Orphanhood, Household Relationships, School Attendance and Child Labour in Zimbabwe

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ABSTRACT

This paper explores the effect of orphanhood on the allocation of children's time to school and work activities. Zimbabwe represents an interesting case of study because it combines one of the best education systems in Africa with a high rate of orphanhood. In particular, this paper explores the determinants of time allocation for children able to attend lower secondary (O-level) school. After controlling for household wealth, a diverse set of covariates at the individual, and household levels, and community fixed-effects, I find that orphans are less likely to attend school and more likely to work. While orphans and non-orphans face the same marginal cost to go to school and work, living in blended households places orphans at a higher disadvantage. The main factor related to discrimination within households is living with household heads with whom children are not closely biologically related.

KEYWORDS: child labour, school attendance, orphanhood, school proximity, Zimbabwe.
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1. Introduction

A high orphanhood rate and low investments in children's human capital accumulation are two main characteristics of many African countries.[2] In particular, Sub-Saharan Africa countries face the most important orphan crisis in the developing world. Approximately 12 percent of children are orphans in the region, which is highly related to the HIV/AIDS epidemic.[3] In addition, Sub-Saharan African countries share the highest incidence of child labour worldwide. 26 percent of children (aged 5-14) in the region were classified as economically active in 2004 (ILO, 2006).[4] Even though recent studies (Beegle et al., 2010; Case and Ardington, 2006; Case et al., 2004; Evans and Miguel, 2007; among others) have explored the relation between these two characteristics, there is need for more country-specific evidence about the effect of orphanhood on investments in children's human capital, taking account of schooling costs and intrahousehold dynamics.

The first objective of this paper is to examine the impact of orphanhood on two indicators of investment in children's human capital: school attendance and work participation. The second objective is to analyse the channels through which orphanhood affects children's time allocation between schooling and labour. This paper estimates the effect of orphanhood on the allocation of children's time by analysing a sample of children able to attend O-level secondary school in Zimbabwe.

Zimbabwe provides a particularly interesting setting to evaluate the effects of orphanhood on children's time allocation for several reasons. First, it is one of the main affected countries in terms of orphanhood. In 2001 orphans were approximately 1 million and in 2007 this number increased to 1.3 million (18 and 24 percent of children younger than 18, respectively).[5] Second, after its independence in 1980, the primary school completion rate was relatively high (above 90 percent) but enrolment in O-level secondary schools was less successful (about 60 percent). Given that school enrolment has been relatively high even within poor households, the analysis of other determinants, such as orphanhood and family arrangements, become more relevant. Third, after the expansion in the two decades after independence, Zimbabwe's economy underwent a serious macroeconomic crisis that affects households' economies directly through unemployment and hyperinflation and indirectly through the reduction of the supply of public services, including education.

[2] Following the literature on the topic, the term 'orphan' is used in this paper in a broader sense, including those children who lost a mother (maternal orphans), a father (paternal orphans) or both parents (double orphans).

[3] In comparison to the 7 percent of children in Latin America and the Caribbean who are orphans and the 6.5 percent in Asia (UNICEF, UNAIDS and USAID, 2002).

[4] This is 10 percentage points more than the worldwide average. In addition, According to ILO estimations, orphans relative to non-orphans, are mainly employed in agriculture, domestic service, or even in more hazardous or abusing activities, such as mining, commercial sex and street vendors (Guarcello et al., 2004).

[5] Even though the data used in this paper does not enable the identification of causes of death, the Joint United Nations Programme (UNAIDS, 2008) estimates for 2007 indicates that HIV and AIDS account approximately for 75 percent of the orphan children population in the country.

Finally, in the last years, due in part to the lack of household survey data, literature concerning development economics in the country has been scarce.

I use a national representative household survey of Zimbabwe, the Income, Consumption and Expenditure Survey (ICES) collected between 2007 and 2008. The survey includes standard information about demographic characteristics of the household's members, education, health, employment, assets, consumption and income. Two particular features of the survey are exploited in this paper. First, for each household and independently of whether children are sent to school or not, the survey collected information on one dimension of the cost of attending school: distance to the closest primary and secondary schools. The availability of this data at household level, rather than community level, allows me to exploit the variation in accessibility of schools across households in the same community to separately identify the effect of school distance from unobserved community characteristics. Second, for each child younger than 18, the survey provides information on whether their mothers and fathers were alive. This makes it possible to analyse the effect of different types of orphanhood and family arrangement on children's time allocation. Furthermore, with respect to the Demographic Health Surveys (DHS) which have been extensively used in previous literature, the ICES offers information on distance to schools and other facilities, information on child labour, and almost twice a larger sample size.[6]

Analysing the impact of orphanhood on children's time allocation is not straightforward. A naïve comparison of schooling and labour indicators for orphans and non-orphans would result in estimates of orphanhood that are biased in unpredictable ways. Case et al. (2004) identify three main factors that need to be considered when comparing human capital investments in orphans and non-orphans: the economic circumstances, the degree of closeness between the orphan and the adult decision-maker in the household and the child's school readiness. In this paper, I use different empirical specifications that account for the effect of orphanhood on children's time allocation through these channels. In contrast to Evans and Miguel (2007), the absence of data for Zimbabwe does not allow me to test whether different investments correspond to children's school readiness.

To obtain comparable results with most studies, I first estimate linear probability models for children's schooling and labour participation, controlling for orphanhood, and individual, household and community characteristics. Then, I add community fixed effects to address the concern that omitted community characteristics might affect the estimated effect of orphanhood. This set of regressions allow me to compare children facing the same labour market conditions (e.g. differential returns to schooling or work opportunities), social norms about child labour and other characteristics that are community-specific.

Third, I incorporate distance to school as a proxy for the costs associated with investment in children's human capital. To deal with the potential non-random location of households with respect to schools, I follow Kondylis and Manacorda's

[6] This is in comparison to Zimbabwean DHS 2010-2011.

(2012) empirical strategy, which relies on the assumption that including a set of distance to other facilities captures the unobservable household characteristics (tastes, opportunities and constraints) affecting the child's time allocation and that are correlated with household location.

Fourth, to start exploring the effect of the household composition on the child's time allocation, this paper tests whether blended households (i.e. those containing orphans and non-orphans) protect investments in orphans and whether non-orphans living in blended households are also affected by the presence of orphans in the household. Furthermore, I analyse the effect that living with a household head with whom the child is not closely biologically related, might have on human capital investments in children.

Finally, for children living in blended households, I estimate children's schooling and labour accounting for household fixed effects. This strategy addresses the concern that omitted household characteristics might affect the estimates when comparing orphans and non-orphans living in the same household. The degree of biological closeness of children and household heads is also explored.

Results from these analyses show that after controlling for household wealth, orphans are in a disadvantaged position relative to non-orphans, in terms of school attendance and work. Among orphans, the most vulnerable children are those who lose both parents. While schooling costs do not seem to affect children differently, I find that living in a blended household puts orphans in a more vulnerable situation, relative to other children. However, when turning to analyse the effect of living in a household where the head is not closely biologically related to the child, I find that being an orphan is no longer the main factor driving differences in investment. Children (orphans and non-orphans) living in households where they are not closely related to the head of the household are less likely to attend school and more likely to work. This evidence is further confirmed in the regressions accounting for unobservable characteristics at household level. Finally, I find evidence that discrimination against children within households is in general negatively associated with the degree of biological closeness of children to the household head.

This paper contributes to the existing literature on children's time allocation and orphanhood in different ways. First, this paper, in contrast to most of the literature on the topic, considers the importance of accounting for changes in living arrangements, schooling costs, and unobservable characteristics at community and household level when studying the allocation of orphans' and non-orphans' time. Second, again in contrast to most of the literature, this paper considers the allocation of children's time to both labour and schooling activities.[7] Finally, this paper provides national

[7] The studies of Guarcello et al. (2004) and Suliman (2003) are two exceptions. Guarcello et al. (2004) uses the UNICEF's Multiple Indicator Cluster Surveys (MICS) cross-section data from ten Sub-Saharan Africa countries, but not Zimbabwe, to explore the effect of orphanhood on children's schooling and labour. They find that orphanhood negatively affects schooling, increases the likelihood of inactivity (no school/no work), and does not significantly affects children's work. For Tanzania, Suliman (2003) finds that orphans combined school and work in higher proportions than non-orphans and that single and double orphans, in particular, had experienced paid-work in higher rates than non-orphans.

representative estimates for Zimbabwe, a country where orphanhood is a major problem and where there is scarce information to design social policies oriented to increase children's welfare.

The rest of the paper follows this structure: Section 2 discusses how orphanhood may affect children's time allocation; Section 3 describes the data and the situation of orphans and the education system in Zimbabwe; Section 4 presents the empirical strategies to identify the mentioned effects and the results; and, Section 5 concludes, proposes some policy recommendations and discusses possible limitations of the analysis.

2. Theoretical Impacts of Orphanhood

Empirical evidence from developing countries shows that a large number of children work; whether exclusively or in combination with schooling. However, even in poor countries it is found that the incidence of child labour is lower among non-poor households, which reflects that child labour earnings complement the low income of poor-households. As Basu and Van (1998) mention, the allocation of children's time to non-labour activities (education or leisure) represents a luxury good for poor households, which can be consumed only once their income rises beyond a certain threshold. Sending children to work, in contrast to sending them to schools, carries negative consequences both for the children's future wellbeing and, through the positive externalities of education on growth, for the growth of the society as a whole (Basu, 1999).

Standard human capital theory offers a suitable framework to study the allocation of children's time between schooling and labour. It predicts that when the net returns to human capital investment are lower than the returns to investments in other assets, children's schooling is likely to be displaced by children's labour. The poverty and capital market explanations offer a theoretical framework to examine how orphanhood might affect the allocation of children's time between schooling and labour.

