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A Lasting Effect of the HIV/AIDS Pandemic: Orphans and Pro-Social Behavior

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Abstract

The HIV/AIDS pandemic has caused numerous deaths. One unfortunate consequence of this is the deterioration in family structure and the prevalence of orphanhood. We investigate whether individuals who were orphaned as a child suffer long-term consequences through a underinvestment in their social capital. We conduct a framed field experiment in rural, southern Uganda where the HIV/AIDS pandemic hit hardest. In the experiment, subjects made decisions to contribute to a public good. Results indicate that adults who were orphaned as a child free ride more contributing less to the public good. We explore the mechanism through which their background operates. We provide evidence that an important channel is through social norms. Subjects orphaned when young tend to have lower expectations regarding typical behavior of others. A strong interaction effect is identified where those with the lowest expectations who were also orphaned contribute the least to the public good. Thus, we document long-term consequences to a community of the adverse health event.

Keywords: HIV/AIDS, orphan, pro-social behavior, public good, social capital, social norm, Uganda

JEL Codes: I15, D03, C93

1.   Introduction

Since the 1980s, Uganda has been considered one of the global epicenters of the HIV/AIDS pandemic. With national prevalence as high as 15% in 1991, Uganda's rate has reduced to 6% of the population. However, as of 2013, health officials estimate 140,000 new cases of infection each year in Uganda, which accounts for 7% of the world's total increase (UNAIDS, 2014). The consequences of the pandemic are substantial.

Poor health and death from the pandemic have contributed to, along with other consequences, the deterioration in family structure in Uganda. Decades of AIDS-related deaths of adults have left many orphaned children. For example, today Uganda's orphan population is 2.5 million, with no less than 1.2 million of this total coming from AIDS-related deaths (UNICEF, 2015). As a consequence, Uganda's population is also very young. Over 49% of the population is less than fifteen years old.[1] Political violence and the myriad of other diseases prevalent (e.g. malaria) are other contributing factors causing the death of both parents. In these situations children rely on extended family and friends (Sengendo and Nambi, 1997). Some children, though, are forced to the streets.

The decades of disruption to the family structure due to adverse health has led many to question what long-term effects arise (Foster and Williamson, 2000). Family structure has been linked to social development and the resulting economic well-being of individuals and their communities (Guiso, Sapienza, and Zingales, 2004; Berggren and Jordahl, 2006; Gannon and Roberts, 2014). When children are orphaned, they do not receive the investments in their social capital typically provided by parents.[2] Richter (2004), for example, examines the psycho-social impact of HIV/AIDS on orphaned children. She outlines multiple developmental setbacks to orphaned children including,

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[1] See http://kff.org/global-indicator/population-under-age-15. This can be compared to the United States, 19%, and the United Kingdom, 18%, for example.

[2] One would also expect underinvestment in human capital. Social capital is relatively under-studied and is, therefore, the focus here. In our data (described in Section 3 and analyzed in Section 4.1), we do not find a strong relationship between years of formal education and being an orphan (r = 0.02). This is likely due to the fact that educational investments overall in rural Uganda are quite low and informal human capital investments are difficult to measure.

for example, the lack of positive emotional care being correlated with a lack of empathy and the development of anti-social behaviors.

We hypothesize that deterioration of family structures, driven by adverse health outcomes of parents, leads to reduced investments in the social capital of the children. As the children become adults, the lack of social capital leads to a reduction in pro-social behaviors. The lack of pro-social behaviors harms the community. Numerous economic dilemmas take the form of public goods where the efforts and behaviors of an individual are enjoyed by others in a community. Therefore, we argue that an important long-term impact of the HIV/AIDS pandemic is the opportunity cost of adults lacking the pro-social behaviors society benefits from.

To test this hypothesis we engage in a framed field experiment with adults in rural, southern Uganda – the epicenter of the HIV/AIDs epidemic. In our subject pool, we assess whether an adult was orphaned as a child. This is expected to correlate with the amount of social capital investment made into that individual. Numerous socio-economic measurements, such as formal education, age, occupation, and living environment are also collected. Also, importantly, the subjects engage in a Public Goods Game standard in the experimental economics literature. The Public Goods Game presents subjects with a tradeoff between private, but free-riding, gain and group-wealth maximization. It is a common assessment tool to evaluate the level of pro-social behavior of individuals. If the deterioration in family structure has lasting effects on social capital, then adults who were orphaned as children are expected to engage in more free riding in the Public Goods Game.

We find evidence supporting our hypothesis. Controlling for background, human capital, income, and wealth, individuals who were orphaned as children contribute less to a public good. At the mean, the effect is an 11.4% reduction in giving, or rather, approximately a two-fifths of a standard deviation decrease. Therefore, we suggest that social capital formation, disturbed by adverse health, stunts community welfare.

Furthermore, we investigate the mechanism through which the family structure affects behavior. Building on the theory of social norms (Bicchieri, 2006), we identify to what degree behavior matches individual's expectations regarding the social norm of behavior in a community. We present evidence that it is the interaction between the

assessed social norm of an individual and having been an orphan as a child that explains free riding well. For orphans with low expectations regarding the typical contributions of members in the community (i.e., social norm) free riding is more severe. It is only for orphans with extremely high assessments of the giving of the typical person in the community do contributions to the public good recover to the level of the adults who were not orphaned as a child. This suggests that the lasting effect is not necessarily on preferences or human capital, but rather that the disruption to family structures leads to negative assessments of other members of the community's behavior. Individuals who prefer to comply with the prevailing social norm respond by engaging in less pro-social behavior.

