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Richard Akresh

Abstract

Researchers often assume household structure is exogenous, but child fostering, the institution in which parents send their biological children to live with another family, is widespread in sub-Saharan Africa and provides evidence against this assumption. Using data I collected in Burkina Faso, I analyze a household's decision to adjust its size and composition through fostering. A household fosters children as a risk-coping mechanism in response to exogenous income shocks, if it has a good social network, and to satisfy labor demands within the household. Increases of one standard deviation in a household's agricultural shock, percentage of good network members, or number of older girls increase the probability of sending a child above the current fostering level by 29.1, 30.0, and 34.5 percent, respectively. Testing whether factors influencing the sending decision have an opposite impact on the receiving decision leads to a rejection of the symmetric, theoretical model for child fostering.

Keywords: Child Fostering, Risk-coping, Social Networks, Household Structure

JEL Codes: O15, J12, D10

1 Introduction

Theoretical and empirical research on household decision-making often treats the household's composition as exogenous. However, if families adjust their structure (by changing who is a resident member) in response to factors affecting the household, then this assumption is not valid and subsequent conclusions might be misleading. In sub-Saharan Africa, the institution of child fostering, in which parents send their biological children to live with another family, is widespread. Household survey data collected by the author in rural Burkina Faso show that approximately twenty-seven percent of households either sent or received a foster child between 1998 and 2000, and these children spent, on average, 2.75 years living away from their parents.[1]

This paper examines why families adjust their structure by sending and receiving children, and provides evidence that the assumption of a fixed and unchanging household is not reasonable in the African context. The paper can consider motivations for fostering that previous researchers have not been able to explore because the fieldwork involved a research methodology in which I located and interviewed the sending and receiving households participating in each fostering exchange.

I present a theoretical framework and empirical evidence that three principal factors influence the household decision to foster a child. First, households use child fostering as a risk-coping mechanism in response to exogenous income shocks. Households that experience worse shocks are more likely to send a child to live with another family. Previous researchers have documented that, in risky environments, households may use various methods to cope with exogenous shocks such as adult migration and marriage strategies (Rosenzweig and Stark, 1989; Paulson, 2000), livestock sales (Rosenzweig and Wolpin, 1993), informal credit markets (Udry, 1994), increased labor supply (Frankenberg, Smith, and Thomas, 2003), and gifts and transfers from relatives and neighbors

[1] Additional Demographic and Health survey evidence from 16 African countries shows that many families adjust their household size through fostering in addition to natural fertility (Vandermeersch, 1997). The percentage of households with foster children ranges from 15 percent in Ghana to 37 percent in Namibia.

(Goldstein, 2000; Fafchamps and Lund, 2003).[2] One researcher developed a theoretical model showing that risk might motivate households to foster children but was unable to empirically test it (Serra, 1996).[3] None of the existing economics research has been able to test whether households use child fostering as a risk-coping strategy. This is the first paper to provide evidence that fostering is used to deal with adverse shocks and income fluctuations.

Second, households with better opportunities, measured in terms of the quality of their social network, are more likely to foster. Previous research has considered the role social networks play in outcomes such as workers locating jobs (Granovetter, 1973; Montgomery, 1991; Munshi, 2003) and the decision to migrate (Espinosa and Massey, 1997), but the importance of networks for child fostering has never been explored or quantitatively measured.

Third, in most African households, children perform chores that might include cooking, cleaning, childcare, fetching wood, and running errands. Having too many or too few children in a given gender and age class may not optimize household production, and therefore, parents are more likely to foster children to offset demographic imbalances. These child labor results are consistent with the seminal work on child fostering by Ainsworth (1990, 1996) as well as the research by anthropologists, demographers, and sociologists working in West Africa (Schildkrout, 1973; Goody, 1982; Oppong and Bleek, 1982; Isiugo-Abanihe, 1985; Bledsoe and Isiugo-Abanihe, 1989).[4]

The survey data provide empirical evidence that a household is significantly more likely to send

[2] Frankenberg, Smith, and Thomas (2003) examine changes in household size and composition as one of several mechanisms that households might have utilized in response to the 1997 financial crisis in Indonesia. Their consideration of the household response to an aggregate, macroeconomic shock differs from the current analysis, which focuses exclusively on the impact of idiosyncratic shocks on child fostering.

[3] Sociologists and demographers have also provided evidence that households use fostering to deal with uncertainty and risk (Brydon, 1979; Etienne, 1979; Goody, 1982; Bledsoe and Isiugo-Abanihe, 1989).

[4] Several sociologists and demographers have provided evidence that households foster children for educational investment when local opportunities are limited (Goody, 1982; Chernichovsky, 1985; Gould, 1985; Isiugo-Abanihe, 1985), but Ainsworth could not empirically confirm this and I do not find evidence that it is a significant motivating factor for the households in Burkina Faso. In the survey, households cited the reason each child was fostered, and only nine percent listed schooling. Given that respondents perceive schooling as a positive reason for fostering (compared to child labor), nine percent is likely to be an upper bound for the number of children actually fostered for schooling.

out a child if it experiences a negative shock, has a better quality social network, or has additional children in a given age and gender class. However, none of these factors explain a household's receiving decision. The only factor that is significantly relevant for the receiving decision is the receiving household's wealth, with richer households more likely to receive a child. One implication of the theoretical framework is that factors influencing the sending decision should have an opposite effect on the receiving decision. Based on the empirical evidence, I reject this symmetric, theoretical model for child fostering.[5]

The importance of understanding why households foster children is magnified by the fact that most international development organizations and many academic researchers believe fostering has negative consequences for that child's human capital investment and welfare outcomes (Bledsoe and Brandon, 1989; Haddad and Hoddinott, 1994; UNICEF, 1999; Case, Lin, McLanahan, 2000; Kielland and Sanogo, 2002; Bishai et al., 2003; Fafchamps and Wahba, 2004). However, related research using these data shows that foster children experience increased school enrollment after moving away from their biological parents, indicating fostering may help insulate poor households from adverse shocks (Akresh, 2004). In circumstances when parents may not be able to adequately provide for their children (due to a negative income shock), but the family has a high quality social network, the biological siblings remaining behind are also protected from the shock's consequences as more resources are made available for them subsequent to the fostering.

The remainder of the paper is organized as follows. Section 2 describes the empirical setting for the data collection. In Section 3, I describe the theoretical framework that motivates the household fostering decision. Section 4 presents the empirical results for the household sending and receiving decision and tests the symmetry implication of the theoretical model. Section 5 concludes.

[5] Empirical evidence indicates that households that receive children have access to better quality networks compared to households that neither send nor receive. This contradicts the theoretical framework, which implies that sending households should have a better network quality than non-fostering households and non-fostering households should have a better network quality than the receiving households.

2 Empirical Setting

The data were collected in Bazega province in central Burkina Faso, located approximately fifty miles from the capital, Ouagadougou.[6] Households in this region consist predominantly of subsistence farmers growing millet, sorghum, and groundnuts and have an average annual income of \$183 (based on an average foreign exchange rate from 1998 to 2000 of \$1 = 641 FCFA). On average, these households have 10.6 members consisting of a household head, 1.5 wives, 3.6 children under age 18, 3.2 children over age 18, and 1.3 members that might include the household head's mother, brothers, sisters, grandchildren, distant relatives, and individuals with no direct relationship. Table 1 contains additional summary statistics for the data.

The fieldwork component of the project improved on previous studies in several ways. First, I adopted a methodology that involved locating and interviewing the sending and receiving households of each fostering exchange. For example, if a household interviewed in the initial sample had sent a child to another family, then the receiving household was found and interviewed in the tracking phase of the survey. Similarly, if a household interviewed in the initial sample had received a child, then the biological parents of the child (sending household) were located and interviewed. This is the first time that both the sending and receiving household from a given fostering exchange have been tracked and interviewed, and it enables a better understanding of the reasons why a household fosters its children, as well as the welfare implications of that decision.

Second, I collected detailed information, such as occupation, marital status, education, and demographic characteristics, about the households in the respondent's social network. This information allows me to construct quantitative measures of the network's quality and the impact of that quality on the fostering decision, which prior to this data collection would not have been possible.