According to the poverty explanation, the low net returns to human capital investment are mainly determined by two factors: high schooling costs, due to either direct costs (e.g. transportation to/from school, school fees, materials and uniforms) or indirect costs (e.g. opportunity costs of studying); and, poor quality education. In turn, under the capital market explanation (Cigno and Rosati, 2005; Parsons and Goldin, 1989), imperfections in physical capital markets (e.g. credit constraints or high interest rate on borrowing) and in human capital markets (e.g. parents may not fully receive the return on investments in children's education because children are likely to receive it as adults), in addition to the degree of altruism of the decision-taker in the household, drive the final decision about the child's time allocation. This theoretical model predicts that when physical capital markets are perfect and there is full control over the income of children, the decision-taker is indifferent between sending their children to school and investing in other assets, at the margin. In contrast, when physical capital markets are perfect but intergenerational transfers

between parents and children are not guaranteed, only altruistic parents send their children to school. When capital markets are imperfect, which characterizes most developing countries, this model predicts that even altruistic parents may sacrifice investments in children's education.

A parental death is likely to be associated with changes in the factors underlying the two explanations, particularly the household's budget and the control over future returns from investing in children. In particular, Case et al. (2004), identify three main channels through which orphanhood is likely to affect children's time allocation: the economic circumstances, the degree of closeness between orphans and the adult decision-maker in the household and the children's school readiness.

First, a parental death represents a negative economic shock to the household that is likely to affect the living standards of its members. The final size of the impact depends, among certain other conditions, on whether the deceased parent was a main earner in the household, whether the household becomes eligible or receives transferences in response to the death, whether children are fostered out, and the economic conditions of the household where the children are fostered in.

Second, particularly in Africa, it is common that living arrangements drastically change after the death of one or both parents, and with them, the control of household resources. For instance, those orphans fostered in new households are likely to be treated differently with respect to how they were treated by their biological parents.[8] Similarly, those orphans whose surviving parent formed new families are likely to be treated differently with respect to non-orphaned children (half-brothers/siblings) with whom they live. The control that the new decision-maker in the household has over future return on investments in children's human capital is also likely to be affected, and so the allocation of resources to orphans. If the degree of biological relatedness between individuals relates to altruistic behaviour, as Hamilton's rule (Hamilton, 1964) states, it is expected that the adult taking decisions in the household would invest less in the orphan's human capital.

A third channel through which orphanhood might affect investments in children's human capital is school readiness. Even without discrimination, orphans, in comparison to non-orphans, might be less ready to benefit from schooling if, for instance, they systematically suffered deeper deprivation or bad health in early-life (e.g. when parental deaths are not randomly distributed but concentrated among the poorest); if their probability of being infected by HIV/AIDS is larger; or, if the parental illness and death implied time out-of-school and emotional distress for the child. This gap becomes even worse when the allocation of the household's limited resources, favours investments in non-orphans, in contrast to those intended to level orphans' welfare. In this regard, Evans and Miguel (2007) uses longitudinal data for Kenya to show that after the occurrence of a parental death, households allocate resources to education according to children's expected return to schooling. Children with lower academic test scores before becoming orphans are found to be less likely

[8] Orphans might be fostered in completely 'new households' when both parents died or when one parent died and the surviving parent decide to foster the child out; or they might move to 'different households' when the surviving parent remarries or follows patrilineage traditions.

to attend school after a parental death, relative to children with high test scores before the death.

3. Data, Definitions and Preliminary Analysis

3.1. Data

The data used in this paper comes from the national representative Income Consumption and Expenditure Survey (ICES), which is one of the largest surveys carried out by the Zimbabwe National Statistical Agency (ZIMSTAT). In this paper, I use the fifth ICES survey 2007, which consists of a sample of 65,637 individuals in 14,280 households and 481 community clusters.[9] As Evans and Miguel (2007) mention, the use of longitudinal data to control for pre-death conditions and child fixed effects when studying the effect of orphanhood is desirable. However, given the lack of longitudinal data in most developing countries and the relevance of understanding children's welfare in Zimbabwe, this cross-sectional data represents the best tool available.

The ICES variables used in this paper come mainly from the modules on socio-demographic characteristics, education and labour activities. In particular, this paper exploits two features of the survey. First, for each household and independently of whether children are sent to school or not, the survey collected information on one dimension of the cost of attending school: distance to the closest primary and secondary schools. This allows me to exploit the variation in accessibility to school across households in the same community to separately identify the effect of school distance from unobserved community characteristics. In addition, the ICES contains data on distances to other community facilities that will be used for identification of the effect of school proximity. Second, for each child younger than 18, the survey provides information on whether the biological mother and father are alive, so it is possible to identify maternal, paternal and double orphans in the sample. In addition, the ICES offers information on distance to schools and other facilities, child labour and has almost twice a larger sample size than the Zimbabwean DHS 2010-11, which might be an alternative source of information.

This paper focuses the study of time allocation among the group of children able to attend O-level secondary schools for two reasons. First, the country has a high attendance rate at primary school (79 percent in 2007) and a high drop-out rate in the transition into lower secondary (43 percent of children attend O-level secondary

[9] The sampling scheme has two levels. First, from the 34 strata defined (according to land use at provincial level), 488 Enumeration Areas (EAs) were selected with probability proportional to population size based on the 2002 Census. Second, 20 households in each urban EA and 15 in rural EAs were selected for interview. It is worthy to mention that the sampling frame excludes people residing on state land (such as national parks, safari areas) and collective households. However, according to ZIMSTAT these account for less than one percent of the total population. Although, the survey was originally thought to collect information of 36 thousand households, several factors (mainly, financial constraints) affected the fieldwork that was carried out between June 2007 and May 2008. The sample weights used in this paper are provided by the ICES 2007-08 and are adjusted to the new sample.

school) observed in Zimbabwe.[10] Second, as is shown in the next section, entering O-level secondary school is not conditional on the child's performance on the academic test taken at the end of primary education. Conversely, entering A-level secondary school depends on the results of the test taken at the end of O-level, which are not available in the ICES data.

The sample used in this paper is restricted to those children aged between 12 and 17 years, living in urban and rural areas of Zimbabwe. All children in the sample had completed primary school but had not completed the lower secondary O-level school, and may or may not be attending school at the time of interview. Thus, the final sample size corresponds to 4,863 children, living in 3,776 households.

The dependent variables used in this paper to capture the allocation of the child's time correspond to indicators for whether the child attends school or not ('school') and an indicator for whether the child works or not ('work').[11] For school attendance, the survey asks whether or not each household member aged 4 and above has ever attended school. Since children in the sample have already completed primary education the option 'never been' is not plausible and therefore, the indicator for school attendance takes the value '1' when the child is currently attending school and '0' otherwise.

Child labour is defined using the information from two questions contained in the ICES questionnaire. Each household member aged 10 or above was asked about the main activity both in the last 12 months and in the last 7 days. Unfortunately, the survey does not include questions about secondary activities, and thus the number of child workers is likely to be underestimated. Under these definitions, 75% of children in the sample attend *school* (73 percent 'school only' and 2 percent combine 'school and work') and 26% *work* (24 percent 'work only' and 2 percent combine 'school and work'. The analysis concentrates in these two indicators, which limits its comparison with papers looking at the four categories separately. The small sample sizes in the categories 'no school no work' and 'school and work' are probably underestimated and likely due to the manner in which the questions are phrased.[12]

3.2. Education System and School Enrolment

After independence in 1980, Zimbabwe embarked on the expansion of its educational system with the aim of eliminating ethnic and social class differences in the access to education. In the 1990s, important improvements in quality were additionally introduced. However, since 2000 and after having reached almost universal primary

[10] These values correspond to the 'net enrolment rate', which refers to the enrolment rate of the official age-group for a given level of education, expressed as a percentage of the total population form the same age-group. See Table A.1b, in the Appendix A.1, for more details.
[11] See Appendix A.2 for further details
[12] Data from Kondylis and Manacorda (2012), for a subsample of countries similar ranked to Zimbabwe in terms of the Human Development Index, indicates that the rate of children "no school no work" and "school and work" are about 20 and 25 percent, respectively.

education, Zimbabwe's education system has suffered the effects of the economic and political crisis affecting the country.[13]

The education system in Zimbabwe is divided into three levels: primary, secondary and tertiary education. Before entering primary schools, students may enrol in early childhood education and pre-schools. At age six, children are officially allowed to enter primary education, which is a seven-year period of compulsory school that runs from Grade 1 to Grade 7 and is mainly free of charge. At the end of Grade 7, students take examinations in four subjects. The results of these examinations do not determine progression to secondary education and it is unusual that admission to a particular secondary school takes in consideration Grade 7 examinations results. In contrast to primary education, secondary schools are not free of charge and school fees are associated with service quality.[14] Secondary education is divided into two further levels: the Ordinary level (O-level) and the Advanced level (A-level). After completing primary education, children enter a four-year O-level cycle, where they take a number of core subjects and some other elective subjects depending on the subject availability in schools. At the end of the fourth year, students take the Zimbabwe General Certificate of Education Ordinary Level (ZGCE-O) examination. In contrast to the transition from primary to secondary education, the results of the O-level examination determine the transition to the A-level cycle. If unsuccessful in the ZGCE-O, a student could choose continuing vocational studies such as teacher's training college, technical college, agricultural college, polytechnic and nursing training colleges. If successful in the ZGCE-O and students decide to continue, they enter the A-level, which is the second level of secondary education and lasts two extra years. Students are expected to choose subjects related to the degree programme they will pursue at the university level. Finally, tertiary education in Zimbabwe includes all universities, colleges and other vocational training centres.[15]

3.3. Orphanhood

A main source of social and economic disadvantage for children in Zimbabwe is related to the impact that parental illness and death has on the household. Even though the data used in this paper do not include information about the causes of death, the Joint United Nations Programme (UNAIDS, 2008) estimates that for 2007 15 percent of adults are infected with HIV/AIDS and that it accounts approximately for 75 percent of the orphan children population in the country. This makes Zimbabwe one of the main affected countries in Sub-Saharan Africa.