Our work contributes to the literature using experimental economics games, conducted in the field, as an assessment tool measuring the determinants of pro-social behaviors. For example, Cassar, Grosjean, and Whitt (2013) and Becchetti, Conzo, and Romeo (2014) use the Trust Game to assess the impact of violence from a civil war in Tajik and Kenya, respectively. Barr (2003) uses field experiments to evaluate the impact of community resettlements in Zimbabwe. The impact of microfinance interventions has been explored by Karlan (2005), Cassar, Crowley, and Wydick (2007). Giné *et al.* (2010), and McCannon and Rodriguez (2016) and group-lending behavior across the world (Cassar and Wydick, 2010), and risk sharing in investments (D'Exelle and Verschoor, 2016). The Public Goods Game has been used to even evaluate the disruption from hurricanes (Whitt and Wilson, 2007) and even differences between northern and southern Italians (Bigoni *et al.*, 2016). We are the first to evaluate the impacts of adverse health on pro-social behavior using a framed field experiment.

The results also contribute to the substantial body of work on the economic impact of HIV/AIDS.[3] Direct effects, such as labor supply (Oliva, 2010; Marinescu, 2014) and female educational investment (Alsan and Cutler, 2013), have been identified. Interesting, indirect effects have been highlighted. Baranov, Bennett, and Kohler (2015) document an indirect benefit to antiretroviral therapy in that it reduces caretaking obligations. Increases in HIV infections are associated with increases in domestic

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[3] Numerous researchers investigate direct impacts of HIV/AIDS, such as HIV/AIDS education, sexual behavior and transmission, and public health spending. This literature is too broad to fully document here.

violence (Chin, 2013). How media coverage affects donors' behavior is studied by Carmignani, Lordan, and Tang (2012). Gong (2015) analyzes how HIV testing correlates with risky sexual behavior. The impact of income shocks (rainfall droughts) is associated with higher HIV prevalence (Burke, Gong, and Jones, 2015). Therefore, we contribute by identifying another important spillover effect of the disease.

Similarly, previous work has directly studied orphans. Immediate impacts on educational investments (Yamano, Shimamaru, and Sserunkuuman, 2016), intra-household resource allocation when integrated into an extended family (Arndt *et al.*, 2006), and height (Beegle, De Weerdt, and Dercon, 2006), have been assessed. We contribute by considering a long-term impact of being an orphan.

Section 2 explores the theory of social capital, how it is expressed, and how family structure contributes to its development. Section 3 presents the experimental methods employed. The main results are presented in Section 4. Section 5 concludes.

2.   Theory

A growing body of literature suggests that social capital influences a wide range of important economic phenomenon (Glaeser *et al*., 2000). Humans are social creatures and social capital has been conceptualized as an individual-specific variable reflecting one's ability to do well in social settings (Loury, 1977). Human actors are influenced by their social environment, obligations, and customs (Portes, 2000). An individual with higher levels of social capital experiences better group-level attributes, such as well-formed social networks (Coleman, 1990). Bowles and Gintis (1976) attribute to social capital the interpersonal skills, status, and access to social networks.

Therefore, one can expect higher levels of social capital to be associated with better economic outcomes for both the individual and his or her community. Social capital can be expected to be important in the development of beneficial social networks like community governance (Fafchamps and Minten, 1999; Bowles and Gintis, 2002; Knack, 2002), family structure (Israel, Beaulieu, and Hartless, 2001), education (Acar, 2011), institutions and corporations (Nahapiet and Ghoshal, 1998; Kostova and Roth, 2003), joint-liability lending (Karlan, 2007), and sovereign nations (Knack and Keefer,

1997; Paxton, 1999). In each of these networks, social capital serves as variable that contributes to individual consumption and the quality of public interaction (Glaeser, Laibson, and Sacerdote, 2002).

Investments by one's family is an important mechanism for social capital development. As the main source of economic and social welfare, the family is the primary builder of social capital (Taiwo, 2012). The family's internal and external relationships model behaviors that are transmitted via children to future relationships. Family structure provides skills, experiences, and knowledge that aid in the cognitive and social development of children and their communities. Family dynamics also encourage reciprocity, which is an important factor in social capital generation. The emotional support of family members generates an implicit willingness to return such support (World Bank, 2011).

Therefore, if one's family is the primary investor in an individual's social capital, then deterioration of the family structure can be expected to harm social capital formation. In countries such as Uganda, adverse health is the primary cause of family structure deterioration. At the top of the list is the HIV/AIDS pandemic. Adverse health leading to parental death has been the driver behind a growing orphan population in Uganda, over the past twenty years. Many government-sponsored and non-profit organizations have been created to manage this growing population (Cho *et al.*, 2011; Sherr *et al.*, 2016). The adverse effects living as an orphan has on social and psychological development, particularly among those orphaned by HIV/AIDS, is well documented (Nielsen *et al.*, 2004; Cluver and Gardner, 2006; Desmond *et al.*, 2014; Sherr *et al.*, 2014; Stein *et al.*, 2014).

Therefore, we hypothesize that adults orphaned as a child typically receive lower social capital investments. Social capital, though, is not directly observable. One must, instead, measure the outcomes it affects. A common way to measure social capital is through surveys (Glaeser *et al.*, 2000). For example, Knack and Keefer (1997) use a trust survey as a measurement of social capital showing that it is correlated with higher levels of economic growth of a country. Alternatively, social capital can be measured using standard laboratory games. Examples include group lending experiments (Cassar, Crowley, and Wydick, 2007; Cassar and Wydick, 2010) and trust games in the field (Becchetti, Conzo, and Romeo, 2014). Pro-social behaviors in experimental games conducted in the field provide the opportunity to measure the impacts of social capital

investments directly and, importantly, can capture different levels of social capital amongst individuals within a population. Behavior in such experiments has been shown to correlate with survey responses as well (Glaeser *et al.*, 2000).

An important economic dilemma is that of public good provision. Communities rely heavily on private provision of public goods and, given the non-excludability of them, free riding by those with low levels of social capital can pose an important opportunity cost. Therefore, we hypothesize that the orphanhood created by the HIV/AIDS pandemic results in adults who exhibit lower levels of pro-social activities, as measured by contributions to a public good.