[6] More detailed information about the fieldwork, including the survey instruments, field enumerator training manuals, and project reports can be found on the website: https://netfiles.uiuc.edu/akresh/www.

I limited the social network to only include immediate family members (parents, brothers, sisters, and adult children) that are not co-resident, instead of all potential households that could send or receive children. This restriction has the benefit that I reduce any potential endogeneity problems related to the fact that a household's decision to foster might be correlated with its choice of which households are in its network. With this definition of network members, the sending household takes its network's size and quality as exogenously given.[7] Third, I asked retrospective questions about agricultural production and agricultural shocks for every crop the household grew during the three years prior to the survey interview in order to understand how a household reacts to changes in its economic environment.

The survey consisted of two distinct phases. The initial phase entailed interviews with 606 household heads and their 812 wives in fifteen randomly selected villages in Bazega province. In these villages, the unit of analysis for the sampling frame was the compound, with some compounds containing multiple households.[8] Within each compound, an enumerator individually interviewed the head of every household and then separately interviewed all of his wives, if applicable.[9]

The tracking phase of the survey consisted of finding the 316 paired households that had exchanged a foster child and interviewing the head of each household along with all of his wives using the same survey instrument as the initial phase. I restricted the tracking to those households

[7] In addition, during the pre-testing of the survey instrument, respondents were unable to consistently answer detailed questions about network members' characteristics if the questions pertained to individuals other than immediate family members. Little information is lost by restricting the network space since sixty-two percent of all foster children in the sample were sent to or received from immediate family members.

[8] To increase the number of households in the sample that had fostered children, I adopted a two part sampling frame that included a random sample and a choice-based sample both drawn from a village level census that included information about the fostering status of every household (for more details, see Akresh, 2004b). The choice-based sample consisted of compounds that had fostered a child between 1998 and 2000. All results in this paper use the entire sample, but results are qualitatively similar when I restrict the observations to just the random sample. Using the population fostering weights from the village level census to adjust the choice-based sample does not significantly alter the results. A total of 383 compounds containing 606 households were selected with approximately sixty percent of the compounds in the random sample.

[9] The household definition (described in Akresh, 2004b) that assigned every individual living in the compound to a specific household was implemented to ensure that individuals in the compound who might have been involved in making a fostering decision would be interviewed.

that had exchanged a foster child between 1998 and 2000 and where the child's age at the time of fostering was between five and fifteen inclusive.

For two reasons, I did not track children under five. First, researchers studying child fostering in Africa have argued that young children are fostered for different reasons than older children (Vandermeersch, 2002). In particular, young children are primarily consumers, but around age five, children are expected to become economic contributors to the family, undertaking tasks in the household, fields, and marketplace. At this time, a household would become concerned with offsetting demographic imbalances in the number of its children of a given age and gender. Second, this survey confirms that fostering young children is much less common than older children, showing a significant jump in fostering rates at age six. Between 1998 and 2000, approximately one percent of children under five were fostered, compared to ten percent of children aged five to fifteen.

Children aged sixteen and older were also excluded from the tracking because, at that age, most villagers in rural Burkina Faso would consider them adults. They are physically mature, have passed initiation rites, and females are of an acceptable age for marriage. In addition, for older children, it becomes difficult to disentangle what is child fostering and what is an example of household members splitting off to form distinct and separate households.

The success of the tracking phase makes these data particularly unique and appropriate for understanding why a household fosters its child. Approximately sixty percent of the paired households were located within a twenty-five mile radius of the child's home, twenty-five percent were located in the capital fifty miles away, six percent were scattered across the other provinces of Burkina Faso about one hundred and fifty miles away, and nine percent were in Côte d'Ivoire approximately eight hundred miles away. There were 316 paired households to be found during the tracking phase, and the field research team located 94.9 percent of them, 300 households in total.[10]

[10] The sixteen tracked households that were not interviewed included four households (three in the capital and one

3 Theoretical Motivation for the Child Fostering Decision

To model the household's fostering decision, I present a theoretical framework that describes the efficient allocation of children across households in a social network. The framework provides motivation for risk-coping, child labor, and network quality as three principal reasons why households foster children. The key assumption of the model is that foster children and biological children (in a given age and gender class) are perfect substitutes in production and utility. This assumption implies that factors influencing the sending decision should influence the receiving decision in an equal and opposite way. The empirical evidence rejects this implication, indicating the need for a richer model of household decision making that incorporates altruism and treats foster children differently than biological children.

To illustrate this framework, I examine a social network made up of N households indexed by i where $i = 1, ..., N$. I let s index the S states of nature, with each state having an objective and known probability of occurrence, π_s. For household i, $\mathbf{K}_i$ is a vector representing the number of household i's resident children and measures the different age and gender classes of these children. The variable $\mathbf{F}_{is}$ is a vector representing the net number of foster children received in each age and gender class for household i if state s occurs. In the model, the number of foster children is defined on the set of real numbers and is not limited to integer values.[11]

Consumption for household i in state s, C_{is}, is determined by its output in state s, $C_{is} = G_{is}(\mathbf{K}_i + \mathbf{F}_{is})$. In the survey region, there are no land or labor markets and so these factors, which

in Côte d'Ivoire) that were found but refused to be surveyed, four households in the capital in which the child left the village in search of work and had not yet contacted his biological parents to indicate the family with whom he was now living, two households where the parents left children in the village in Burkina Faso and went to work in Côte d'Ivoire but the receiving household did not have information to locate them, and three households (two in Côte d'Ivoire and one in Togo) that had contacted the parents to inform them they were moving towns and would send new contact information once they were settled. Finally, the remaining three cases included issues of disputed paternity, alleged adultery, and confirmed sorcery.

[11] Imposing an integer constraint on the number of foster children yields qualitatively the same results regarding the Pareto efficient allocation of children in the network, except there would be a wedge driven between optimal and actual fostering.

can be heterogeneous across households, are incorporated into the production function, G_{is}. The production function also incorporates other characteristics of the household that influence output, such as occupation and marital status. Capital is not considered in the model since almost no households in the survey area use capital inputs such as animal traction. Net fostering for household i determines its amount of available child labor, and household i's production, $G_{is}(\mathbf{K}_i + \mathbf{F}_{is})$, is increasing and concave in child labor, $G'_{is}() > 0$, $G''_{is}() < 0$.

For household i, I define utility, U_i, to be a function of resident children's per capita consumption, $\frac{C_{is}}{(\mathbf{K}_i+\mathbf{F}_{is})}$. The utility function is twice continuously differentiable with $U'() > 0, U''() < 0$. The timing in the model is such that households in the social network initially pick a vector of potential fostering decisions, the state of nature is observed, the household completes the fostering exchange it initially committed to, and then production and consumption outcomes are realized.[12]

Any Pareto efficient allocation of children within the social network can be characterized by maximizing the weighted sum of expected utilities for each of the N households for some choice of Pareto weights for each household i, λ_i, with $0 < \lambda_i < 1$ and $\sum_i^N \lambda_i = 1$:

$$\underset{\{\mathbf{F}_{is}\}}{Max} \sum_{i=1}^{N} \lambda_i \sum_{s=1}^{S} \pi_s U_i \left(\frac{C_{is}}{(\mathbf{K}_i + \mathbf{F}_{is})} \right) \tag{1}$$

subject to the production constraint for each household in each state of nature and the condition that net fostering across households in the social network is zero:

$$C_{is} = G_{is}(\mathbf{K}_i + \mathbf{F}_{is}) \quad \forall i, s \tag{2}$$

$$\sum_{i=1}^{N} \mathbf{F}_{is} = 0 \quad \forall s \tag{3}$$

[12] For this model, I assume a unitary household framework in which there is no intra-household bargaining with respect to the fostering decision. A related paper explores this assumption.

In this model, results are symmetric for sending and receiving households because only net fostering enters the maximization problem and the sum of net fostering across all households in the social network must be zero.