Using information from the ICES 2001 and 2007, Table 1 shows the distribution of children aged 0 to 17 years across their orphanhood situation. The proportion of

[13] For a more detailed description of the evolution of the educational system in Zimbabwe see the Appendix A.1.

[14] As Kanyongo (2005) mentions, boarding schools (public or private/church-affiliated) generally offer better quality services but at higher prices. Day schools, in contrast, are cheaper but usually of poor quality and not surprisingly they receive the vast majority of students.

[15] See Appendix A.1 for a detailed description of the Zimbabwean education system and distribution of students across educational levels.

orphans has increased over the period 2001 (17.9 percent) to 2007 (23.5 percent).[16] As shown in Table 1, the mortality rate among adult males seems to be higher, which is reflected in that most children suffered the loss of their fathers.[17] Furthermore, Table 1 shows an important increase in the proportion of orphans of both parents (in three percentage points, p.p.) from 2001 to 2007. As Foster and Williamson (2000) argue, the increment in the number of orphans over time is likely to affect the system of extended family.[18] Finally, maternal orphans represent the smallest group among orphans. Maternal orphans have been found to be more likely to receive less child-related goods, healthy foods, and other child health and education expenditures (Beegle et al., 2010; Case et al., 2000; Case and Ardington, 2006; Case and Paxson, 2001; Evans and Miguel, 2007; Gertler et al., 2004).

Table 1: Type of Orphanhood by Area (%), ICES

	2001			2007		
	Rural	Urban	Total	Rural	Urban	Total
Orphan - mother dead	2.9	2.0	2.7	3.4	3.0	3.3
Orphan - father dead	12.5	10.9	12.1	15.0	12.5	14.2
Orphan - both parents	3.2	2.8	3.1	6.6	4.4	6.0
Both parents alive	81.3	84.2	82.1	75.0	80.1	76.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Notes: Rates were calculated using survey weights provided in the ICES 2001 and 2007.

3.4. Living Arrangements

Orphan children may be exposed to higher disadvantage as a consequence of the strategy adopted by their families, in relation to changes in the family arrangements, following a parental death. Traditions of patrilineage in Africa may cause children who lost their fathers to stay with paternal relatives instead of with their mothers (Case et al., 2004). Remarriage of the surviving parent and migration and separation of siblings are other reasons for the dissolution of original families following a parental death (Foster, 1996; Monk, 2000; Ntozi, 1997; Ntozi and Nakayiwa, 1999).

Children (orphans or not) may be incorporated into a new family as adoptive or fostered children. Fostering is a common practice in many Sub-Saharan countries, in particular where extended families play a more important role given the high incidence of HIV and AIDS. Under this family arrangement, biological parents send their children (independently of whether orphans or not) to extended family members to be raised. This might be seen as a mutually beneficial mechanism both for the original families who place their child up for adoption/fostering because they cannot provide for the child's needs and for the new families who may find in the

[16] Bicego et al. (2003) report that the prevalence rates of the different types of orphans in Zimbabwe increased during the 1990s.
[17] Similar evidence is found by Case et al. (2004) in Kenya, Namibia, Tanzania, Uganda and Zambia.
[18] Guarcello et al. (2004) argue that the extended family system is at risk of being weakened, particularly in areas with high prevalence of HIV/AIDS, because the modernization of the society, the conversion to cash economy and labour migration.

adopted/fostered child, an additional worker, particularly for domestic service. Fostering is also expected to reinforce extended family bonds and to improve children opportunities (Foster and Williamson, 2000).

Table 2 shows the distribution of orphans and non-orphans, aged 0 to 17, according to their relationship to the household head. The comparison of the last two columns shows evidence of changes in the living arrangements associated with parental death. While only 33 percent orphans lives with a parent, 76 percent of non-orphans do so. Table 2 also shows evidence of the important role extended families play after a parental death. More than a half of orphans live with 'close relatives' (siblings, aunts/uncles, grandparents), and within this group, orphans live mainly with their grandparents.[19] The first row shows the proportion of children who are themselves head of the household or head's spouses. Even though this proportion is small (1 percent of households with children), it is consistent with evidence found in other Sub-Saharan countries with high AIDS prevalence (Case et al., 2004).[20]

Table 2: Living Arrangements by Type of Orphanhood[21]

Relationship to Household Head	Maternal Orphans	Paternal Orphans	(a)	Double Orphans	(b)	All Orphans	Non-orphans	(c)
Head/Spouse	0.73	0.84		1.62	***	1.01	0.35	***
Son/daughter	32.05	46.24	***	0.00	***	33.13	76.47	***
Close relative	54.84	45.01	***	79.96	***	54.80	19.64	***
Other relative	11.45	6.81	***	16.59	***	9.80	3.19	***
Non-relative	0.93	1.09		1.83	*	1.25	0.35	***
Total	100.00	100.00	-	100.00	-	100.00	100.00	-

Note: "close relative" includes siblings, aunts and uncles, and grandparents. The definition of orphans in this table includes, in addition to children who lost one or both parents, those children who did not know whether their mother and/or father were alive. (a) shows the significance level of tests of mean differences between maternal and paternal orphans; (b) shows the significance level of tests of mean differences between single (maternal and paternal orphans combined) and double orphans; and (c) shows the significance level of tests of mean differences between all orphans and non-orphans. *Significant at 10%, **Significant at 5%, ***Significant at 1%. Data: ICES, 2007.

Evidence of higher family fragmentation after a paternal death is found in Table 2. Similar to what Evans (2005) finds in his sample from 26 African countries, I find that a lower proportion of maternal orphans (32 percent) live with their surviving fathers than the proportion of paternal orphans who live with their surviving mothers

[19] Foster and Williamson (2000) associate the fact that more orphans live with their grandparents with the severity of the AIDS epidemic and the degree of weakness of the extended families system. In these cases the authors argue that it is likely that grandparents accepted to take care of orphans just after other extended family members were consulted but rejected to take care of the children. The authors mention that a similar mechanism may cause child-headed households in Zimbabwe.

[20] These children are excluded from the analysis below.

[21] In contrast to Table 4, the definition of orphans in Table 5 includes, in addition to children who lost one or both parents, those children who did not know whether their mother and/or father were alive. The assumption that an 'unknown' parent has no incidence on the decision process about the child's time allocation seems reasonable and therefore it is the definition of orphanhood used in the paper.

(46 percent).[22] Children who lost their mothers are more likely to go to live with other relatives than those who lost their fathers. In addition, weak evidence of patrilineage traditions is found. When fathers die, children are almost as likely to stay with their mothers as to experience changes in living arrangements. The living arrangements of double orphans are quite different, relative to single (maternal or paternal) orphans. Extended families, in particular grandparents, seem to assume the care of double orphans after parental death. The proportion of orphans ending in households where they may be exposed to higher disadvantage (child-headed or headed by a non-close relative or non-relative) is higher for double orphans than for any other type of orphan.[23]

3.5. Schooling Costs

This paper also explores the effect of schooling costs, focusing on a particular dimension: distance to school. Schooling costs are ignored in most of the studies analysing the effect of orphanhood on the allocation of children's time between schooling and labour. In contrast, schooling costs, measured as distance to school, have received much attention as a determinant of children's time allocation. As mentioned above, the ICES contains information on distance to schools for all households, independently of whether children are sent to school or not, and thus, a measure of cost for all households is available.

The ICES 2007 dataset shows considerable variability in distance to schools in Zimbabwe. On average, secondary schools are at longer distances than primary schools (4 vs. 2.5 km, respectively) and distances to secondary schools are even larger in rural areas than in urban areas (5.2 vs. 1.6 km, respectively).[24] This implies that, on average, the total travelling time needed to attend secondary school by foot in Zimbabwe is, on average, 1.6 hours per day.[25]

Based on the empirical literature using data from different developing countries (Duflo, 2001; Handa, 2002; Filmer, 2004; Jensen and Nielsen, 1997; Kondylis and Manacorda, 2012, among others), a negative relation between children's schooling and distance to school, used as a proxy for direct schooling cost, is expected. In contrast, I expect to find a positive relation between distance to school and child labour (Hazarika and Bedi, 2003; Vuri, 2008).

[22] The ICES 2007 data shows that female-headed households have a higher proportion of orphans in comparison with male-headed households (52 vs. 23 percent), which is frequently found in other countries in the region and implies further source of economic disadvantage for children.

[23] 6 percent of double orphans (43 observations in the age group 12-17) were miss-coded as son/daughter of the household head and I dropped them from Table 2. However, in Table 6, I define this group as "living in a household head who is not a biological parent", and, in Table 7, I dropped them for the analysis of the effect of biological closeness to the household head.

[24] See Table A.1a, in the Appendix A.1, for more details.

[25] Even though the ICES datasets do not have information on travel time to the closest school, Kondylis and Manacorda (2012) estimates that the average travelling time to primary schools in rural Tanzania (located in average to 2.5 kilometres) is in average half an hour, at average adult speed on regular terrain and normal conditions. Applying this rate for Zimbabwe implies that travelling to secondary schools require about 0.6 hours daily in urban areas and 2.1 hours daily in rural areas.