Another noteworthy dimension to pro-social behavior is social norms. In this framework, it is argued that individuals evaluate a strategic environment assessing what they believe the social norm is in the community. The empirical social norm is the typical response of many in the community (Bicchieri, 2006). An individual's decision, then, is to decide whether to engage in norm compliance, following his or her assessed social norm, or violate the norm. Individuals are "contingent cooperators" where they prefer to comply with the norm, so long as they believe a sufficient number of other people are cooperating (Bicchieri, 2006).

Applying the theory of social norms, behavior is driven by an individual's expectations regarding others' decisions. Recent experimental evidence supports this framework. Bicchieri and Xiao (2007) consider giving in Dictator Games manipulating subject's empirical norms and normative norms (beliefs about what should be done) and find that, when in conflict, individuals follow empirical norms. Bicchieri and Chavez (2010) highlights the importance of normative norms in Ultimatum Game experiments. Reuben and Riedl (2008) investigate which social norm level of giving arises with punishment in public goods games, while Houser and Xiao (2011) demonstrate that public punishments are more effective and eliciting public goods contributions arguing that this is due to the impact on social norms.

While social capital is an input in decision making of an individual, social norms are assessments of behaviors by others in the community and are therefore distinct. Thus, we further hypothesize that the deterioration in social capital investment interacts with one's beliefs regarding behaviors in the community. In fact, social capital has been

thought of as an attribute of a community (Portes, 2000). Therefore, we measure pro-social behavior by one's willingness to contribute to a public good and not free ride off of others. We explore whether having been an orphan affects the willingness to contribute, specifically, and whether there is an interaction between assessed social norms of the community and orphanhood of a subject on these contributions.

3.   Methods

We describe the method employed to test the hypothesis that being orphaned as a child has long-lasting effects on pro-social behaviors. The description of the method implemented in the experiment is separated into the major components: setting, subjects, game, and procedures.

3.1   Setting

The planning and implementation of the framed field experiment was done with leaders of a U.S.-based, non-profit organization *Embrace It Africa* (hereafter EIA). The organization operates primarily in the village of Bethlehem in the Rakai district in Uganda. The Rakai district is at the southern edge bordering Tanzania. The organization's objective is to connect American donors with local community service efforts. Initially, EIA teamed up with a private boarding school, *Bethlehem Parent's School* (hereafter BPS). BPS was founded in 1998 to provide housing and education to the orphans of the HIV/AIDS epidemic that ravished Uganda in the 1980s and 1990s. Hence, BPS has the mission of serving as an orphanage and primary school for children orphaned from the pandemic. Since its inception, BPS has expanded into pre-school and primary school services, along with enrolling non-orphaned children.[4] EIA connects U.S. donors to BPS to fund school fees of orphans and finance building projects such as dormitories, teacher housing, and water wells. EIA has now expanded into community

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[4] Standardized test scores of BPS students surpass those of local public schools. Hence, there is now demand from families throughout the area. A limited number of non-orphaned students are enrolled. Fees collected from these families offset some of the expenses of the orphaned children.

health awareness and microfinance operations around the village of Bethlehem to expand their impact on the well-being of the community. EIA has a small building on site that served as the facility used in the field study.

EIA and BPS are located in Bethlehem, which is a small village approximately 20 kilometers from the nearest small city of Kyotera (estimated population of 9,000 as of the 2011 Ugandan census). The area has an agriculture-based economy with bananas, coffee, maize, beans, and a variety of other vegetables as the primary sources of food. Subsistence agriculture dominates. Some families have chickens, goats, and pigs to provide eggs and meat. Only dirt roads provide access to the area.

3.2   Subjects

Local community leaders and the administration of BPS were used to recruit subjects for the experiment. Advertising occurred throughout the entire village of Bethlehem one month prior to the event. The announcements explained that researchers would be conducting a study in cooperation with EIA. Announcements were made to parents of children at the school, at local churches, and other gatherings of village residents. Given the small population of the village, the employment of community leaders as recruiters lead to all members of the community being aware of the event. The experiments were conducted on January 11 & 12, 2016. Any and all members of the community were invited to participate. The only restriction placed on the recruitment was that individuals had to be at least eighteen years of age to participate and they could take part in the study only once. We conducted a "framed field experiment" (Harrison and List, 2004), which are experiments that use a non-standard subject pool and add a field context.

In Uganda, both English and the local language, Luganda, are official languages. Education occurs in English, but in rural communities Luganda dominates. The games and survey questions were asked in English and, if necessary, Luganda. Given the low expected literacy rates, printed instructions were not used. A script, though, was developed in both English (provided in the appendix) and Luganda to be used by the research team.

A total of 165 people participated in the study. On the first day, 107 subjects engaged in the experiment, with 58 subjects participating on the second day (the indicator variable *Day 1* captures whether the subject engaged in the first day of the field study). Background information was collected after engaging in the game. This includes basic socio-economic information and, importantly, whether the subject was orphaned as a child. Descriptive statistics are reported in Section 4.1. A copy of the questionnaire is in the appendix. Given the expansive reach of the recruiting, there is wide variation in ages, educational backgrounds, occupations, and income/wealth.

Regarding the primary control variables, the gender, age, and education of the subjects was obtained. Family structure measurements are marital status (single, married, widowed, divorced) and the number of children. Occupation controls include being a farmer, trader, teacher, student, Boda-Boda driver (motorcycle taxi), or being in a skilled profession. Examples of skilled jobs include being a mechanic or hotel receptionist. The occupation responses were open ended and all subjects provided a job. Household wealth is captured by the type of house: either a mud hut (known locally as a *kuywepe*) or a brick home, whether the subject has a solid, concrete floor in their house, and whether they have electricity or solar power. These household controls assess wealth levels of the individuals.

3.3   Game

Subjects played a standard, one-shot Public Goods Game. In it, each was endowed with 2500 Ugandan Shillings taking the form of five 500-Shilling coins. The coins were laid out on a bench in front of the subject. Each subject was instructed to choose how many coins to keep for him/herself and how many to put in a bucket, which was also placed on the bench. Subjects physically placed the coins in the bucket.