To illustrate the different motivations for child fostering, I examine two extreme sub-cases of the above model. First, I focus exclusively on the labor productivity explanation and assume there is no fostering for risk-coping reasons. I assume there are perfect insurance markets, so households have complete insurance. Even with perfect insurance markets, households foster children to equate the marginal product of child labor across households in the network. Because of the symmetry result previously mentioned, if a household with a low marginal productivity of child labor sends a child, there must be a household with a higher marginal productivity of child labor that receives the child. For a given production function, a family with many children of a given age and gender will have a lower marginal productivity of child labor than a family with few children.

Second, households foster children only for risk-coping but not labor productivity reasons. I eliminate the labor productivity motivation by making household production not depend on child labor. There are no insurance or financial markets, but fostering can serve as an insurance substitute. Even without productivity differentials, households in a network will try to equalize the marginal utility of consumption across states by fostering children. If a household experiences low consumption, it will send out a child to a household in the network experiencing high consumption.

These sub-cases highlight two factors, labor productivity and risk-coping, that influence household i's fostering decision. If household i has low productivity or low consumption, it is more likely to send a child. However, because of the symmetry result, the other households in the network also play a role in household i's decision. If household j in the network experiences transitory factors such as high productivity or high consumption that influence its decision to receive a child, then household i will also be more likely to send. In addition to transitory factors, if household j in the network has permanent characteristics such as a good occupation or a stable marital situation which influence its decision to receive a child, these characteristics will also make household i more likely to send. These permanent and transitory characteristics of the other households in the network constitute the network's quality and measure the fostering opportunities available to households in that network.

4 Empirical Results

4.1 Household Sending Decision

To analyze the household sending decision, I need to measure each household's network quality. I begin by examining why a household selects a particular network member to receive its child. I estimate logit and household fixed effects logit (conditional logit) models of the probability a given network member is selected to receive a child as a function of the network member's characteristics and the joint characteristics about the potential match between the member and the foster child. Results show that a network member with a good occupation, in a stable, long-term marriage, or the parent or child of the sending household, is more likely to be selected to receive the foster child.

Using this information, I calculate two alternative network quality measures for every household in the sample (including households that did not foster children). The first is an ad hoc, intuitive measure that captures two dimensions of the network's quality that impacts the fostering decision, occupational status and relationship to the respondent. In the second measure, I use the estimated coefficients from the household fixed effects logit regression to calculate for every network member a predicted value, $X\widehat{\beta}_{FELogit}$, that the network member would be selected to receive a foster child, if a child were sent. I measure the household's network quality as the percentage of the household's network members whose predicted value of being selected lies above some threshold level.

Finally, I estimate the household decision to send a child in a given year as a function of household level agricultural shocks, network quality, and variables measuring the household's demographic characteristics. The empirical results are consistent with the theoretical framework. Households that experience a worse agricultural shock in a given year, have a better quality network of potential receivers, or have household level demographic imbalances in the age and gender composition of their children are more likely to send out a child.[13]

4.1.1 Preliminary Evidence About Selection of a Network Member

For the binary logit and household fixed effects logit models, which analyze why a particular network member is selected to receive a foster child, I restrict the data to only households that sent children to immediate family members between 1998 and 2000. This restriction is necessary because I use information about network members who potentially could have been selected to receive a foster child but were not. Each of the 2364 observations in the restricted dataset consist of immediate family members linked with a sending household.[14] Appendix Table 1 contains summary statistics for the variables used in the network member selection regression.[15]

Analyzing descriptive statistics about network members' occupation and relationship to the sending family provides preliminary evidence about which factors influence the selection decision. Panel A of Table 2 shows that 31.9 percent of immediate family members who received a foster child

[13] In using this two-step procedure in which I first estimate the selection of a network member and then the sending decision, I assume there is no correlation between the network member selection and the additional option of not sending a child. Intuitively, this assumption implies that, conditional on sending, if a household selects the oldest brother in its network to receive its child, and is then given the additional option to not send a child but still chooses to do so, it will still select the same oldest brother. If this assumption is violated, an alternative one-step procedure in which I jointly estimate the selection of a network member and the sending decision would be appropriate. However, because the data do not measure shocks for each network member, a joint estimation procedure has to make additional assumptions about these shocks. If the assumption is not violated, both the two-step and one-step procedures will yield similar results. An additional advantage of the two-step procedure is that it provides a summary measure of network quality for each household that I use in other related work.

[14] I include in the restricted dataset all sending households identified in the initial phase, and the sending households from the tracking phase, which were identified via their link with initial phase receivers.

[15] Data for immediate family members include information on the respondent's mother and father. To prevent double counting households, I omit the mother's observation if the father is alive and the parents are co-resident.

were parents of the respondent, but parents represented only 8.6 of the immediate family members who did not receive a foster child. The likelihood ratio test that the relationship categories are significantly different yields a $\chi^2(3)$ test statistic of 87.7 and a corresponding p-value of zero. Panel B of Table 3 indicates that only 8.1 percent of immediate family members who did not receive a foster child are business people compared to 12.5 percent of family members who did receive a foster child. Network members who are unemployed, retired, or housewives are less likely to be selected to receive foster children. The likelihood ratio test that the occupation categories are significantly different yields a $\chi^2(6)$ test statistic of 10.2 and a corresponding p-value of 0.12.

4.1.2 Logit specification for estimating network member selection

I first estimate network member selection using the binary logit model, $Prob(Selected_{cm} = 1|X_{cm}) = \frac{exp(X_{cm}\beta)}{[1+exp(X_{cm}\beta)]}$, where $Selected_{cm}$ is defined as a dichotomous 0,1 variable with the value 1 indicating network member m was selected to receive foster child c, and the explanatory variables, X_{cm}, for network member m relating to foster child c, are described below. The regression estimates the probability that an immediate family member was selected to receive a foster child as a function of the network member's characteristics and the joint characteristics of the potential match from sending a child to that network member. In the restricted 2364-observation dataset, 6.8 percent of network members were selected to receive a foster child. The explanatory variables, X_{cm}, include the network member's occupation, relationship to the sending family, marital status, educational attainment, household demographic characteristics (measuring the age and gender structure for the network member's children), whether the network member has children currently enrolled in school, whether the network member's household had a birth between 1998 and 2000, and the age and gender characteristics of the foster child.

Logit regression results in column 1 of Table 3 provide evidence that the sending family is attempting to find the best receiving household for its child. A network member with a good occupation, such as a business person or bureaucrat, is more likely to be selected, while network members who are unemployed or retired are less likely to receive a foster child. Calculating the marginal change in the probability of being selected due to an incremental change in the independent variable from its mean shows that network members are 4.5 percent more likely to be selected if their occupation is business and 6.3 percent less likely to be selected if they are unemployed or retired. A network member who is the respondent's parent or adult child is 9.1 and 5.0 percent, respectively, more likely to be selected to receive a foster child. A network member who is recently married, widowed, divorced, or has never been married is less likely to be selected compared to someone married for more than three years. Widowed or divorced network members are 5.3 percent less likely to receive a foster child, while those who have never been married are 7.0 percent less likely. These results indicate that the receiving household is more likely to be someone with a good occupation, in a stable marital union, and with close blood ties to the respondent.

Educational investment is sometimes cited as a reason for sending a child and households might be more likely to select an educated network member to receive the child because that member could value education more and keep the foster child in school. Similarly, the sending household might select a network member living near a primary school to ensure their own child's schooling. However, neither of the coefficients for the variables measuring whether the network member attended school or has children in school is statistically significant.

Sociologists argue that having no children, a limited number of children, or too few children of a particular gender are situations where households might receive a child to make up for these shortcomings (Lallemand, 1980; Jonckers, 1997). Regression results provide some evidence that the network member's demographics influence the receiving decision, with network members who have boys aged zero to five 2.7 percent less likely to receive a child.[16] The coefficients for the variables indicating if the network member recently had an infant are not significantly different from zero.

