Africa: The Role of Fathers, Mothers, and Others." *Population and Development Review* 22:265–98.

Lundberg, M. and M. Over. 2000. "Transfers and Household Welfare in Kagera." Unpublished manuscript. Available on-line at http://www.iaen.org/files.cgi/199_38lundbergtext.pdf

Monk, N. 2000. "Underestimating the Magnitude of a Mature Crisis: Dynamics of Orphaning and Fostering in Rural Uganda." *Orphan Alert: International Perspectives on Children Left Behind by HIV/AIDS*. Available on-line at http://www.orphans.fxb.org/media/FXBDurban.pdf

Ntozi, J.P.M. and S. Nakayiwa. 1999. "AIDS in Uganda: How Has the Household Coped With the Epidemic?" Pp. 155–81 in *The Continuing African HIV/AIDS Epidemic,* edited by J.C. Caldwell, I.O. Orubuloye, and J.P.M. Ntozi. Canberra, Australia: Health Transition Centre, National Centre for Epidemiology and Population Health, Australian National University. Available on-line at http://htc.anu.edu/pdfs/continuingHIV/Ntozi_Naka.pdf

Spira, R, P. Lepage, P Msellati, P. Van De Perre, V. Leroy, A. Simonon, E. Karita, and F. Dabis. 1999. "Natural History of Human Immunodeficiency Virus Type 1 Infection in Children: A Five-Year Prospective Study in Rwanda." *Pediatrics* 104(5):e58.

UNAIDS. 2000. *Report on the Global HIV/AIDS Epidemic*. Geneva: UNAIDS.

———. 2002. *Report on the Global HIV/AIDS Epidemic*. Available on-line at http://www.unaids.org/barcelona/presskit/report.html

UNAIDS/WHO. 2000. *Update: Epidemiological Fact Sheets on HIV/AIDS and Sexually Transmitted Infections.* Available on-line at http://www.unaids.org/fact_sheets/files/Africa_Eng.html

Urassa, M., J.T. Boerma, J.Z.L. Ng'weshemi, R. Isingo, D. Schapink, and Y. Kumogola. 1997. "Orphanhood, Child Fostering and the AIDS Epidemic in Rural Tanzania." *Health Transition Review* 7(Supp. 2):141–53.

World Bank. 2002. *Education and HIV/AIDS, A Window of Hope*. Washington, DC: World Bank.