The subjects were instructed that they would be grouped with three other individuals participating in the experiment. Each would have the same decision to make. They were told that for every coin put in the bucket, the researchers would add another coin. After the four had made their decision and the coins had been added, the amount in the bucket would be evenly divided between the four of them.

After making their choice, two additional questions were asked. First, subjects were asked "how many coins do they believe individuals will typically put in the bucket." Again, a whole number between zero and five was provided by each respondent. Second, the subjects were asked to suppose, "they were the only one of the four who was allowed to put coins in the bucket." It was followed with the reinforcement that whatever they put in the bucket would be matched, but also evenly shared amongst the four in the group. They were asked in this scenario how many coins they would like to have put in the bucket.

The first question is designed to elicit the empirical norm held by the subject. Rather than have the individual anticipate the exact behavior of the people s/he will be paired with, the question asks individuals to provide information regarding his or her beliefs about the typical person. In this way, we can evaluate whether a subject is complying with the social norm. This allows us, within a pool of subjects who make differing public goods contributions, to assess whether they differ in their expectations regarding the norm of play or they differ in their actual willingness to break with the norm.

The second question was designed to record subject's decision in the Dictator Game (Kahneman, Knetsch, and Thaler, 1986). The Dictator Game is a common tool to assess an individual's level of altruism/fairness. In it, subjects are asked to make a contribution from their endowment. The contribution benefits others, but comes at a personal cost. What differentiates the Dictator Game from other games of social-preference elicitation is that the recipients of the contribution have no action to take. Thus, expectations about reciprocation, for example, cannot influence behavior. While numerous studies have directly investigated the determinants of Dictator Game giving, it is most commonly used as a subject-level control variable. For example, Cox (2004) argues for a triadic laboratory procedure when studying Trust Games. Contributions in games intended to assess pro-social behaviors can either be driven by a preference to share (altruism) or based on strategic motivations to grow. In public goods environments, a subject may want to share with others, which could be a different motivation from the collective action problem in groups. Hence, the amount offered as a response to the

second question can be used to differentiate the motives of the subjects in the Public Goods Game.

The standard design for a Dictator Game is to consider a two-person group where one of the subjects can give to the other (see List (2007) for an analysis of the game). We choose to consider a four-person grouping to keep the decision problem as similar as possible to the Public Goods Game implemented. One should always be concerned whether the subjects understand the decision problem they have, so that choices driven by confusion does not confound the results (Andreoni, 1995). Therefore, the decision problem we provided incorporates self-sacrificing decision making without deviating far from the public goods choice problem. The difference between the two decisions problems we present the subjects is only whether others can contribute, which is the crucial distinction between free riding behavior and non-altruistic behavior.

Consequently, three measurements arise from the experiment. The amount actually given in the Public Goods Game becomes the observation for the variable *Contribution*. The amount expected of others is the variable *Norm*, while the amount given when they were the only one who could give is the variable *Dictator*. Each variable takes a discrete value between zero and five.

3.4   Procedure

To staff the experiments, leaders of the school and both co-authors ran the sessions. Local Ugandans with high levels of education and proficiency in English were used as translators. At all times at least four translators were available. English was used, and a Luganda translator was available to assist each subject in conducting the experiment. Furthermore, prior to date of the study, a script was written and translated into Luganda. An English copy of the script is in the appendix. Aids were trained prior to the experiment.

To provide a "show-up" compensation for participation, rather than give money, we provided a community meal both days. Everyone was welcome to come and eat a traditional Ugandan meal. Culturally, food is expected at any sort of community function, and so by abiding to cultural norms we were able to recruit many for the experiment.

Volunteers from the community cooked and served the food. These volunteers are closely affiliated with BPS, being either teachers or former students who still live in the community. Since all schools were on break for the month of January, many people were willing and eager to volunteer their time.

A tent was set up outside EIA's building. To entertain community members and commence the event, young BPS students performed traditional songs and dances. Members of the community were free to come and eat and bring their family, without an obligation to participate in the study. If they wanted to also engage in the experiment, they were encouraged to enter the building. Once inside, consent forms were provided and explained (and signed).

After providing written, informed consent, the subject went into one of two small rooms inside the building where the game was played. In each room was a bench with five coins laid out and a bucket. As stated, subjects physically placed the coins in the bucket. Individuals do not pick or know the subjects they were paired with, which avoids confounding factors (Page, Putterman, and Unel, 2005). Only one subject was in a room with the researcher and translator at a time, and the door was shut during the game to ensure the confidentiality of the responses.

After completing the game, the subject went to a second room within the building to (orally) complete the background questionnaire. A copy of the survey is provided in the appendix. Descriptive statistics from the survey are provided in the following section.

Finally, a desk in the main room of the building was used to provide payment. After completing the survey, each subject came one at a time to the desk. To score the game, a rolling average was utilized. A subject's contribution was added to the contributions of the three previous participants to determine the subject's earnings. Since the game was one-shot, each subject earned the amount from the game. Given that each starts with an endowment of 2500 Ugandan Shillings (hereafter UGX), and there is no deadweight loss to the game, the average payment could not be less than 2500 UGX. If each subject within a group made the full five-coin contribution, then the average payment could be as high as 5000 UGX. For a subject, the lowest monetary payment possible would occur if s/he contributed everything and was paired with three others who contributed nothing. This would result in a payment of 1250 UGX (but this outcome did

not happen to occur). Additionally, the maximum payment a subject could have received arises if s/he contributes nothing, but the other three make a full contribution. This would generate 6250 UGX (again, this did not arise). Since the 500-Shilling coin was the smallest denomination used in the sessions, payments were rounded up to the nearest 500 UGX. The average monetary payment earned was 4293.90 UGX, ranging between 2500 and 6000 UGX with a median of 4000 and a standard deviation of 1040.30.