4.1.3 Household fixed effects logit for estimating network member selection

It is likely there are certain unobserved factors unique to a sending household and its social network that influence the likelihood a potential network member is selected. This unobserved household heterogeneity might include factors about the child, besides the child's age and gender that are already controlled for, such as the child's personality, whether the child is hard-working, or the child's ability to do certain tasks. I address this unobserved heterogeneity by estimating network member selection using the following household fixed effects logit specification, $Prob(Selected_{cm} = 1|X_{cm}) = \frac{exp(\alpha_c + X_{cm}\beta)}{\sum_m exp(\alpha_c + X_{cm}\beta)}$, where the dependent and independent variables are as previously defined and α_c represents the fixed effect for foster child c in a given household. The foster child subscript $c = 1, 2, ..., n$ denotes the groups and the network member subscript $m = 1, 2, ..., M_c$ the observations for the c^{th} group. I follow Chamberlain's (1980) proposed method for estimating this model by maximizing the conditional likelihood function, abbreviating $Selected_{cm}$ as Y_{cm}:

$$L^c = \prod_{c=1}^{n} Prob(Y_{c1} = y_{c1}, Y_{c2} = y_{c2}, ..., Y_{cM_c} = y_{cM_c} | \sum_{m=1}^{M_c} y_{cm}) \quad (4)$$

The household fixed effects logit results are presented in column 2 of Table 3. Coefficient estimates and standard errors are similar to the logit regression results. Network members who have a good occupation, closer blood ties with the sending household, and a long-term, stable marital situation remain more likely to be selected to receive a foster child. Network members who attended school are more likely to receive a foster child, but the coefficient is not statistically

[16] I also estimated a model that included interactions of the age and gender of the child sent with the age and gender of the children in the network member's family, but the results were inconclusive.

significant. Coefficient estimates for the variables measuring the network member's demographics and if the network member had an infant between 1998 and 2000 are similar in both specifications.

To test which specification better fits the data and whether there is unobserved heterogeneity in the model, I calculate a likelihood ratio test statistic, $2(\mathcal{L}_{FELogit} - \mathcal{L}_{Logit})$, where $\mathcal{L}_{FELogit}$ is the log likelihood for the fixed effects logit model and $\mathcal{L}_{Logit}$ is the log likelihood for the logit specification.[17] The test statistic equals 303.12 and is distributed $\chi^2(26)$ with a critical value at the five percent level of 38.89. I can reject the null hypothesis of homogeneity, indicating the fixed effects logit is the preferred specification, which I use in the following network quality analysis.

4.1.4 Measuring network quality

Using the characteristics that influence the selection of which network member receives a foster child, I calculate two alternative network quality measures for every household in the sample. The first measure is based on the cross tabulations in Table 2, and it attempts to capture two dimensions of the network, occupation and relationship to the respondent, which impact the receiving decision. Households with network members who are business people and members who are either parents or adult children would be considered to have a good network. The intuition is that households whose network members satisfy these criteria (business person for occupation and parent or adult child for relationship) have more opportunities available for finding a favorable receiving household. Table 4 shows that fifty-four percent of households have a good network measured this way. While this network quality measure is intuitive and draws on the cross tabulations presented earlier, it ignores other dimensions about the network's quality, particularly the other variables in the network member selection regression in Table 3.

[17] Under the null hypothesis of homogeneity, the fixed effects logit and the unconditional logit are consistent, but the fixed effects logit is inefficient. Under the alternative hypothesis of unobserved heterogeneity, the unconditional logit is inconsistent, but the fixed effects logit is consistent and efficient.

The second network quality measure incorporates these other dimensions by using the estimated coefficients from the household fixed effects logit regression. For every household in the sample, I link each child aged five to fifteen with that household's network members to calculate the predicted value that the network member would be selected to receive a foster child, if a child were sent. The predicted value is based on that member's characteristics and the joint characteristics of the potential match between the member and the foster child. Since this is an out-of-sample prediction, in most cases the child was never sent to a network member, but the predicted value estimates the likelihood the network member would have been selected if a child had been sent.[18]

Using these predicted values, the second network quality measure is calculated as the percentage of the household's network members whose predicted value of being selected to receive a foster child lies above the 80th percentile for the entire sample. I use this percentile because, in the household fixed effects logit described above, the average percentile for the selected network members is the seventy-ninth percentile.[19] This second measure is based on the idea that, for a fostering exchange to occur, the sending family only needs one household to receive the child, and the measure is intended to describe the right tail of the distribution of predicted values. Intuitively, a sending family that has a larger share of network members with high predicted values is more likely to find a household in its network that can receive a child.

Several intermediate steps were needed to calculate this measure. For sending households with multiple children, each network member will have a predicted value related to every potential foster child. For a given network member, it is possible that the predicted values related to some children are above the 80th percentile while others are below. Network members with a predicted value

[18] The second network quality measure uses the estimated coefficients from a regression that only includes those households that sent a child, and is based on the assumption that any unobservables, such as shocks, that might influence whether a household sent a child are uncorrelated with the observables that are used to calculate the predicted probabilities.

[19] Results are qualitatively similar and robust when using other percentiles as the threshold level, including the 70th, 75th, and 85th percentiles.

above the threshold for any child in the sending household are considered good.[20] On average, households have thirteen network members, and 22.8 percent of them are good quality.

Table 5 presents evidence that households with a high quality network are more likely to send a child compared to households with a low quality network. Households with a network in which the percentage of good members is above the median value of twenty percent constitute 65.0 percent of households that sent a child, but only 43.4 percent of households that did not send a child. Testing whether these are statistically different yields a likelihood ratio $\chi^2(1)$ test statistic of 6.7 with a corresponding p-value equal to 0.01.

4.1.5 Estimating the Probability of Sending a Child in a Given Year

I estimate the household sending decision using the binary logit model, $Prob(Sending_{ivt} = 1|X_{ivt}) = \frac{exp(X_{ivt}\beta)}{[1+exp(X_{ivt}\beta)]}$, where $Sending_{ivt}$ is a 0,1 dichotomous variable taking a value of one if household i in village v sent a child aged five to fifteen (inclusive) during year t and zero otherwise, and X_{ivt} are the variables, based on the theoretical framework, measuring agricultural shocks, network quality, and household demographics for household i in village v at time t.[21] For the household sending regression, the sample consists of 358 households.[22]

The agricultural shock measure builds on hypotheses discussed in the sociological, demographic and economic literature that economic crises affect the household's decision to send a child (Serra,

[20] I obtain similar results using an alternative intermediate step in which a network member is considered good for a given child and this measure is averaged across children. For example, a network member with a predicted value above the 80th percentile for one of four children in the household would be assigned a value of 0.25. Likewise, a network member who was a good match for all four children would be assigned a value of one.

[21] I also estimate the household sending decision with an ordered logit model (where the dependent variable is the number of children sent by the household in a given year) to exploit the additional information present for those households that sent multiple children. The coefficient estimates and standard errors are similar in both specifications because 88.8 percent of the household-year observations have no child sent, 9.5 percent of the household-year observations sent one child, and only 1.7 percent sent two children in a given year.

[22] The difference between the 358-observation regression sample and the 606 surveyed households consists of 63 households that did not have children aged five to fifteen (and therefore could not send), 74 households that had no network quality measure (usually due to not having immediate family members), 54 households that did not engage in agriculture during one of the three years, and 57 households where the household head did not complete an individual questionnaire (only household rosters were completed).

1996; Locoh, 1997). Because the survey respondents are rural, subsistence farmers, their economic environment and relevant crises are best captured by measures of their agricultural shocks. To calculate a household agricultural shock measure, I use the response to the question, "For each crop grown in a given year, how much of that crop was lost due to an unexpected agricultural shock?" To help respondents answer the question, the enumerators were trained to provide examples of unexpected agricultural shocks such as animals running through the respondent's fields, pests, rodents, or fungi destroying crops, or unexpected weather damage. The answers were coded from zero (no loss) to three (a large loss). For the regressions, the household's agricultural shock variable, for each of the three years, is calculated as the average of the shocks for every crop grown by that household in that year.[23] The average household shock across all crops for the three years is 1.90.