4. Orphans, Household Effects, and Schooling and Working

This section presents the different empirical strategies used to estimate the effect of orphanhood on children's time allocation between schooling and working. The potential channels are discussed in the following two subsections: Section 4.1 compares orphans and non-orphans, and Section 4.2 explores household-related effects. For each child in the sample and in all specifications, I estimate two separate linear probability models, one for school attendance and one for working. I do not account for the fact that both decisions are taken jointly and for the consequent correlation between the error terms. The main motivation for doing this is to obtain results that are consistent and comparable to previous studies (Case et al., 2004; Kondylis and Manacorda, 2012; among others). In addition, the properties of these estimators are well known.[26] Furthermore, as Edmonds (2008) mentions, using univariate models (instead of bivariate probit, multinomial logit/probit, or hierarchical choice model) is the common practice in this literature.

4.1. Orphans versus Non-Orphans and Schooling Costs

To begin, I estimate equation (1) where Y_{ihc} represents the outcome (school or work) of the decision process of household h, living in the community c, about the investment in child i's human capital. O_{ihc} is an indicator variable for whether a child is an orphan of any type (maternal orphan, paternal orphan, double orphan), X_{ihc} corresponds to a vector of child and household covariates, and ε is an error term.

$$Y_{ihc} = \alpha_0 + \alpha_1 O_{ihc} + X'_{ihc}\alpha_2 + \varepsilon_{ihc} \quad (1)$$

Equation (1) is estimated using OLS with robust standard errors correcting for heteroscedasticity. The covariates initially included in X_{ihc} are: the child's age and gender; household size; the number of individuals in different age groups (0-5, 6-12, 13-17, 18-59 and 60 or over); the household head's sex, age and age squared; indicators for the household head's education (no education, incomplete primary, complete primary, incomplete secondary, complete secondary, some post-secondary education); the logarithm of household's expenditure per member; an indicator for the number of assets the household owned; an indicator for whether the household is located in an urban area; and finally, indicators for the month in which the interview took place. Children's age is included in the model because age is potentially correlated with both orphanhood (positively) and schooling (negatively) and labour

[26] Table B.1, in the Appendix B, shows that probit regressions for school attendance and working (in equation 1) give similar results to the ones using a linear probability model. Moreover, the joint estimation of the two regressions, using a bivariate probit model, shows that the same variables that are significant in the linear probability model are so in this specification, and that marginal effects are similar.

(positively).[27] Month of interview dummies are included to control for the potential seasonality in children's schooling and labour linked to the school holiday period and periods of higher demand for children's labour (e.g. the harvest season). The logarithm of household's expenditure per member and the indicator of assets owned are included to control for the current wealth condition of the household. Poor households are likely to face larger restrictions from investing in children and thus excluding these variables would lead to upward estimates of the effect of orphanhood.

The first two columns in Table 3 correspond to the estimation of equation (1).[28] Relative to non-orphans, orphans are (4 p.p.) less likely to attend school and (4 p.p.) more likely to work. Using the 1994 and 1999 DHS surveys from Zimbabwe and a similar specification, Case et al. (2004) find similar results. Being an orphan, of any type, reduces (in about 5 p.p.) the probability of attending school. Despite the fact that they live in poorer households (see Appendix A.3 for further details), when controls for household characteristics (per capita expenditures and assets ownership) are included, the coefficient on orphan is still different from zero, which suggests that the effect of the death of a parent on the investment in the child's human capital occurs through channels other than wealth. This evidence contrasts with several papers finding evidence of no or small disadvantage in schooling between orphans and non-orphans after controlling for household's wealth (Ainsworth and Filmer, 2002; Ainsworth et al., 2005; Foster et al., 1995; Lloyd and Blanc, 1996).

Table 3: Children's Time Allocation on Child and Household Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	school	work	school	work	school	work	school	work
Orphan (any type)	-0.040***	0.040***	-0.048***	0.046***	-0.021	0.028*	-0.025	0.030**
	(0.013)	(0.013)	(0.014)	(0.014)	(0.016)	(0.017)	(0.015)	(0.015)
Maternal orphan	-	-	-	-	-0.016	0.012	-	-
	-	-	-	-	(0.031)	(0.032)	-	-
Double orphan	-	-	-	-	-0.077***	0.052**	-0.074***	0.049**
	-	-	-	-	(0.024)	(0.024)	(0.023)	(0.023)
F tests (p values):								
Maternal orphan=Double orphan	-	-	-	-	3.341	1.402	-	-
	-	-	-	-	(0.068)	(0.236)	-	-
Observations	4863	4863	4863	4863	4863	4863	4863	4863
Adjusted R-squared	0.15	0.14	0.23	0.23	0.23	0.23	0.23	0.23
Individual controls	yes	yes	yes	yes	yes	yes	yes	yes
Household controls	yes	yes	yes	yes	yes	yes	yes	yes
Community fixed effects	no	no	yes	yes	yes	yes	yes	yes

Notes: Each column reports the OLS coefficients from a single regression on an indicator(s) for orphanhood. The individual controls include age and gender dummies. The household controls include household head's gender, age and age squared, dummies for education level accomplished (none, incomplete primary, complete primary, incomplete secondary, complete secondary, some post-secondary), household size, number of individuals in the household in different age cells (0-5, 6-12, 13-17, 18-59 base category, 60 or over), logarithm of household expenditure per member and an indicator of assets owned. Dummies for urban location and month of interview are also included. Robust standard errors shown in parentheses. *Significant at 10%, **Significant at 5%, ***Significant at 1%.

[27] Ainsworth and Filmer (2002) compare the fraction of orphans and non-orphans attending schools without controlling for the child's age and thus their results are biased estimates of the effect of orphanhood.

[28] Full results are reported in Tables B.2, in the Appendix B.

However, equation (1) do not account for community-specific constraints unobserved in the data, and compares, for instance, children facing different labour markets (e.g. work opportunities, social norms about child labour). To disentangle the effect of orphanhood from the potentially omitted community characteristics, equation (2) includes community fixed effects α_c. Moreover, to explore differences among orphans, O_{ih} enters in (2) as a dummy for an orphan of any type and as a set of indicators for the type of orphan (maternal orphan, paternal orphan, double orphan or non-orphan).

$$Y_{ih} = \alpha_3 + \alpha_4 O_{ih} + X'_{ih}\alpha_5 + \alpha_c + \varepsilon_{ih} \quad (2)$$

Columns 3 to 8 in Table 3 show estimations of equation (2). Columns 3 and 4 show that the effects of being an orphan found in the previous specification are consistent even after controlling for community fixed effects. In fact, they even increase in absolute value, which suggest that the omission of unobservable heterogeneity across communities downward biased the results in the previous specification.

Columns 5 and 6 (Table 3) look at differences between types of orphanhood. First, relative to non-orphans, paternal orphans are (2.8 p.p.) more likely to work and are similar in terms of school attendance. Maternal orphans do not seem to be in disadvantaged, neither in school attendance nor in working; and, double orphans are considerably worse off; they are 10 p.p. (significant at the 1% level) less likely to go to schools and 8 p.p. more likely to work (significant at the 1% level).[29] Second, relative to paternal orphans, maternal orphans are statistically equivalent, both in terms of school attendance and working. Double orphans are (7.7 p.p.) less likely to go to schools and (5.2 p.p.) more likely to work. The F-tests below columns 5 and 6 show that double orphans are less likely (6 p.p.) to go to schools than maternal orphans and that they are similar in terms of probability of working.

Given that maternal and paternal orphans do not seem to be statistically different from each other, columns 7 and 8 (Table 3) merge these two categories into one category of 'single orphans' and compare it to 'double orphans', which is found to be the group at a highest disadvantage. Relative to orphans who lost one parent, being a double orphan is highly disadvantageous: they are (7.4 p.p.) less likely to attend school and (4.9 p.p.) more likely to work.

Overall, results from Table 3 show that orphans are less likely to attend school and more likely to work. In particular, among orphans, those children who lost both parents are more disadvantaged. Given that no statistically significant differences between maternal and paternal orphans have been found, the rest of the analysis focuses on the comparison between single and double orphans.

I now turn to explore a factor that might contribute to explain the lower investment in the human capital of orphans: schooling costs. To do this, the next empirical

[29] Values obtained by summing up the coefficients on *Orphan (any type)* + *Double orphan* in specifications (5) and (6), respectively.

strategy allows for a potential differential effect of schooling costs (measured as distance to secondary school) on human capital investments in orphans and non-orphans. Schooling costs (D_h) and its interaction with the indicator for orphanhood are added to the set of covariates. In equation (3), the coefficient α_9, reflects whether the marginal cost of attending school and working differ for orphans and non-orphans.

$$Y_{ih} = \alpha_6 + \alpha_7 O_{ih} + \alpha_8 D_h + \alpha_9 (O_{ih} * D_h) + \tilde{X}'_{ih}\alpha_{10} + \alpha_c + \varepsilon_{ih} \quad (3)$$

Because it is likely that households are not randomly located within communities, distance cannot be assumed as exogenous. This is particularly relevant given the characteristics of the sample considered: children of secondary schools ages in Zimbabwe, where the incidence of orphanhood is high and fostering practices are common. It is likely that unobserved characteristics of households (e.g. tastes, opportunities and constraints) affect both the chance of sending children to school (and to work) and the residential location with respect to schools.[30] Kondylis and Manacorda (2012) argue that better-off households who are more likely to send their children to schools (and less likely to send them to work) are also more likely to live closer to the administrative centre of the community, where most services are conglomerated, including schools. It is also possible that households who are more likely to send children to schools, might decide to move or foster-out their children to households located closer to schools. To deal with this omitted-variables problem, and following Kondylis and Manacorda (2012) empirical approach, I add to X_{ih} in equation (2), the measure of household distance to a set of other facilities, all included in $\tilde{X}_{ih}$.[31] In the absence of a good instrument for household location, this approach relies on the assumption that including the set of distances to other facilities picks-up most of the unobserved characteristics at the household-level related to the allocation of children's time and the household location.