The researchers learned that, during a pre-experiment assessment, the typical wage in the local community for a person hired as an unskilled, temporary laborer is 2500 to 4000 UGX for a day's work. Thus, the endowment in the game represents approximately a day's salary and subjects earned approximately 1.5 days salary. Thus, it can be argued that not only was the compensation appropriate, but real stakes were at play.[5] The exchange rate between the Ugandan Shilling and the U.S. Dollar at the time of the experiment was approximately 3000 UGX per $1. Thus, the average payment was $1.43.

4. Results

The results from the framed field experiment are presented. First, basic descriptive measurements provide a picture of the population studied, their background, and the decision making that arose. Second, an econometric investigation presents the main result.

4.1 Descriptive Findings

Table 1 provides the descriptive statistics for the variables measured in the study. The sample size is N=165 since each subject engaged in only a one-shot game.[6]

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[5] Anecdotal evidence supports this. An issue that arose on the second day was that two individuals were caught trying to play the game a second time. One subject went home and changed clothes, while another attempted to hide her face in the hope of being assigned to the other room to play the game to get a new researcher and translator that did not recognize her. Thus, the stakes were high enough to encourage such attempts.

[6] During the aid training, it was strongly emphasized to the translators that participation was voluntary and subjects were both free to not participate as well as not answer any question in the survey. Since private information was collected, the aids were encouraged to not "push" for responses subjects were

Table 1: Descriptive Statistics

		Outcomes of the Game			
	Mean	St. Dev.	Median	Min	Max
Contribution	3.139	0.99	3	1	5
Norm	2.986	1.05	3	1	5
Dictator	3.421	1.07	4	1	5

Background			Family Structure	
Orphan	0.305		*Children*	3.14
Male	0.448		*Married*	0.630
Age	33.31		*Widowed*	0.075
Education	8.03		*Divorced*	0.030

Occupations			Households	
Farmer	0.606		*Kuywepe*	0.198
Trader	0.218		*Concrete*	0.578
Teacher	0.127		*Electricity*	0.208
Student	0.036		*Solar*	0.097
Boda-Boda	0.024			
Skill	0.115			

Contributions are high. On average, subjects donated approximately 63% of their endowment to the public good. This is higher than what typically arises in laboratory experiments with U.S. undergraduate subjects where the giving levels are closer to 50% (Ledyard, 1995). Also, interestingly, Dictator Game giving is not only higher than what is

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uncomfortable with. As a consequence, while all 165 subjects completed the game decision, there are two missing observations for *Age*, one for *Orphan*, one for the household questions, and five for *Education*. There is overlap between the omissions.

typical in the lab (List, 2007), but is, in fact, greater than the Public Goods Game giving. Thus, the Ugandan subjects studied tended to give more if they were the only ones who can contribute and free ride, to a degree, if others can also contribute. This is in stark contrast to U.S. populations typically studied where the altruistic sharing is less than public goods giving. Anticipated giving by others is, at the mean, close to the actual amount given. Thus, subjects were rather accurate in their expectations regarding others' behavior. Finally, it is noteworthy that none of the 165 subjects who participated in the study chose to give zero in either the Public Goods Game or the Dictator Game.

The Ugandan subjects are primarily engaged in farming with only a modest cohort involved in high-skill occupations. The proportions sum to a number greater than one since individuals can have more than one source of income. Regarding family structure, the average is to have more than three children. The median is 2.5 children, with a standard deviation of 3.0. Given that most subjects were in their prime adult years, this is in line with the national average number of children a woman in Uganda can expect to have (5.9 children / woman). Many subjects are married with 26.5% of the adults studied being single.

Over 30% of the subjects were orphaned as a child. Thus, unfortunately, they make up a nontrivial proportion of the sample. Educational investments are low. The median number of years of formal education is 7 with a standard deviation of 3.5. One could expect that having been orphaned as a child would also reduce human capital investments. Figure 1 compares the distribution of education attainment for orphans compared to non-orphans.

Figure 1: Education Distribution
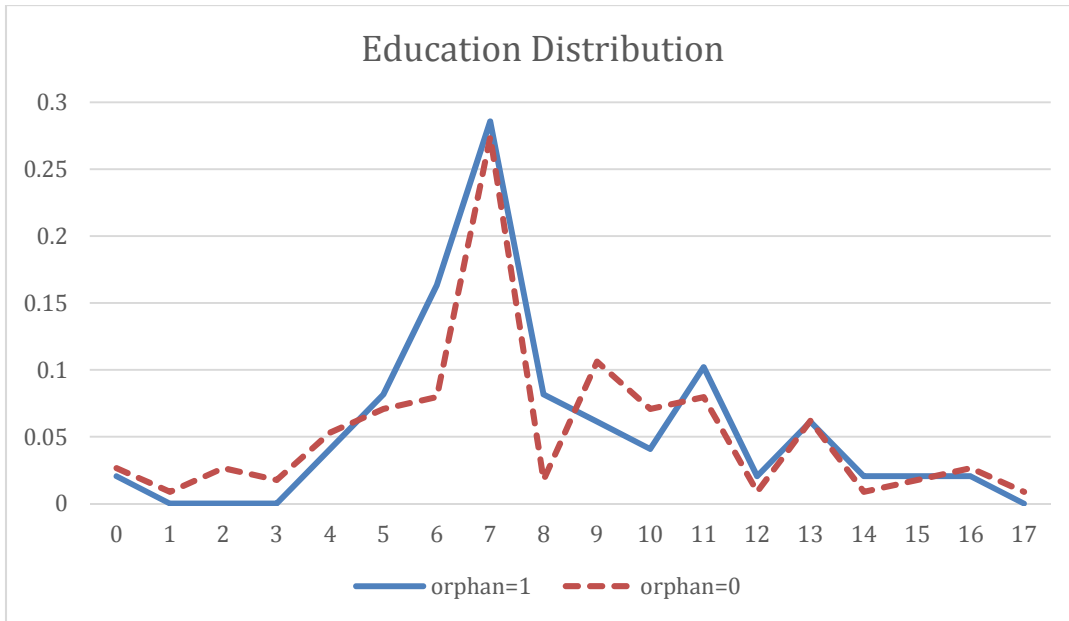
There is not a noticeable difference in the distribution of years of formal education obtained. In fact, the correlation coefficient between having been an orphan and education is 0.02. Therefore, at least with regards to formal human capital investment, the deteriorated family structure does not lead to an observable difference between the two samples.