The household demographics in the regression are measured using the number of boys and girls aged zero to four, five to ten, and eleven to fifteen to allow for the possibility that demographic imbalances influence the household fostering decision (Lloyd and Desai, 1992).[24] Summary statistics for the variables used in the regression are in Table 4. I find a household is more likely to send out a child in a given year if it experiences a worse agricultural shock that year, has a better quality network where it can send the child, and has more girls aged five to fifteen.

In Table 6, I present the marginal effects of an incremental change in the independent variables on the probability a household sends a child in a given year. Regardless of the specification, a household that experiences a worse agricultural shock in a given year is more likely to send out a child, controlling for the household's history of shocks. In the regression using the percentage of good network members as the network quality measure and not controlling for wealth, a one unit increase (roughly one standard deviation) in the shock measure increases the probability a

[23] Results are qualitatively similar and robust when I use two alternative measures of household shocks. I calculate first an agricultural shock measure restricted to only grains (millet, sorghum, maize, and rice) grown by that household in a given year and then second restricted to the main staple crops, millet and sorghum.

[24] Alternatively, using the fraction of children in a given age and gender category yielded similar regression results.

household sends a child by 3.2 percent (column 2), a marginal effect that is significantly different from zero at the 1 percent level. With eleven percent of households sending children, a one standard deviation increase in a household's agricultural shock leads to a 29.1 percent increase in fostering.

In these regressions, I control for the history of shocks a household faced at time t, $t-1$, and $t-2$. The coefficients on the one and two-period lagged shocks are negative and smaller but are not significantly different from zero.[25] I also include village dummies to control for factors that are unique to each village. Possible village heterogeneity includes varying local weather patterns affecting agricultural shocks or access to different types of network members due to diverse migration patterns. Testing the joint significance of the village indicator variables yields a $\chi^2(14)$ test statistic of 28.99, with a corresponding p-value of 0.01.

These results imply that shocks influence the household sending decision, and in regressions not presented, I attempt to disentangle the two distinct types of shocks examined in the theoretical model, those affecting consumption and those affecting marginal productivity. In the previous regressions, children aged five to fifteen inclusive are considered eligible to be fostered, but there are also younger foster children. Since these younger children are not involved in household production, a finding that shocks positively influence the sending decision for young children is evidence supporting the consumption smoothing explanation and against the labor productivity story. I estimate a logit regression with the dependent variable measuring household sending of children aged zero to seven and the same independent variables as in column 2 of Table 6. The coefficient on household shocks is negative and statistically significant at the ten percent level. This is suggestive evidence that households send older, but not younger, children for labor productivity reasons.[26] However, the older child might simply consume more than the younger child, and therefore this

[25] Using the same observation sample, but controlling only for one-period lagged shocks or not controlling for any lagged shocks, yields similar coefficient estimates and standard errors on the current period household shock.

[26] However, the results are not robust to alternative age cutoffs. Regressions using a dependent variable measuring children aged zero to six or zero to eight yield negative but insignificant coefficients for the household shock variable.

result does not show conclusively that labor productivity is the only motivation for household sending.

Table 6 also provides evidence that a household with a better quality network is more likely to send out a child in a given year. Column 1 includes the ad hoc network quality measure and column 2 uses the measure calculated as the percentage of members above the 80th percentile. A household with a good ad hoc network quality measure is 4.4 percent more likely to send a child in a given year, and the coefficient is significantly different from zero at the ten percent level. Increasing a household's percentage of good network members by one percent implies the household is 0.22 percent more likely to send a child in a given year, which is significant at the one percent level. Compared to the base level of household sending, the magnitude of the network quality effect is large. A one standard deviation increase in the percentage of good members in a household's network leads to a 30 percent increase in fostering.

The demographic variables indicate that a household with more girls aged five to fifteen has a higher probability of sending a child in a given year. In the column 2 specification, an additional older girl increases the probability of sending a child by 3.8 percent (significant at the one percent level), while an additional girl aged five to ten increases the sending probability by 1.9 percent (significant at the ten percent level). Having additional boys or girls aged zero to four reduces the probability of sending a child, which is consistent with the explanation that older children are needed to care for their younger siblings, but the coefficients are not statistically significant. The results for the demographic variables are consistent with the literature that argues a household will use fostering to cope with a redundancy of children in a particular age and gender category.

The last three columns of Table 6 present similar regressions but control for household wealth using three different measures. Results for shocks, network quality, and household demographics are robust to the inclusion of these wealth measures. Household wealth in column 3 is measured as the value of the household's livestock and assets.[27] Column 4 uses a measure of the household's permanent income calculated as the three-year average of income earned from agricultural and non-agricultural sources. Column 5 estimates a linear probability model using characteristics of the respondent's parents as instruments for household wealth.[28] Results for the different household wealth measures indicate that permanent characteristics of the household are not important for the sending decision. None of the coefficients are statistically significant and all are close to zero.[29]

4.2 Household Receiving Decision

The theoretical framework implies that the same covariates influencing the household's sending decision should also influence the decision to receive a child, but I do not find empirical support for this. I organize the receiving decision analysis in a similar way as the sending decision. I begin by examining, for a household that received a child from a network member, why it selected that particular member's child. Analogous to Table 3, I estimate logit and household fixed effects logit regressions estimating the probability a network member's child is received based on the network member's characteristics and the joint characteristics of the match. Using these estimated coefficients, I calculate a comparable receiving household network quality, and I then estimate the household decision to receive a child in a given year as a function of household shocks, receiver's network quality, and demographics. None of these variables is statistically significant, but in a similar regression that controls for household wealth, I find that richer households are significantly more likely to receive a child.

[27] Assets include seventeen different items that rural households might typically own, such as a bicycle, a radio, a wheelbarrow, and a cart. To account for heterogeneity in asset quality across individuals, the value of each asset as reported by the respondent is used to measure total asset value.

[28] The instruments include the number of wives of the respondent's father, the rank of the respondent's mother among the father's wives, the number of children of the respondent's father, the number of children of the respondent's mother, and village level positions held by either the father or mother.

[29] Regression results including an interaction of household wealth and shocks, to measure the differential impact of negative shocks on rich and poor households, were inconclusive. Similarly, results were statistically insignificant for regressions including an interaction of network quality and shocks.

Table 7 presents logit and household fixed effects logit regressions estimating the probability a network member's child is received. For this analysis, I restrict the data to households that received children from immediate family network members between 1998 and 2000. Each of the 1771 observations in the restricted dataset consist of an immediate family member's child (aged five to fifteen) linked with a receiving household. This restriction is necessary because I use information about network members whose children potentially could have been received but were not.

The results show that none of the occupation variables is statistically significant. This is consistent with the Table 6 finding that sender's wealth, which is highly correlated with occupation, is not an important determinant of the sending decision. A respondent's adult child is 10.6 percent more likely to send a child compared to the respondent's brother, and recently married network members are 12.2 percent more likely to send a child. The marital status results are consistent with Table 3 results, in which network members with these characteristics were less likely to receive a child. Network members who attended school are less likely to send a child, but the coefficient is not significant. However, network members with children in school are significantly less likely to send a child. Consistent with Table 6, these results provide additional evidence that demographics influence the sending decision, with girls aged eleven to fifteen 4.2 percent more likely to be sent.

I use the coefficients from the fixed effects logit regression to calculate an analogous receiving network quality measure. I link every household in the sample, even if it did not receive a child, with each network member's child aged five to fifteen to calculate the predicted value that a network member's child would be received by the sample household, if the child were sent. Using these predicted values, the receiving network quality measure is calculated as the percentage of network members' children who have a predicted value of being selected that lies above the 80th percentile.