Table 4 shows the indicator of schooling cost (distance to secondary school) interacted with the orphanhood indicators.[32] This specification also controls for individual and household characteristics, community fixed-effects, and additional controls for household self-reported distance to different facilities. The first two columns explore whether schooling costs has a differential effect between orphans and non-orphans, while the last two columns explore if costs contribute to making double orphans the most vulnerable group.[33]

In both set of regressions, there is no evidence that the marginal cost of sending an orphan to school (and not to work) is different to the marginal cost of sending a non-

[30] Fafchamps and Wahba (2006) and Kondylis and Manacorda (2012) point out that household location might be correlated to preferences about the use of children's time.

[31] The set of other facilities includes distance in kilometres to: hospital/clinic; postal office/postal agency; shops; bus stop; hammer mill; GMB depot; market for vegetables; public payphone; banking; and, internet.

[32] Full results are reported in Tables B.3, in the Appendix B.

[33] The sample size in Table 4 is reduced because of missing data in the variables for distance.

orphan (coefficients on the interaction terms). As expected, in the first specification, distance to school reduces the probability that children go to schools. An additional kilometre reduces (by 0.7, p.p., significant at the 10% level)[34] the probability of attending schools, for all children (orphans and non-orphans). Similarly, Kondylis and Manacorda (2012) find that an additional kilometre in distance to school reduces by 0.5 p.p. the probability of school attendance in rural Tanzania and has no effect on the probability of working.

Table 4: Schooling Costs – Distance to School

	(1)	(2)	(3)	(4)
	school	work	school	work
Orphan (any type)	-0.036*	0.038**	-0.008	0.021
	(0.019)	(0.019)	(0.021)	(0.022)
Double orphan	-	-	-0.083***	0.052*
	-	-	(0.032)	(0.031)
Distance (km) to secondary school	-0.004	0.003	-0.004	0.003
	(0.004)	(0.004)	(0.004)	(0.004)
Orphan (any type)*School cost	-0.003	0.002	-0.004	0.002
	(0.003)	(0.003)	(0.004)	(0.004)
Double orphan (any type)*School cost	-	-	0.003	-0.001
	-	-	(0.005)	(0.005)
Observations	4724	4724	4724	4724
Adjusted R-squared	0.24	0.23	0.24	0.23
Individual controls	yes	yes	yes	yes
Household controls	yes	yes	yes	yes
Community fixed effects	yes	yes	yes	yes

Notes: Each column reports the OLS coefficients from a single regression on an indicator(s) for orphanhood. The individual controls include age and gender dummies. The household controls include household head's gender, age and age squared, dummies for education level accomplished (none, incomplete primary, complete primary, incomplete secondary, complete secondary, some post-secondary), household size, number of individuals in the household in different age cells (0-5, 6-12, 13-17, 18-59 base category, 60 or over), logarithm of household expenditure per member and an indicator of assets owned. Dummies for month of interview are also included. Distances to secondary schools and other facilities (hospital/clinic, postal office/postal agency, shops, bus stop, hammer mill, GMB depot, market for all vegetables, public payphone, banking and internet) are included. Robust standard errors shown in parentheses. *Significant at 10%, **Significant at 5%, ***Significant at 1%.

In sum, results so far show that orphans are at a disadvantage relative to non-orphans, and that double orphans are the most vulnerable group. Moreover, they show that not considering unobservable characteristics at community level might bias the estimates of the effect of being orphan toward zero. Finally, even though schooling costs reduce the probability of attending school, the effect is homogenous among orphans and non-orphans, and therefore does not help to explain differences in investments between children.

[34] Value obtained by summing up the coefficients on *Distance (km) to secondary school + Orphan (any type)*School cost* in specifications (1).

4.2 Household Effects

This section explores additional factors, related to different family arrangements, which might help to explain differences in investments between children. First, I test whether blended households (i.e. those containing orphans and non-orphans) protect orphans and whether non-orphans living in blended households are treated equally to orphans in the household. To do this, equation (4) includes a set of indicators, B_{ih}^{j}, where *j* stands for whether the child i is an orphan in a non-blended household *(j=1)*, an orphan in a blended household *(j=3)*, a non-orphan in a blended household *(j=4)*, or a non-orphan in a non-blended household (*j=2*, the base category). The protective role of blended households for orphans and its role as a space for discrimination against orphans are tested comparing the coefficients γ_1 and γ_3, and γ_3 and γ_4, respectively.

$$Y_{ih} = \alpha_{11} + \sum_{j=1}^{4} \gamma_j B_{ih}^{j} + X'_{ih}\alpha_{12} + \alpha_c + \varepsilon_{ih} \quad (4)$$

Table 5 shows the results of estimating this equation and testing the hypotheses that blended households (those with orphans and non-orphans) protect human capital investments in orphans, and that in blended households non-orphans and orphans are equally treated, in terms of school attendance and work.[35] In the sample used in this paper, 33 percent of children live in blended households (19 percent are orphans and 14 percent are non-orphans), 19 percent are orphans in non-blended households and 48 percent are non-orphans in non-blended households (the base category).

The top part of Table 5 shows that, orphans in blended households, followed by orphans in non-blended households and non-orphans in blended households (in this order) are worse-off than non-orphans in non-blended household in terms of schooling and labour. The bottom part shows the F-test for the equality of the coefficients of orphans in non-blended (γ_1) and blended households (γ_3) and orphans and non-orphans in blended households $(\gamma_3 = \gamma_4)$. Significant differences (at the 10% level) among children appear in the regression for school attendance. Among orphans, those in blended households are less likely to go to schools (7.4 p.p.) than orphans in non-blended households (3.7 p.p.), which suggests that blended households do not protect human capital investments in orphans. The second row shows evidence of different treatment to orphans and non-orphans in blended households. While non-orphans in blended households are statistically similar to the ones in non-blended households, they are more likely to go to schools (4.2 p.p.) than orphans in blended households.[36] With respect to child labour, while being an orphan and living in a blended household puts children in a more vulnerable condition (as

[35] Full results are reported in Tables B.4, in the Appendix B.

[36] Values obtained by comparing the coefficients on *Orphans, blended hh* and *Non-orphans, blended hh* in column (1).

shown by the three coefficients at the top of Table 5), there is no evidence that blended households exacerbate discrimination against orphans.[37]

Table 5: Effects of Co-resident Orphans

	(1)	(2)
	school	work
Orphans, nonblended hh	-0.037**	0.042**
	(0.017)	(0.018)
Orphans, blended hh	-0.074***	0.069***
	(0.018)	(0.018)
Non-orphans, blended hh	-0.032	0.037*
	(0.020)	(0.020)
F tests (p values)		
Orphans non-blended & blended	3.073	1.543
	(0.080)	(0.214)
Blended households (orphans and non-orphans)	3.583	1.968
	(0.058)	(0.161)
Observations	4863	4863
Adjusted R-squared	0.23	0.23
Individual controls	yes	yes
Household controls	yes	yes
Community fixed effects	yes	yes

Notes: Each column reports the OLS coefficients from a single regression on an indicator(s) for orphanhood. The individual controls include age and gender dummies. The household controls include household head's gender, age and age squared, dummies for education level accomplished (none, incomplete primary, completed primary, incomplete secondary, completed secondary, some post-secondary), household size, number of individuals in the household in different age cells (0-5, 6-12, 13-17, 18-59 base category, 60 or over), logarithm of household expenditure per member and an indicator of assets owned. Dummies for month of interview are also included. Robust standard errors shown in parentheses. *Significant at 10%, **Significant at 5%, ***Significant at 1%.

To further explore the effect of household composition, I now turn to exploring the effect of living apart from biological parents. This is particularly relevant given that Table 2 shows that orphans, and especially double orphans, are more likely to experience such a change, relative to non-orphans. Unfortunately, with the ICES survey it is not possible to completely identify whether or not a child lives apart from his/her biological parents. It only offers information about whether or not the child's mother and father are alive, and about the relationship of the child with the household head. Therefore, when the surviving parent (1 for single orphans and 2 for non-orphans) is not the household head, it is not possible to know for sure whether they live in the household with the child or not. In these cases, it is not possible to know whether the child lives completely apart from his/her biological parent (fostered or adopted) or it is just that their parents are not the heads of the household. 'Double orphans' are the only children who, by definition (they lost both parents), live apart from their parents. Therefore, I define a variable (N_i), which indicates whether a child is related to the household's head differently than son/daughter (i.e.

[37] The F-tests at the bottom of Table 5 are not statistically significant.

brother/sister, nephew/niece/cousin, grandchild, other relationship, and not related). When doing this, I am biasing the effect of *living apart from biological parents* towards showing zero-effects, and therefore any significant estimate would represent an underestimate of the actual effect. Henceforth, for simplicity, I will refer to a child living with a household head who is not a biological parent as a child *"living apart from biological parents"*.

Keeping this in mind, to explore whether living apart from biological parents affects investments in children's human capital differently, equations (5 and 5') include a set of interactions between the indicator(s) for orphanhood and an indicator for whether the child is not biological son/daughter of the household head (N_i).

$$Y_{ih} = \alpha_{13} + \alpha_{14}O_{ih} + \alpha_{15}N_i + \alpha_{16}(O_{ih} * N_i) + X'_{ih}\alpha_{17} + \alpha_c + \varepsilon_{ih} \quad (5)$$

$$Y_{ih} = \alpha_{13} + \alpha_{18}O_{ih} + \alpha_{19}DO_{ih} + \alpha_{15}N_i + \alpha_{22}(O_{ih} * N_i) + X'_{ih}\alpha_{23} + \alpha_c + \varepsilon_{ih} \quad (5')$$

In equation (5), any differential effect, between orphans and non-orphans, of living apart from biological parents would be reflected in α_{16}. In equation (5'), α_{19} reflects whether living apart from biological parents particularly affects the probability of attending schools and working as double orphans (DO_{ih}), whom by definition cannot live with their biological parents. α_{22} represents the differential effect of living apart from biological parents for single orphans (maternal or paternal) and non-orphans.