The median age of the subjects is 30 years old, with a standard deviation of 12.0 and a maximum age of 76. According to the CIA World FactBook, 21.2% of the population in Uganda is 15-24 years old, 25.9% is 25-54, and 2.4% is 55 or over. Since the study excluded any participants under the age of eighteen, our sample mimics the overall Ugandan population well. In fact, we have 30.1% under 25, 63.2% between 25 and 54, and 6.7% 55 or older. The presumption of the work presented here is that losing one's parents due to, primarily, the HIV/AIDS pandemic is the important driver of orphanhood directly and pro-social behaviors indirectly. Therefore, one would expect the distribution of the ages to be different between adults orphaned and those not. Figure 2 compares the age distributions of the two groups.

Figure 2: Age Distribution
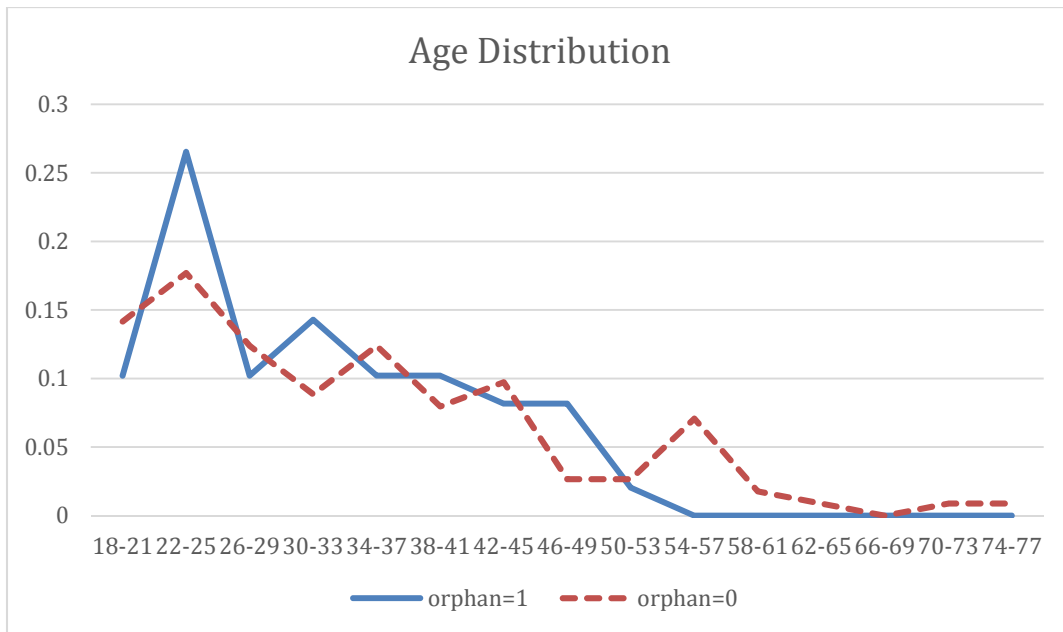
As one can see, the distribution of ages amongst the orphan population is heavier at age ranges under thirty-four years old. This corresponds to adults born after 1982. This is in line with the HIV/AIDS infection prevalence in the country. There is little difference in the relative rate of orphanhood in adults aged thirty-four to fifty-four in our sample, which corresponds to the pre-HIV/AIDS period in Uganda.

Finally, the descriptive statistics in Table 1 reveal the relatively poor living environment of Ugandans in the Rakai district. One in five subjects live in a mud hut with more than two in five having a dirt floor in their house. Access to power is rather rare. There is some evidence that adults who were orphaned experience lower living standards when adults. The correlation between being an orphan and having electricity is -0.15, while the correlation with having a solid floor and mud walls is -0.19 and 0.11, respectively. While modest, these reveal a long-term, disproportionate impact from the pandemic.

The primary research question is whether individuals who were orphaned as a child engage in less pro-social behavior when they are adults. Figure 3 compares the sample of orphans to non-orphans. Specifically, for the primary variables of interest the

subsample average for the orphans is compared relative to the subsample average for the non-orphans. A value greater than one indicates that the *Orphan* = 1 subsample experiences a higher mean than the *Orphan* = 0 subsample.

Figure 3: Subsample Comparisons
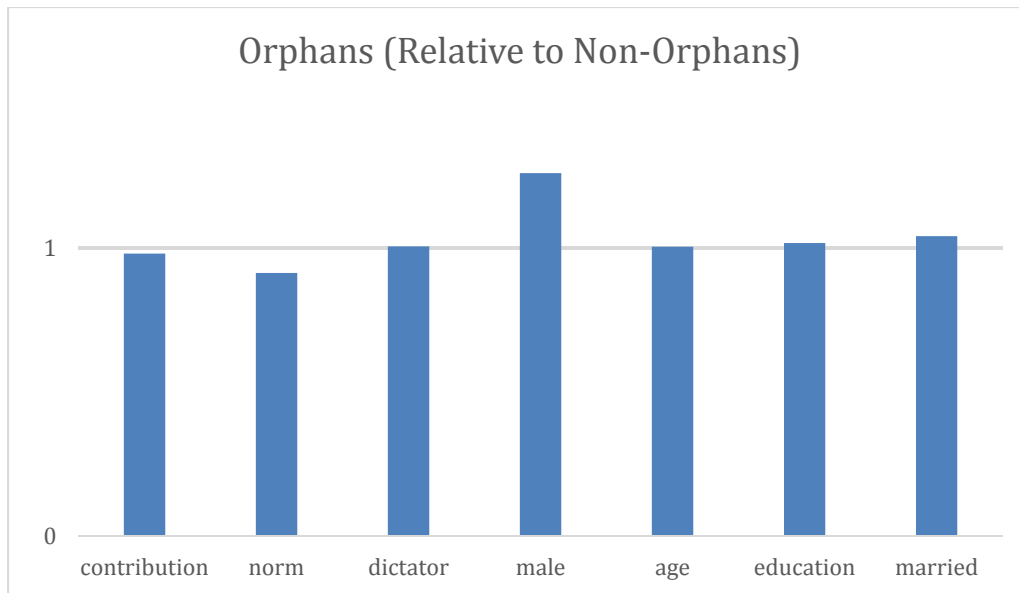
As previously illustrated, only modest differences arise based on age and education. Marital status is slightly higher. Orphans, though, are more likely to be male.[7]