In Table 8, I present the marginal effects from a logit regression estimating the probability a household receives a child in a given year as a function of its agricultural shocks, network quality, and household demographics. For this analysis, I use the same 358-observation sample used in the sending regressions, but I drop observations from four villages that have no receiving households.[30] The dependent variable, household receiving, takes the value one if household i in village v received a child aged five to fifteen (inclusive) during year t and zero otherwise. Its mean is 0.08 with a standard deviation of 0.28. Results in column 1 indicate that households experiencing worse shocks are less likely to receive a child in a given year, but the coefficient is small and not statistically significant. The network quality coefficient is close to zero and not significant. Likewise, the demographic variables are not significant and exhibit no clear pattern. Column 2 estimates a similar regression controlling for household wealth. A one standard deviation increase in the household's wealth increases the probability of receiving a child by 2.9 percent, and is significant at the five percent level. Similar to column 1, none of the other coefficients is significant.

4.3 Jointly Testing Sending and Receiving Decisions

The sending regressions in Table 6 and the receiving regressions in Table 8 provide evidence that the same covariates do not influence both decisions. However, those regressions are not mirror images of each other due to the presence of non-fostering households in the sample. In the sending regression, senders are compared to the group of non-fostering and receiving households, while in the receiving regression, receivers are compared to the group of non-fostering and sending households. To test the theoretical implication that the factors influencing the sending decision influence the receiving decision in an equal and opposite way, I use a multinomial logit regression to estimate the probability a household sends a child, receives a child, or does neither in a given year. This allows for a comparison of senders against non-fostering households and receivers against non-fostering households. The dependent variable takes the value no fostering in 80.6 percent of the

[30] In Appendix Table 2, I re-estimate the sending regression using the smaller 273-observation receiving sample, and results are similar but standard errors are larger.

observations, sending in 11.7 percent, and receiving in 7.7 percent. To maintain consistency with the earlier regressions, I use the 273-observation sample (drawn from the 358-observation sample used in the sending regressions, but dropping observations from four villages that have no receiving households).

Column 1 of Table 9 shows the sending outcome results to be similar to the Table 6 sending regressions, except for slightly larger standard errors due to the smaller sample size. A one standard deviation increase in a household's shock increases the probability of sending a child by 3.6 percent. The results for network quality and number of girls aged five to fifteen indicate a similar impact on the sending decision as previously seen, with the coefficients similar in magnitude and significance. Column 2 presents the receiving outcome results, which are comparable to those in Table 8. None of the coefficients is statistically significant, except for the number of older girls.

The multinomial logit results indicate that sending households differ from non-fostering households, but receiving households, at least by these measures, do not differ from non-fostering households. To formally test this implication, I calculate a likelihood ratio test of the joint restriction that the coefficients for shocks, network quality, and demographics for the sending outcome are equal and opposite to the coefficients for the receiving outcome. This yields a $\chi^2(10)$ test statistic of 23.93 with a corresponding p-value of 0.008. Based on these results, I reject the symmetric, theoretical model for child fostering.

5 Conclusion

Although previous research often assumes that household structure is exogenous, the results of this paper provide strong evidence against the validity of that assumption. This paper analyzes a household's decision to adjust its composition by sending and receiving children and finds that a household is significantly more likely to send out a child if it experiences a negative income shock, has a better quality social network, or has additional children in a given age and gender class. Quantifying the magnitude of this impact shows that increases of one standard deviation in a household's agricultural shock, percentage of good members in its network, or number of older girls would increase the probability of sending a child above the current level of fostering by 29.1, 30.0, and 34.5 percent, respectively.

The research methodology that involved locating the sending and receiving households participating in each fostering exchange makes these data well-suited for examining explanations for changes in household structure that previous researchers could not. In particular, this is the first paper to provide empirical evidence that households use child fostering as a risk-coping mechanism in response to adverse shocks and income fluctuations. It is also the first paper to analyze and quantitatively measure the importance of social networks for the child fostering decision. Future research should take advantage of these data to extend this analysis by measuring the impact of social networks on children's educational and welfare outcomes. In addition, to further understand the endogeneity of household structure, future research should examine the factors influencing the timing of new household formation.

Understanding why households engage in this social institution has significant policy implications for international development organizations who are currently trying to prevent children from growing up away from their biological parents. However, related research using these data indicates foster children are not negatively affected (in terms of school enrollment) in either the short-run or long-run by living away from their biological parents (Akresh, 2004). If child fostering insulates households from adverse shocks, provides them access to the benefits of extended family networks, and moves children to households where they are more productive, then restricting the movement of children as a policy prescription should be reevaluated. The prevalence of child fostering as a means for a household to adjust its structure suggests it is also critical for governments and development organizations, in designing and evaluating policies, to allow for the possibility that a household changes its size in response to programs (Edmonds, Mammen, Miller, 2005).

These results about why a household adjusts its structure also have implications for the larger issue in Africa and even the United States of how to define a household and who should be considered as actors who potentially influence a child's welfare outcomes. Children living away from their biological parents is not a phenomenon restricted to Africa. Using the 1910 United States census, Moehling (2002) found evidence that 3 percent of white mothers and 12 percent of African-American mothers under age 35 had children not living with them. More recent evidence from the National Longitudinal Survey of Youth, a representative sample of children aged 14 to 21 as of 1979, shows that 2.6 percent of non-orphaned white children and 5.2 percent of non-orphaned black children under age 15 were not living with either biological parent (Haurin, 1992). Whenever household size and composition are choices, researchers need to consider the potential biases arising from endogenous household structure.

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Table 1: Summary Statistics from Burkina Faso Household Survey

Percentage of Households Involved in Fostering a Child During 1998, 1999, or 2000	27%
Percentage of Households Sending	16%
Percentage of Households Receiving	14%
Percentage of Households Sending and Receiving	3%
Percentage of Children (Aged 5 to 15) Living Away From Biological Parents	10%
Mean Duration Spent Away From Parents (in years)	2.75
Location of Where Foster Children Were Sent or Received	
Percentage Within 25 Mile Radius of Parents	60%
Percentage in Capital City, Ouagadougou (50 miles away)	25%
Percentage in Other Provinces of Burkina Faso (150 miles away)	6%
Percentage in Côte d'Ivoire (800 miles away)	9%
Mean Characteristics of Household Composition	
Number of Members per Household	10.6
Number of Wives per Household	1.5
Number of Children Under Age 18 per Household	3.6
Number of Children Above Age 18 per Household	3.2
Number of Additional Other Members per Household	1.3
Mean Number of Immediate Family Network Members per Household	13
Mean Household Income	$183

Note: Data source: Author's survey.

Table 2: Tabulation of Whether Immediate Family Member Received a Foster Child, Broken Down by Relationship of Immediate Family Member with Sending Family (Panel A) and Occupation (Panel B)
[Column Percent]

Panel A: Relationship	Did Not Receive Foster Child	Received Foster Child
Parents	8.6%	31.9%
Brother	39.1%	26.9%
Sister	40.5%	20.0%
Adult Non-coresident Children	11.8%	21.2%
Number of Immediate Family Members	2204	160

Panel B: Occupation	Did Not Receive Foster Child	Received Foster Child
Farmer	72.6%	69.4%
Employee, bureaucrat	3.5%	5.0%
Business person	8.1%	12.5%
Manual labor	1.8%	2.5%
Housewife	6.6%	4.4%
Other job	3.5%	5.0%
Unemployed or retired	3.9%	1.2%
Number of Immediate Family Members	2204	160

Note: In Panel A, for those immediate family members who did not receive a foster child, column 1 presents the percentage of these members broken down by their relationship to the sending family. Column 2 presents the percentage of members broken down by relationship, for those members that did receive a foster child. Testing for the equality of the columns yields a LR $\chi^2(3)$ test statistic equal to 87.7 with the corresponding p-value equal to 0. In Panel B, for those immediate family members who did not receive a foster child, column 1 presents the percentage of these members in each occupation. Column 2 presents the percentage of members by occupation for those members that did receive a foster child. Testing for the equality of the columns yields a LR $\chi^2(6)$ test statistic equal to 10.2 with the corresponding p-value equal to 0.12. Data source: Author's survey.