Table 6: Living Apart from Biological Parents

	(1)	(2)	(3)	(4)
	school	work	school	work
Orphan (any type)	-0.012	0.014	-0.011	0.014
	(0.020)	(0.020)	(0.020)	(0.020)
Double orphan	-	-	-0.040	0.012
	-	-	(0.025)	(0.026)
HH head is not parent	-0.121***	0.122***	-0.121***	0.122***
	(0.021)	(0.022)	(0.021)	(0.022)
Orphan (any type)*HH head is not parent	0.013	-0.020	0.031	-0.026
	(0.029)	(0.030)	(0.031)	(0.032)
Observations	4863	4863	4863	4863
Adjusted R-squared	0.24	0.24	0.24	0.24
Individual controls	yes	yes	yes	yes
Household controls	yes	yes	yes	yes
Community fixed effects	yes	yes	yes	yes

Notes: Each column reports the OLS coefficients from a single regression on an indicator(s) for orphanhood. The individual controls include age and gender dummies. The household controls include household head's gender, age and age squared, dummies for education level accomplished (none, incomplete primary, complete primary, incomplete secondary, complete secondary, some post-secondary), household size, number of individuals in the household in different age cells (0-5, 6-12, 13-17, 18-59 base category, 60 or over), logarithm of household expenditure per member and an indicator of assets owned. Dummies for urban location and month of interview are also included. Robust standard errors shown in parentheses. *Significant at 10%, **Significant at 5%, ***Significant at 1%.

The first two columns in Table 6 report the estimation of equation (5), which only distinguishes between orphans and non-orphans. Columns 3 and 4 report the estimated results of equation (5'), which isolates the effect of the most vulnerable group of orphans, double orphans.[38] In both specifications, the interactions are statistically insignificant, which indicates that living apart from biological parents does not affect orphans differently to non-orphans. However, living in a household where the household head is not a biological parent substantially reduces the probability of attending schools (by 10.8 p.p., significant at the 1% level) and increases the probability of working (by 10.2 p.p., significant at the 1% level).[39] After accounting for living apart from biological parents, the coefficient of being an orphan is no longer significant. This holds even after isolating double orphans, who by definition cannot live with a biological parent (columns 3 and 4).

Up to this point, specifications have compared orphans and non-orphans living in the same communities but in different households. In addition to the observable dimensions included, households may be different in unobservable characteristics, such as tastes for schooling and child labour, opportunities and constraints. To further deal with unobserved factors that could affect the decision about children's schooling and labour, in the last set of regressions I control for household fixed effects α_h. The sample reduces only to blended household containing at least two children who are able to attend secondary O-level schools. The other controls included in these regressions, in $\dot{X}_i$, are children's age and gender.

$$Y_i = \alpha_{24} + \alpha_{25} O_i + \alpha_{26} N_i + \alpha_{27}(O_i * N_i) + \dot{X}'_i \alpha_{28} + \alpha_h + \varepsilon_i \qquad (6)$$

In equation (6), evidence of discrimination against orphans, relative to non-orphans living in the same household, would be found when $(\alpha_{25} + \alpha_{27})$ is significant. The coefficient α_{27} reflects whether living apart from biological parents has a differential effect on orphans and non-orphans, once unobserved heterogeneity at household-level is considered.

To explore whether the biological closeness of the child and the household head positively affects the decision about the children's schooling and labour (as stated by Hamilton's rule), equation (6') includes the interaction terms between the indicator for orphanhood and the indicators for closeness between the child and the household's head (R_i^k). The latter correspond to whether a child is a son/daughter (*k=1*, the base category), close relative *(k=2)*, other relative *(k=3)*, or is not biologically related to the household head *(k=4)*. The coefficients δ_k indicate whether each particular relationship of the child and the household's head is associated with a differential investment in the human capital of orphans and non-orphans. In general,

[38] Full results are reported in Tables B.5, in the Appendix B.

[39] Values obtained by summing up the coefficients on *HH head is not parent + Orphan (any type)*HH head is not parent* in specifications (1) and (2), respectively.

for both orphans and non-orphans, the effect of biological closeness is measured by $\vartheta_k + \delta_k$.

$$Y_i = \alpha_{29} + \alpha_{30} O_i + \sum_{k=1}^{4} \vartheta_k R_i^k + \sum_{k=1}^{4} \delta_k (O_i * R_i^k) + \dot{X}'_i \alpha_{31} + \alpha_h + \varepsilon_i \quad (6')$$

Table 7 shows the estimates of equations (6) and (6').[40] In addition to the child's age and gender, the regressions in Table 7 include indicators for orphanhood and for whether the household's head is not a child's biological parent (columns 1 and 2) and the biological relatedness of the child with the household's head (columns 3 and 4). The latter corresponds to indicators for whether the child is a 'son/daughter' (the base category), 'close relative' or 'other and non-relative' of the household's head. These are added to test whether the biological closeness with the household's head affects the human capital investments in children, as predicted by Hamilton's rule.[41]

Table 7: Relatedness to the Household's Head

	(1)	(2)	(3)	(4)
	school	work	school	work
Orphan (any type)	0.001	0.015	0.008	0.006
	(0.084)	(0.077)	(0.085)	(0.078)
HH head is not parent	-0.200***	0.233***	-	-
	(0.069)	(0.068)	-	-
Orphan (any type)*HH head is not parent	0.059	-0.104	-	-
	(0.114)	(0.109)	-	-
Close relative	-	-	-0.142*	0.151**
	-	-	(0.076)	(0.075)
Other relative	-	-	-0.278**	0.354***
	-	-	(0.135)	(0.121)
Orphan (any type)*Close relative	-	-	0.039	-0.072
	-	-	(0.117)	(0.109)
Orphan (any type)*Other relative	-	-	0.060	-0.129
	-	-	(0.176)	(0.167)
Observations	518	518	518	518
Adjusted R-squared	0.39	0.44	0.40	0.44
Individual controls	yes	yes	yes	yes
Household fixed effects	yes	yes	yes	yes

Notes: The sample consists on blended households containing at least two children able to attend O-level schools. Each column reports the OLS coefficients with household fixed effects from a single regression on indicator(s) for orphanhood. The individual controls include gender dummies, age, dummy indicators for the degree of biologically relatedness of the child and the household head (son/daughter is the base category). Robust standard errors shown in parentheses. *Significant at 10%, **Significant at 5%, ***Significant at 1%.

Similar to the results in Table 6, when changes in living arrangements are considered, orphans do not seem to be at a disadvantage when compared to non-

[40] Full results are reported in Tables B.6, in the Appendix B.

[41] 'Other relatives' and 'Non-relative' are combined in a single category because of the reduced number of observations in the first group.

orphan children with whom they live (columns 1 and 2). Accounting for unobservable characteristics at household level increases the negative effect of living with a household head who is not a biological parent on investments in children's human capital. Children who live apart from biological parents are (14.1 p.p.) less likely to go to schools and (12.9 p.p.) more likely to work.[42] Once again, the effect of living apart from biological parents is homogeneous for orphans and non-orphans.

The last two columns show evidence of a positive relation between the degree of biological closeness between the child and the household's head and the investment in children's human capital. Relative to biological children, children who are 'close relatives' of the household's head are less likely to go to schools and more likely to work (10 and 8 p.p. respectively, but not precisely estimated),[43] however the ones at much higher disadvantage are those who are 'other-relatives and non-relatives': they are less likely to go to schools (22 p.p., significant at the 5% level) and more likely to work (22 p.p., significant at the 5% level).[44] While biological closeness does not seem to matter for orphans, for non-orphans it does. Non-orphans who are 'close relatives' of the household's head are considerably less likely to go to schools and more likely to work (14 and 15 p.p. respectively, coefficients on *Close relative*), and the less related 'other and non-relatives' are even more disadvantaged (28 p.p. less likely to go to schools and 35 p.p. more likely to work, coefficients on *Other relative*).

Overall, in addition to providing evidence of the disadvantageous situation of orphans (and particularly double orphans) relative to non-orphans, this section finds that household composition and family relationships are associated with differences in human capital investment between children. First, signs of discrimination against orphans living with other non-orphan children (in blended households) are found. Second, living in a household where the head of the household is not a biological parent, places children (the estimate of living apart from biological parents), orphans and non-orphans, at a higher disadvantage. This evidence is further confirmed when unobservable characteristics of the household are considered. Finally, I find evidence of a positive association between the degree of biologically relatedness of the child to the household head and investments in his/her human capital.

5. Conclusions, Policy Recommendations and Discussion

This paper studies the effect of orphanhood on the allocation of children's time between schooling and labour in Zimbabwe. Zimbabwe is a country with a high orphanhood rate (26 percent in 2007), high attendance rate in primary education (79 percent in 2007) but relatively low attendance rate in secondary education (43 percent

[42] Values obtained by summing up the coefficients on *HH head is not parent + Orphan (any type)*HH head is not parent* in specifications (1) and (2), respectively.
[43] Values obtained by summing up the coefficients on *Close relative + Orphan (any type)*Close relative* in specifications (3) and (4), respectively.
[44] Values obtained by summing up the coefficients on *Other relative + Orphan (any type)*Other relative* in specifications (3) and (4), respectively.

in 2007).[45] The analysis focuses on a sample of children aged 12-17 and able to attend O-level secondary education.