Regarding decision making in the experiment, orphans contribute slightly less than non-orphans. A more noticeable difference is that orphans have substantially lower expectations regarding the social norm of play (9% less). Therefore, if orphans have lower social norms, and subjects have a preference for norm compliance, then being an orphan leads to reduced levels of pro-social behaviors.

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[7] The source of the gender gap is unclear. The difference may be spurious. Alternatively, it has been shown that orphans in Africa are allocated a smaller share of household resources when moved into a new home (Arndt *et al.*, 2006). It is possible that resources are more available for orphaned males, which affects their survival rate. Measuring this effect is beyond the capabilities of the current study.

4.2   Econometric Analysis

To test the veracity of these observations, an econometric model is estimated. The amount contributed to the public good is the dependent variable. The family structure controls, occupational variables, and household characteristics are used as control variables. The effect of personal characteristics, including, importantly, whether or not the subject was orphaned as a child, is used as the primary independent variables. Table 2 presents the results.

Table 2: Effect of Being an Orphan on Pro-Social Behavior

(dependent variable = *Contribution*)

	I		**II**	
Orphan	-0.362 **	(0.177)	-1.034 **	(0.584)
Male	-0.362 *	(0.189)	-0.070	(0.148)
Age	-0.004	(0.008)	-0.001	(0.009)
Education	0.059 *	(0.036)	0.036	(0.024)
Dictator			0.476 ***	(0.097)
Norm			0.131	(0.085)
Orphan x *Norm*			0.276 **	(0.119)
Controls				
Family Structure	YES		YES	
Occupation	YES		YES	
Household	YES **		YES	
Adj R^2	0.07		0.47	
AIC	379.6		328.1	
F	2.6 ***		9.8 ***	
N	145		144	

The first column illustrates that individuals who were orphaned contribute less to the public good. Being an orphan as a child is associated with an 11.4% reduction in public goods contributions at the mean.

Additionally, men contribute less to the public good than women. This is a common finding in laboratory experiments (Andreoni and Vesterlund, 2001) and field study (List, 2004).

Additionally, education attainment is positively related to public good contributions. The estimated effect is a one standard deviation decrease in the number of years in school increases giving by one-fifth of a standard deviation. The observation that *Orphan* is statistically significant when *Education* is controlled for suggests that both human capital and social capital are important, independent drivers of pro-social behavior.

Also, the household control variables i.e., the characteristics of the floor, walls, and access to electricity, are collectively statistically significant explanatory variables. Wealth is difficult to measure in an area without formal, established financial institutions. Thus, the significance of *Orphan* when controlling for household characteristics, as a proxy for wealth, illustrates that the lack of pro-social behavior is not driven by income effects.

In the second column an interaction effect between *Orphan* and the anticipated social norm, *Norm*, is included. The results reveal a strong interaction effect between the anticipated social norm of an individual and being an orphan. While being an orphan is associated with lower levels of giving, the effect is mitigated for those who have positive expectations regarding other's play. In other words, there is a multiplicative effect between being an orphan and have pessimistic expectations.

To illustrate, for any level of *Norm*, contributions by those who were orphans is less – so long as *Norm* is less than 3.82. Only for orphans with very high levels of expectations of others' behavior is the orphanhood effect overcome. In the sample studied, 25% of orphans have this high enough level of expectations. For those who do not, the average contribution of the orphans is 2.84, while for the non-orphans it is 3.06 (a 7.7% increase). Thus, the subsample comparisons are in line with the econometric estimation.

The inclusion of an interaction term between *Orphan* and *Dictator* is statistically insignificant and does not change the importance of any of the other variables, Therefore, estimates including it are not reported. Similarly, *Orphan* can be interacted with the other explanatory variables (*Male*, *Age*, *Education*, and *Married*). Adding each individually and collectively to the specification in the first column generates statistically insignificant coefficients on the interaction terms and worsens the goodness of fit measurement (AIC).

While there is not a strong interaction effect, the second column of Table 2 illustrates that altruistic giving, as captured by *Dictator*, is associated with higher levels of public goods contributions. This is to be expected. The motivation to share one's endowment in the Dictator Game is present in the Public Goods Game.

As is common in experiments with discrete choices, one may be concerned that OLS is not an appropriate model to estimate. The dependent variable takes only discrete values and cannot be less than zero or greater than five. The sign and statistical significance of *Orphan* in I continues to hold if a Poisson Count Data model or an Ordered Probit model is estimated, along with the sign and statistical significance of *Orphan*, *Dictator*, and *Orphan* x *Norm* in the second model. Also, its statistical significance is maintained if unadjusted standard errors are calculated. Thus, the results are robust to the model selected.

While not directly relevant to the research question addressed here, we also collected information from the subjects regarding their access to financial markets. Specifically, we asked whether they had received a bank loan in the past, a loan from a microfinance organization, or if s/he participates in a farming cooperative (as a measure of group financial support). The inclusion of these variables does not change the sign or statistical significance of *Orphan*. Finally, the family structure question regarding the

number of children suffers from missing observations (# obs. = 148). If it is included, reducing the number of observations used in the regression estimation, the sign and statistical significance of *Orphan* remains.