Table 3: Marginal Effects for Logit and Household Fixed Effect Logit Regressions Estimating the Probability of Selecting a Given Network Member to Receive a Foster Child

Dependent Variable: Network member is selected	(1) Logit	(2) HH Fixed Effect Logit
Network Member's Occupation		
Employee, bureaucrat	0.032**	0.034
	[0.016]	[0.029]
Business person	0.045***	0.068***
	[0.013]	[0.019]
Manual labor	0.033*	0.049
	[0.019]	[0.040]
Housewife	-0.009	-0.031
	[0.016]	[0.031]
Other job	0.047***	0.072**
	[0.016]	[0.029]
Unemployed or retired	-0.063*	-0.089*
	[0.033]	[0.049]
Relationship to Network Member		
Parents	0.091***	0.129***
	[0.012]	[0.019]
Sisters	-0.017	-0.025
	[0.012]	[0.017]
Adult Non-coresident Children	0.050***	0.081***
	[0.010]	[0.018]
Network Member's Marital Status		
Recently married	-0.028*	-0.042*
	[0.015]	[0.024]
Widowed/Divorced	-0.053***	-0.082***
	[0.015]	[0.022]
Never Married	-0.070***	-0.101***
	[0.019]	[0.029]
Network Member's Education		
Attended school	0.001	0.017
	[0.014]	[0.023]
Has children in school	-0.007	-0.020
	[0.011]	[0.018]
Network Member's Household Demographics		
Network Member Has Boys 0-5	-0.027***	-0.042**
	[0.010]	[0.017]
Network Member Has Boys 6-10	-0.012	-0.018
	[0.009]	[0.015]
Network Member Has Boys 11-15	0.017*	0.027*
	[0.010]	[0.016]
Network Member Has Girls 0-5	-0.001	-0.005
	[0.011]	[0.016]
Network Member Has Girls 6-10	-0.005	-0.009
	[0.010]	[0.015]
Network Member Has Girls 11-15	0.008	0.009
	[0.012]	[0.017]

Table 3 (Continued): Regressions Estimating the Probability of Selecting a Given Network Member to Receive a Foster Child

Dependent Variable: Network member is selected	(1) Logit	(2) HH Fixed Effect Logit
Characteristics of Child Sent		
Boy Sent aged 5-10	-0.006	0.026
	[0.006]	[0.030]
Girl Sent aged 11-15	-0.013*	0.003
	[0.007]	[0.033]
Boy Sent aged 11-15	-0.012**	-0.003
	[0.006]	[0.039]
Network Member's Household Demographics		
Birth in 2000	-0.008	-0.007
	[0.012]	[0.020]
Birth in 1999	-0.010	-0.003
	[0.015]	[0.021]
Birth in 1998	0.001	0.010
	[0.013]	[0.021]
Number of Observations	2364	2364
Log-Likelihood Value:	-509.08	-357.52

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The omitted categories for the dummy variables included in the regression are: occupation variable is farmer, relationship to respondent variable is brother, marital status variable is married longer than 4 years, and child sent variable is girl aged 5 to 10. Data source: Author's survey.

Table 4: Means and Standard Deviations for Household Level Characteristics

Variables	Mean	Standard Deviation
Proportion of Households Sending Children	0.11	0.32
Percentage of good network members	22.84	14.98
Proportion of households with good ad hoc network quality measure	0.54	0.50
Number of network members	13.39	7.89
Household shock t	1.90	0.96
Household shock t-1	1.23	1.01
Household shock t-2	1.15	1.07
Household Wealth (in 100,000 FCFA)	4.19	7.34
Household Permanent Income (in 100,000 FCFA)	1.29	1.65
Number of Boys Aged 0 to 4	0.58	0.74
Number of Boys Aged 5 to 10	0.89	0.90
Number of Boys Aged 11 to 15	0.78	0.95
Number of Girls Aged 0 to 4	0.65	0.73
Number of Girls Aged 5 to 10	0.99	1.06
Number of Girls Aged 11 to 15	0.68	0.84
Number of observations	358	

Note: Ad hoc network quality measure is considered good if the household has network members who are business people and network members who are either parents or adult children. The percentage of good network members is calculated as the percentage of the household's network members with a predicted value of being selected to receive a foster child that lies above the 80^{th} percentile (additional details on both network quality measures are in the paper). Household shocks are calculated as the average of the shock measures, which range from zero (no loss) to three (large loss), for every crop grown by that household in that year. Household wealth and permanent income are measured in units of 100,000 FCFA, with the average exchange rate between 1998 and 2000, $1 USD = 641 FCFA. Household wealth is measured as the value of the household's livestock and assets in a given year. Permanent income is measured as the three-year average of household income earned from agricultural and non-agricultural sources. Data source: Author's survey.

Table 5: Tabulation of Whether Household Sent a Child, Broken Down by Household's Network Quality (Column Percent)

Network Quality	Did Not Send a Child	Sent a Child
Household with percentage of good members below median value	56.6%	35.0%
Household with percentage of good members above median value	43.4%	65.0%
Number of Observations	318	40

Note: For those households that did not send a child in a given year, column 1 records the percentage of those households that had above or below the median network quality of 20.0 percent. Column 2 presents the same percentage for those households that did send a child. Testing for the equality of the columns yields a LR $\chi^2(1)$ test statistic equal to 6.7 with the corresponding p-value equal to 0.01. Data source: Author's survey.

Table 6: Marginal Effects from Household Level Logit and Linear Probability Model Regressions Estimating the Probability of Sending a Child in a Given Year

Dependent Variable: Household Sends a Child	Logit Marginal Effects				Linear Probability Model
	(1)	(2)	(3)	(4)	(5)
Household shock t	0.031**	0.032***	0.032***	0.033***	0.040*
	[0.013]	[0.012]	[0.013]	[0.012]	[0.024]
Household shock t-1	-0.000	-0.004	-0.004	-0.003	-0.004
	[0.014]	[0.014]	[0.014]	[0.014]	[0.021]
Household shock t-2	-0.016	-0.018	-0.018	-0.019	-0.025
	[0.014]	[0.013]	[0.013]	[0.013]	[0.021]
Percentage of good network members		0.0022***	0.0022***	0.0022***	0.0032**
		[0.0007]	[0.0007]	[0.0007]	[0.0014]
Ad hoc network quality	0.044*				
(Parents/Adult Kids * Businessman)	[0.025]				
Number of Boys 0-4	-0.014	-0.016	-0.016	-0.016	-0.017
	[0.015]	[0.013]	[0.013]	[0.013]	[0.021]
Number of Boys 5-10	0.004	-0.001	-0.001	-0.001	0.003
	[0.013]	[0.012]	[0.012]	[0.013]	[0.026]
Number of Boys 11-15	0.023	0.021	0.021	0.021	0.035
	[0.015]	[0.014]	[0.014]	[0.014]	[0.023]
Number of Girls 0-4	-0.021	-0.017	-0.017	-0.018	-0.016
	[0.018]	[0.018]	[0.018]	[0.017]	[0.026]
Number of Girls 5-10	0.015	0.019*	0.019*	0.019*	0.034*
	[0.011]	[0.010]	[0.010]	[0.010]	[0.019]
Number of Girls 11-15	0.041***	0.038***	0.038***	0.038***	0.068**
	[0.012]	[0.012]	[0.012]	[0.012]	[0.027]
Household wealth			-0.00001		
			[0.001]		
Household permanent income				0.002	
				[0.008]	
Predicted household wealth (parents'					-0.006
characteristics as instruments)					[0.013]
Number of observations	358	358	358	358	341[a]

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions also include village dummies. In column 5, household wealth is instrumented using the following characteristics of the respondent's parents: number of wives of respondent's father, rank of respondent's mother among father's wives, number of children of respondent's father, number of children of respondent's mother, and village level positions held by either the father or mother. Data source: Author's survey.

[a] Column 5 uses only 341 observations because of missing values in the instruments. Replication of the regressions in the other columns using the 341-observation sample yields similar results.