Sending children to work instead of sending them to schools might have negative consequences in their future development and for society as a whole. Theoretically, child labour is determined by imperfections in capital markets, uncertainty with respect to the control over future returns of human capital investment in children, and the degree of altruism of the decision taker in the household. Related to this, the empirical literature on the effect of orphanhood on human capital investments has identified three main factors that might affect orphans after a parental death: economic circumstances, changes in living arrangements, and school readiness.

The data used in this paper comes from a national representative survey of Zimbabwe, the ICES 2007, which offers information about the orphanhood situation of the child, labour and schooling, schooling costs (distance to schools), and counts with a larger sample of children than any other available dataset from the country.

This paper presents different empirical attempts to recover the effect that orphanhood, through different channels, has on children's time allocation. I start with a specification comparable to the previous literature that does not account for community fixed effects. Then, I include community fixed effects to compare children facing the same labour market. Under this specification, I test whether schooling costs, blended households and changes in living arrangements affect orphans differently to non-orphans. Finally, I further account for unobservable at household level and compare orphans and non-orphans living together.

Overall, the results in this section show that being orphan reduces the probability of attending schools and increases the probability of working, and that these effects are not simply reflecting the poverty status of the households where they live. After controlling for household wealth, orphans are still found to be at a disadvantage in comparison with non-orphans, which suggests the existence of additional channels through which orphanhood relates to lower investments in human capital. Furthermore, among orphans, double orphans are the most disadvantaged group.

Schooling costs do not seem to contribute to differences in investment in orphans and non-orphans. The protective role of blended households is not verified by the data. Orphans in blended households are relatively disadvantaged with respect to orphans in non-blended households. Additionally, non-orphans in blended households receive more investments than non-orphans living in similar households. Living apart from biological parents is however the main factor associated with the reduced investments in children's human capital. This is confirmed when comparing orphans with the non-orphans with whom they live using a model with household fixed effects. I find that being an orphan does not lead to lower investments itself but what matters is the biological closeness to the household head. I find that biological closeness and investment in children's human capital are positively related. The less related biologically is a child to the household head, the lower investments in human capital he/she receives.

[45] See Table A.1b in the Appendix A.

The accurate formulation of policies oriented to increase children's welfare needs a better understanding of the mechanisms restricting investments in children's human capital. According to the findings of this chapter, after holding all else equal, orphans and children living with non-relatives receive less investment than other children. Therefore, social programmes aimed at improving children's wellbeing and protecting investments in education should target primarily orphans (targeting, when possible, double orphans) and children (orphans and non-orphans) living with non-relatives. If there is intrahousehold discrimination, policies oriented to increase investments in children in general, are likely to leave orphans and children living with non-relatives at suboptimal investment levels. In addition, policies should be aimed at reducing the price of investment in orphans and other disadvantaged children relative to non-orphans (educational subsidies, vouchers). In addition, improvements in the supply of secondary schools (through more schools or improving the access to them) would reduce the marginal cost of schooling and bring more children to schools.

The use of the ICES cross-section dataset for Zimbabwe, however, imposes limitations to this study. First, there may be omitted variable bias, in the sense that it is not possible to control for unobservable fixed characteristics of children or their households of origin (i.e. it is impossible to know if orphans and non-orphans were comparable before the parental death). Second, there may be endogeneity given that all the information about children's and households characteristics used as controls in the models for children's time allocation were collected at the same time as the dependent variable and thus, they may have been affected by the parental death. According to Evans and Miguel (2007), these two factors are likely to underestimate the estimates of the impact of orphanhood of schooling found in most studies. If this is the case, the results of this study can be considered as lower bound estimates of the "true" effect of orphanhood on children's time allocation between schooling and labour.[46]

[46] Another limitation, shared with all the studies using household surveys, is that children living in orphanages or those who are homeless are not included in the analysis. Even though not including these children may lead to an underestimation of orphan rates, I would not expected a considerable difference since estimations for Zimbabwe indicated that "just" 1 percent of orphan and vulnerable children are homeless, 1 percent live in institutions and the rest within the community (UNAIDS, 2008).

6. References

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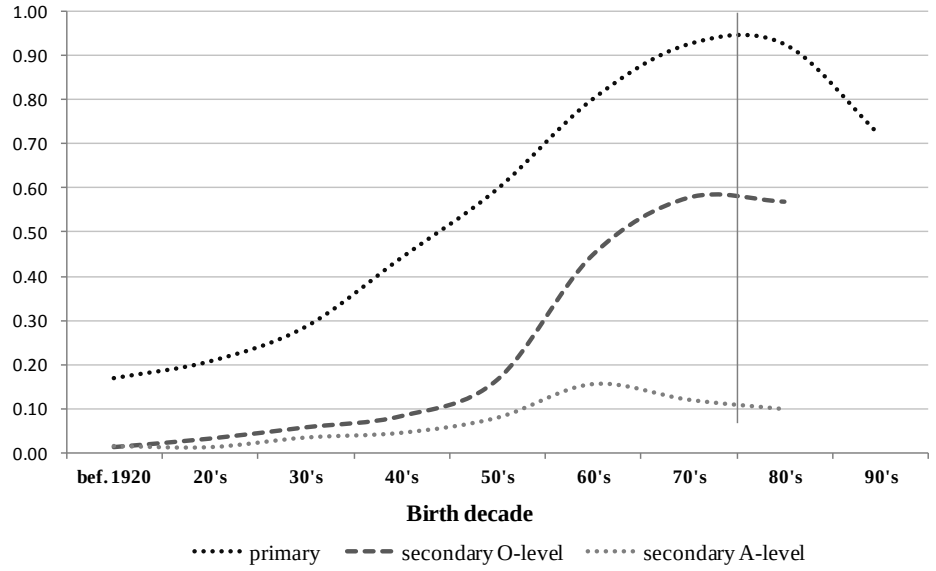
7. Appendix A

A.1: An Overview of School Enrolment

After getting independence in 1980, Zimbabwe embarked on an expansion of its educational system with the aim of eliminating ethnic and social class differences in the access to education. As Kanyongo (2005) mentions, the first post-independence policies consisted of an expansion of the education service supply (more schools, double turns per day, provision of learning materials) without considering major improvements in the quality of teaching. This situation was partially reversed in the period after 1990, where important improvements in quality were achieved: the proportion of primary and secondary school teachers with training increased.

Figure A.1a: School Attainment by Cohorts



Source: ICES, 2007

Since 2000 and after having reached almost universal primary education, Zimbabwe's education system suffered the effects of the economic and political crisis that is affecting the country. Hyper-inflation, unemployment and food insecurity have directly affected the number of households that cannot afford education, schooling costs paid by students (uniforms, transport, nutrition) and teacher's real wages. The number of teachers has also decreased by emigration and AIDS. The combination of these factors with the scarcity of teaching materials contributed to the deterioration of one of the best education systems in the African region.

Using data from the Income, Consumption and Expenditure survey (ICES) 2007, Figure A.1a shows the school attainment of Zimbabweans by cohorts of birth. As mentioned above, a high proportion of Zimbabweans completed at least primary education, in particular those born around independence (represented by the vertical line). Those born in the decade of 1970 and 1980 (i.e. those who were in primary-

school-age in the 80's) seem to have taken more advantage of the expansion of the education system post-independence. In contrast, those born in the decade of 1990 (and therefore in primary-school-age in the late 90's and early 2000's) experienced the deterioration of the education system after the economic crisis. Another interesting fact is the important gap between those getting at most primary school and those having at least secondary school education, which confirms that the policy was mainly aimed at increasing the supply of primary education.

After independence, Zimbabwe increased substantially the supply of schools. The number of primary schools increased by 50 percent from 3,161 schools in 1980 to 4,842 in 2006, and the number of secondary schools increased from 197 to 1,642 schools for the same years (World Bank, 2007).

Table A.1a shows the average reported distance to primary and secondary schools in urban and rural areas using the 2001 and 2007 ICES surveys. It is clear that in both educational levels and over time, schools were more accessible in urban areas. In addition, for both periods primary schools are closer than secondary schools. Table A.1a also shows evidence of the evolution of the education system in the last decade. From 2001 (initial period of the economic crisis) to 2007 (critical period of the crisis), distance to the closest primary school substantially increased, which is another evidence of the system's deterioration mentioned above.[47] In 2007, 10 percent of households at national level had the closest primary school at least twice the average distance (6 vs. 3 kilometres) and the closest secondary school at even longer distances (10 vs. 4.6 kilometres).

Table A.1a: Average Distance to School (km)

	rural		urban	
	2001	2007	2001	2007
Primary school	3.0	3.8	1.4	1.5
Secondary school	6.2	5.9	2.1	1.9

Notes: Rates were calculated using survey weights provided in the ICES 2001 and 2007.

Education System

The education system in Zimbabwe is divided mainly into three levels: primary, secondary and tertiary education. Before entering primary schools, students may enrol in early childhood education and pre-school. At age six, children are officially allowed to enter primary education, which is a seven-year period of compulsory school that runs from Grade 1 to Grade 7, mainly free of charge. At the end of Grade 7, students take examinations in four subjects. The results of these examinations do

[47] Even though the ICES datasets do not have information on travel time to the closest school, Kondylis and Manacorda (2012) estimates that the average travelling time to primary schools in rural Tanzania (located in average to 2.5 kilometres) is in average half an hour, at average adult speed on regular terrain and normal conditions. This implies that in 2007 in Zimbabwe travelling to primary schools may require at least 70 minutes per day and almost two hours per day for secondary schools.

not determine progression to secondary education and it is unusual that admission to a particular secondary school takes into consideration Grade 7 examinations results.