5. Conclusion

The purpose of this study is to evaluate the impact of adverse health on pro-social behaviors. As an epicenter of the HIV/AIDS pandemic, poor health and death contributed to a high population of orphans in the Rakai district of southern Uganda. To measure levels of pro-social behaviors, subjects engaged in a standard Public Goods Game with our sample of community members in the Rakai district.

Results of the experiments indicated that adults who were orphaned as a child make lower contributions to the public good. At the mean, the estimated effect is a reduction by 11.4%. Also, orphans have lower expectations of giving by others. Norm compliance leads to lower levels of pro-social behavior. Orphans who also have low assessments of others select an elevated level of free riding.

One important issue worthy of note is that we do not directly assess the current health of the experimental subjects or their parents. Specifically, we do not differentiate between adults orphaned due to death related to AIDS, or other causes. This was done intentionally because we wanted to respect the health privacy of our subjects. Recently the *HIV and AIDS Prevention and Control Act, 2014* of Uganda mandates the protection of HIV status requiring medical confidentiality.[8] To avoid breaches, only the question regarding orphanhood is asked. Ideally, one would like to know further details regarding differences between orphans to assess in more detail the potential under-investments in social capital.

Another concern is the external validity of the results. To understand how an event affect preferences, individual-level data is needed. By analyzing behavior in a field study at one location, confounding effects such as cultural differences, can be controlled for. The tradeoff, though, is the concern that the results presented are not generalizable.

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[8] See http://globalhealth.washington.edu/sites/default/files/AIDS_Law_Brief-Health_Information_Confidentiality_in_Uganda.pdf for a brief on health privacy laws in Uganda.

For example, the purpose of the study is to assess the impact of HIV/AIDS, through orphanhood, on social capital formation and the resulting pro-social behaviors. We cannot, though, separate other sources of parental death from the disease, such as other health problems or violence. While a possible limitation, the results presented are the first to document a systematic relationship between orphanhood and pro-social behaviors.

It is important to establish the long-lasting effect of adverse health. Community well-being can be expected to be affected by private provision of public goods and, hence, communities such as the one studied are still being handicapped by the consequences of HIV/AIDS. Our study, though, does not directly measure how to fix these behaviors. It does suggest that social norms are important. Educational and counseling efforts may want to consider positive norm-promoting activities. These restorative efforts, though, are beyond the scope of the current study.

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Appendix

Below is the English language script used in the experimental sessions.

Welcome. We greatly appreciate your willingness to participate. The decisions you make in our game will help us with our research.

There are a few things you should know about the game today. First, you are going to be making decisions that affect how much money you will receive and how much money other people get. Similarly, how much money you receive will also depend on the choices made by others. We want to assure you that the choices you make will remain anonymous and confidential. At no time will the other participants know the decisions you made. We will not reveal any information about your choices to others. Second, we want to emphasize that participation in the research is voluntary. You may quit the game at any time and are free to leave. Third, the paper you have received provides contact information of Dr. Gary Ostrower. If at any time you feel as if you have not been treated fairly and with respect by us, you are encouraged to contact him. The game is designed so that you have the opportunity to gain money. At no time can you lose money and at no time should you be put at any risk.

If you consent to participating in our research, please sign the paper form.

Thank you.

We are going to be playing a game. On the table in front of you are five coins and a sealed bucket. You are going to be a part of a group of four individuals. Each of you has five coins. The decision you need to make is how many of your five coins you would like to put inside the bucket. The coins you do not put in the bucket are yours to keep. For every coin you put in the bucket we will add another one to the bucket.

Three others will soon also make the same decision of how many coins to put in the bucket. They will not know how many you contributed and you do not know how many they contributed.

After the four in your group make this choice, the coins in the bucket will be divided equally between the four of you. The amount of money you make in this research will be the number of coins you keep and your share of the bucket.

Let us provide an example. Suppose each individual keeps three coins and puts two coins in the bucket. This means that there are sixteen coins in the bucket. The four of you have put a total of eight coins in and we have added another eight coins. The sixteen coins in the bucket are split evenly so that each of you receives four coins. As a result, you will gain a total of seven coins – the three you kept and the four you received from the bucket.

Alternatively, suppose two individuals put all five coins in the bucket and two individuals put zero coins in the bucket. This means there are twenty coins in the bucket – the ten contributed by the first two people and the ten contributed by us. The coins in the bucket are evenly shared between the four of you so that each receives five coins from the bucket. The two individuals who did not keep any coins receive a total of five coins in the research and the two who kept all five coins receive a total of ten coins – the five they kept plus the five received from the bucket.

Those are two examples. You are free to make any decision you want.

[Take a few moments to answer questions, re-explain the game, and administer proficiency questions until you are confident that the subject comprehends the game.]

[Have them make their decision by physically placing coins in the bucket.]

Great! Thank you again!

[Send the subject to the survey room]

The following is a copy of the table completed in the surveying. The questions were posed orally to the subjects in either English or Luganda, depending on the preferences and communication skills of the subject.

ID	
Gender	
Age	
Married? (Never, currently, or in the past)	
If "in the past", divorced or widowed?	
# of children	
Occupation	
If a farmer, do you participate in a co-op?	
If a farmer, do you hire laborers to help?	
If yes, how many?	
If a farmer, do you grow crops or raise livestock?	
If a crop farmer, which crops?	
If a livestock farmer, which livestock?	
How many?	
If a trader/business owner, do hire workers?	
If yes, how many?	
How many years of school have you completed?	
Have you or someone in your family received a microloan?	
If yes, from whom?	
If yes, you or your family member?	
Have you or someone in your family received a bank loan?	
If yes, you or your family member?	
Have you ever received or contributed to a lending cooperative?	
If yes, what form did it/they take?	
Does your house have a concrete floor?	
Is your house made of brick or is it mud hut (kuywepe)?	
Does your house have electricity or solar?	
Did you grow up as an orphan, without your biological parents?	