Table 7: Marginal Effects for Logit and Household Fixed Effect Logit Regressions Estimating the Probability a Network Member's Child Is Received

Dependent Variable: Network member's child is received	(1) Logit	(2) HH Fixed Effect Logit
Network Member's Occupation		
Employee, bureaucrat	-0.021	-0.036
	[0.037]	[0.053]
Business person	-0.015	-0.060
	[0.020]	[0.037]
Manual labor	-0.003	-0.006
	[0.053]	[0.068]
Housewife	0.004	-0.025
	[0.023]	[0.041]
Other job	0.003	-0.014
	[0.033]	[0.046]
Unemployed or retired	-0.039	-0.029
	[0.044]	[0.071]
Relationship to Network Member		
Parents	0.033***	0.035
	[0.012]	[0.028]
Sisters	-0.014	-0.032
	[0.015]	[0.020]
Adult Non-coresident Children	0.049***	0.106***
	[0.011]	[0.025]
Network Member's Marital Status		
Recently married	0.088***	0.122**
	[0.034]	[0.053]
Widowed/Divorced	0.031	0.042
	[0.020]	[0.030]
Network Member's Education		
Network Member Attended School	-0.018	-0.054
	[0.026]	[0.051]
Network Member Has Kids in School	-0.028***	-0.041**
	[0.010]	[0.018]
Characteristics of Child Sent		
Boy sent aged 5-10	-0.036***	-0.044**
	[0.012]	[0.017]
Girl sent aged 11-15	0.024**	0.042**
	[0.011]	[0.017]
Boy sent aged 11-15	-0.016	-0.014
	[0.015]	[0.020]
Network Member's Household Demographics		
Birth in 2000	0.006	0.010
	[0.010]	[0.018]
Birth in 1999	-0.006	-0.013
	[0.012]	[0.021]
Birth in 1998	0.001	0.003
	[0.011]	[0.021]

Table 7 (Continued): Regressions Estimating the Probability a Network Member's Child Is Received

Dependent Variable: Network member's child is received	(1) Logit	(2) HH Fixed Effect Logit
Receiving Household Demographics		
Receiving Household has Boys 0-4	0.002	-0.009
	[0.009]	[0.069]
Receiving Household has Boys 5-10	0.010	-0.103
	[0.008]	[0.114]
Receiving Household has Boys 11-15	-0.012*	0.078
	[0.007]	[0.089]
Receiving Household has Girls 0-4	0.001	0.001
	[0.007]	[0.072]
Receiving Household has Girls 5-10	-0.020**	0.051
	[0.008]	[0.105]
Receiving Household has Girls 11-15	-0.016*	-0.119*
	[0.009]	[0.072]
Number of Observations	1771	1771
Log-Likelihood Value:	-387.77	-266.63

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The omitted categories for the dummy variables included in the regression are: occupation variable is farmer, relationship to respondent variable is brother, marital status variable is married longer than 4 years, and child sent variable is girl aged 5 to 10. Data source: Author's survey.

Table 8: Marginal Effects from Household Level Logit Regressions Estimating the Probability of Receiving a Child in a Given Year

Dependent Variable: Household Receives a Child	(1)	(2)
Household shock t	-0.004	0.003
	[0.016]	[0.016]
Household shock t-1	-0.018	-0.016
	[0.021]	[0.020]
Household shock t-2	0.006	0.007
	[0.018]	[0.017]
Receiver network quality (Percentage of good opportunities in household's network)	-0.0001	-0.0001
	[0.0005]	[0.0005]
Household wealth		0.004**
		[0.002]
Number of Boys 0-4	-0.006	-0.010
	[0.022]	[0.022]
Number of Boys 5-10	-0.011	-0.015
	[0.016]	[0.015]
Number of Boys 11-15	0.015	0.013
	[0.017]	[0.017]
Number of Girls 0-4	-0.034	-0.033
	[0.021]	[0.021]
Number of Girls 5-10	-0.002	-0.004
	[0.016]	[0.013]
Number of Girls 11-15	0.025	0.019
	[0.015]	[0.015]
Number of Observations	273	273

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Regressions also include village dummies. Sample used in the receiving analysis is the same 358-observation sample as for the sending regression, but 4 villages are dropped due to no receiving households in those villages. Results in the sending regression are similar when using the smaller 273-observation sample (see Appendix 2). The mean of the dependent variable, household receiving, is 0.08, with a standard deviation of 0.28. Data source: Author's survey.

Table 9: Marginal Effects from Household Level Multinomial Logit Regression Estimating the Probability of Sending, Receiving, or No Fostering

Dependent Variable: Send, Receive, No Foster	(1) Sending	(2) Receiving
Household shock t	0.036**	-0.001
	[0.016]	[0.002]
Household shock t-1	-0.006	-0.002
	[0.019]	[0.003]
Household shock t-2	-0.018	0.001
	[0.018]	[0.003]
Sender Network Quality (Percentage of good network members in household's network)	0.0019*	0.00002
	[0.0011]	[0.0001]
Number of Boys 0-4	-0.021	-0.000
	[0.018]	[0.003]
Number of Boys 5-10	0.009	-0.002
	[0.014]	[0.002]
Number of Boys 11-15	0.012	0.002
	[0.017]	[0.002]
Number of Girls 0-4	-0.033	-0.004
	[0.023]	[0.003]
Number of Girls 5-10	0.029**	-0.000
	[0.013]	[0.002]
Number of Girls 11-15	0.050***	0.004*
	[0.018]	[0.0024]
Number of Observations	273	273

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Regression also includes village dummies. The likelihood ratio test of the joint restriction that the coefficients for the sending regression are equal and opposite to the coefficients for the receiving regression yields a $\chi^2(10)$ test statistic of 23.93 with a corresponding p-value of 0.008. Data source: Author's survey.

Appendix Table 1: Means and Standard Deviations for Network Members' Characteristics

Variables	Mean	Standard Deviation
Dependent Variable: Network Member is Selected	0.068	0.251
Network Member's Occupation		
Employee, bureaucrat	0.036	0.187
Business person	0.084	0.277
Manual labor	0.018	0.134
Housewife	0.064	0.245
Other job	0.036	0.187
Unemployed or retired	0.037	0.189
Relationship to Network Member		
Parents	0.102	0.302
Sisters	0.391	0.488
Adult Kids	0.124	0.330
Network Member's Marital Status		
Recently Married	0.093	0.291
Widowed/Divorced	0.110	0.313
Never Married	0.092	0.289
Network Member's Education		
Attended school	0.076	0.265
Network Member Has Kids in School	0.158	0.365
Network Member's Household Demographics		
Network Member Has Boys 0-5	0.362	0.481
Network Member Has Boys 6-10	0.313	0.464
Network Member Has Boys 11-15	0.164	0.370
Network Member Has Girls 0-5	0.304	0.460
Network Member Has Girls 6-10	0.266	0.442
Network Member Has Girls 11-15	0.122	0.327
Birth in 2000	0.209	0.406
Birth in 1999	0.131	0.337
Birth in 1998	0.142	0.349
Characteristics of Child Sent		
Boy Sent aged 5-10	0.187	0.390
Girl Sent aged 11-15	0.298	0.457
Boy Sent aged 11-15	0.126	0.332
Number of Observations	2364	

Note: Each variable is a 0, 1 indicator recording whether the network member possessed that characteristic. Means indicate percentage of network members that possess that characteristic. Data source: Author's survey.

Appendix Table 2: Marginal Effects from Household Level Logit Regression Estimating the Probability of Sending a Child in a Given Year Using Restricted 273-Observation Sample

Dependent Variable: Household Sends a Child	(1)
Household shock t	0.038**
	[0.016]
Household shock t-1	-0.004
	[0.018]
Household shock t-2	-0.022
	[0.017]
Percentage of good network members in household's network	0.0019**
	[0.0009]
Number of Boys 0-4	-0.021
	[0.017]
Number of Boys 5-10	0.012
	[0.013]
Number of Boys 11-15	0.009
	[0.016]
Number of Girls 0-4	-0.035
	[0.022]
Number of Girls 5-10	0.026**
	[0.013]
Number of Girls 11-15	0.047***
	[0.016]
Number of Observations	273

Note: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Regression also includes village dummies. Sample used in this analysis is the restricted 273-observation sample that corresponds to the 358-observation sending regression sample (in Table 6) dropping the 4 villages with no receiving households. Data source: Author's survey.