In contrast to primary education, secondary schools are not free of charge and prices are associated with service quality. As Kanyongo (2005) mentions, boarding schools (public or private/church-affiliated) generally offer better quality services but at higher prices. Day schools, in contrast, are cheaper but usually of poor quality and not surprisingly they receive the vast majority of students. Secondary education is divided into two further levels: the Ordinary level (O-level) and the Advanced level (A-level). Children at age 12-13 enter a four year O-level cycle, where they take a number of core subjects and some other elective subjects depending on the availability in schools. At the end of the fourth year, students take the Zimbabwe General Certificate of Education Ordinary Level (ZGCE-O) examination. In contrast to the transition from primary to secondary education, the results of the O-level examination determine the transition to the A-level cycle. If unsuccessful in the ZGCE-O a student could choose continuing vocational studies (teacher's training college, technical college, agricultural college, polytechnic and nursing training colleges). If successful in the ZGCE-O and they decide to continue, students enter the A-level, which is the second level of secondary education and lasts two extra years. Students are expected to choose subjects related to the degree programme they will pursue at the university level. Finally, tertiary education in Zimbabwe includes all universities, colleges and other vocational training centres.

Table A.1b: Net School Enrolment (%)

	2001				
	female		male		Total
	rural	urban	rural	urban	
Primary	79.55	75.59	80.92	75.77	79.14
Secondary O-level	39.47	47.57	42.15	57.75	44.08
Secondary A-level	1.13	6.97	1.80	12.42	4.30
Tertiary	0.09	0.84	0.18	2.29	0.73
Total	57.65	47.26	63.43	53.40	57.36
	2007				
	female		male		Total
	rural	urban	rural	urban	
Primary	79.65	77.58	79.14	79.21	79.10
Secondary O-level	39.80	48.85	37.81	58.43	43.09
Secondary A-level	3.25	11.36	4.22	15.35	7.01
Tertiary	0.13	3.44	0.29	4.17	1.67
Total	55.22	51.43	57.90	57.06	55.70

Note: 'Net school enrolment' refers to the enrolment of the official age-group for a given level of education expressed as a percentage of the total population from the same age group. School-age ranges from age 6 to 26. Rates were calculated using survey weights provided in the ICES 2001 and 2007.

Considering the different levels of education, Table A.1b shows the net enrolment ratio (i.e. the number of the official age-group children enrolled in a given level of

education expressed as a percentage of the total population from the same age group) by gender and geographical location for 2001 and 2007. While total enrolment in primary education has not changed over the period, the enrolment ratio in the lower secondary level decreased and the one for secondary A-level and tertiary education increased. Overall, fewer students were enrolled in formal education in 2007 than 2001. As mentioned above, enrolment ratios in primary school are significantly higher than those for secondary and tertiary education. In particular for this paper, it is interesting to highlight the big gap between enrolment at primary and the first secondary level. Even though the gap with tertiary education levels is bigger, as it is explained later in the paper, this process cannot be analysed in this paper due to data restrictions.

Table A.1b shows also differences across gender. No gender differences are found in primary education enrolment, however, differences in favour of males appear in further education levels. While also found in rural areas, the male advantage is particularly relevant for students residing in urban areas. A final interesting result found in Table A.1b is that enrolment rates in primary education are higher in rural areas in comparison with urban areas, with the exception of male students in the 2007 sample.

A.2: Dependent Variables

This section gives more details about how the dependent variables for children's schooling and labour were constructed using the Income, Consumption and Expenditure Survey (ICES) 2007.

In its module for Education, the ICES asked for all the individuals aged 4 and above the following question:

- *"Has (name) ever attend school?"*
  1. *Never been*
  2. *At school*
  3. *Left school*

Since in this paper I am interested in children who are able to attend to Secondary O-level education (i.e. those who had already completed Primary education but had not completed Secondary O-level yet), the option 'never been' is not plausible. Therefore, the created indicator for school attendance takes the value '1' when the option *'at school'* was chosen and '0' otherwise.

With respect to children's work participation, the ICES asked in its module for Employment and for all individuals aged 10 and above the following questions:

- *"What was (name's) main activity in the last 12 months?"*, and
- *"What was (name's) main activity in the last 7 days?"*

The list of possible activities in both questions included: *paid employee-permanent, paid employee-casual/ temporary/ contract/ seasonal, employer, own account worker, unpaid family worker, unemployed, student, home maker, retired with pension, retired without pension* and *other*.

The indicator for work participation takes the value '0' when '*student'* was chosen as the main activity in the last 12 months and '1' otherwise. For the very few cases (56 cases, 1 percent of the sample) where children declare not to be workers in the last 12 months but workers in the last 7 days, I imputed the value corresponding to the last 7 days.

Table A.2a: Children's School Attendance and Work Participation (%)

	Does child work?		
Does child attend school?	No	Yes	Total
No	0.78	24.18	24.96
Yes	73.31	1.73	75.04
Total	74.09	25.91	100.00

Notes: The sample corresponds to children aged 12-17 able to attend Secondary O-level education in the ICES 2007.

The dependent variables considered in this paper combine the indicator for attending school and work participation. The distribution across the different

categories is shown in the Table A.2a. Given the small sample size in the categories ‘no school no work’ (38 children = 0.8% of total sample) and ‘school and work’ (84 children = 1.7% of total sample), the analysis concentrates in the indicators for whether children attend school (exclusively or combined with work, 75% of total sample) and whether children work (exclusively or combined with school, 26% of total sample). Thus, ‘idle’ and ‘working - studying’ children are used both in the regressions for ‘school’ and ‘work’ above.

A.3: Household Wealth

As discussed in Section 2, children's time allocation to school and work activities might be determined by household resources. The first two regression models in Table A.3a show differences in household wealth between orphans and non-orphans. In both models, an indicator of household wealth (W) was regressed on an indicator of the child's orphanhood situation, distance to secondary school, the child's age and gender and month of interview:

$$W_{ihc} = \alpha_0 + \alpha_1 I(gender) + \sum_{j=13}^{17} \beta_j \, I(age = j) + \delta I(orphan) + \sum_{k=2}^{12} \theta_k \, I(month = k) + \varepsilon_{ihc}$$

Two indicators of household's wealth are used: the logarithm of annual total household's consumption per capita and an index of household's assets, which comes from the estimation of the first principal component of an index of household durables and characteristics of housing.[48] W_{ihc} represents, thus, the household's wealth index for child i in household h living in community c, α_1 measures the difference in wealth between boys and girls, the coefficients β_j measure the difference in wealth between children of age j and age 13. As Case et al. (2004) show, it is important to include the age dummies because age is positively related to orphanhood and may also be related to household wealth. In order to account for potential seasonality on household activities and its effects on wealth, the equation above includes month dummies, where the coefficients θ_k account for differences in wealth related to the month when the interview took place.[49] The coefficient of main interest is δ, which measures the difference in wealth between orphans and non-orphans, keeping children's age and gender fixed. Table A.3a shows the estimation of the equation above by ordinary least squares (OLS) for children aged 13-17 in the ICES sample. Standard errors are clustered at the household level.

The first and third columns of Table A.3a show that orphans live in poorer households in comparison to non-orphans, in terms of per capita consumption and household assets. When orphanhood is decomposed according to the parental loss (column 2 and 4), Table A.3a shows that in comparison to non-orphans, orphans of any type have lower living standards. In particular, double orphans are in the worst condition in terms of per capita consumption (followed by paternal orphans and maternal orphans) and paternal orphans live in households with the lowest assets

[48] The second approach is similar to the one followed by Filmer and Pritchett (1999) and Ainsworth and Filmer (2002) using DHS data. However, in relation to DHS, ICES contain richer information in terms of household's expenditure, which allow me to use the first approach.

[49] As Kondylis and Manacorda (2012) argue, including dummies for the month of interview control also for potential seasonality in children's time allocation to school/work activities linked to for example the harvest season and school holiday period.

index, in comparison to non-orphans.[50] It is interesting that the difference in household wealth between orphans and non-orphans is larger for household's durables than for per capita consumption. This might reflect the response of households in view of the negative economic shock that a parental death represents, and evidence of the permanent income hypothesis. However, they cannot be tested mainly because data on duration of orphanhood is not available.

Table A.3a: Household Wealth Indicators

	(Log) consumption per capita		Assets index	
Orphan (any type)	-0.136***	-	-0.387***	-
	(0.030)	-	(0.086)	-
Maternal orphan	-	-0.102*	-	-0.044
	-	(0.059)	-	(0.191)
Paternal orphan	-	-0.124***	-	-0.451***
	-	(0.035)	-	(0.102)
Double orphan	-	-0.170***	-	-0.412***
	-	(0.051)	-	(0.121)
Constant	11.893***	11.891***	1.268***	1.263***
	(0.104)	(0.104)	(0.331)	(0.331)
Observations	5604	5604	5565	5565
R-squared	0.60	0.61	0.03	0.03

Notes: Each column reports the OLS coefficients from a single regression on an indicator(s) for orphanhood. The additional controls include child age and gender dummies, and dummies for month of interview. Standard errors correcting for heteroskedasticity at the household level are shown in parentheses. *Significant at 10%, **Significant at 5%, ***Significant at 1%.

In sum, orphans are, on average, older and more likely to live in poorer households, and thus, not controlling for children's age and household's wealth would bias the effects of orphanhood upwards.

[50] Using 1994 and 1999 DHS data from Zimbabwe, Case et al. (2004) find similar results to the ones in the assets index equation (their index, however, is the simple sum of some household durable): paternal orphans are in the worst situation, followed by double and maternal orphans, in comparison to non-orphans. The authors find (although not significant) evidence of deterioration in the living standards of paternal orphans over time.