Center for European, Governance and Economic Development Research | cege

cege Discussion Paper

No. 427

September 2021

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ISSN: 1439-2305

Expected Neediness and the Formation of Mutual Support Arrangements: Evidence from the Philippines*

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August 5, 2021

Abstract

This paper studies the role of expected neediness for the formation of mutual support arrangements between households. I predict that under strategic link formation in the context of risk-sharing, households with fewer resources and thus a higher probability to become needy have a higher incentive to engage in informal support, yet mutual support arrangements should be less likely between households that differ in their expected neediness. The predictions are tested using census support network data of a fishing village on the Philippines. I show that households are indeed more likely to form mutual support arrangements with households that face a similar probability of neediness; yet, households with fewer resources are not necessarily more likely to engage in mutual support. Furthermore, I document substantial differences in the structure of reciprocated and unreciprocated support links that need to be accounted for in the analysis of support arrangements.

*Financial support through the German Academic Exchange Service (DAAD) and the Bojanovsky Foundation is gratefully acknowledged. The paper benefited from many helpful comments by Marcel Fafchamps, Esther Gehrke, Matthew Jackson, Krisztina Kis-Katos, Stephan Klasen, Andreas Landmann, Hannah Liepmann, Nico de Silva, Susan Steiner, Arne Thomas and Georg Weizsäcker. I thank participants of various conferences and seminars. I am grateful to my enumerators for their invaluable support and to Helke Seitz for her outstanding research assistance.

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1 Introduction

When people have limited resources on hand, the immediate social network presents an important source of support. In particular for economically less developed countries this has been well-documented. A large proportion of the population in these countries is self-employed and thus faces highly fluctuating income. Furthermore, access to formal financial services, such as credit, insurance or savings, is still limited. People thus turn to neighbors, relatives and friends for support to manage day-to-day income fluctuations and deal with the consequences of shocks, whereby support can be in terms of money, food, shelter or labor assistance (Fafchamps and Lund 2003; De Weerdt and Dercon 2006; Krishnan and Sciubba 2009; De Weerdt and Fafchamps 2011; Ambrus et al. 2014).

Despite the importance of informal support, there is still limited evidence on the formation of these support arrangements and the evidence cannot be always reconciled with the theoretical predictions. It is commonly assumed that informal support is guided by a principle of 'balanced reciprocity' (Platteau 1997). Provision of support is conditioned on the implicit agreement that the support will be reciprocated should the support providing household be in need of assistance in the future. In principal, support arrangements could thus function as insurance at the community level, allowing all households to pool their idiosyncratic risks and smooth their consumption (Townsend 1994). Yet, due to imperfect monitoring and limited commitment, not all types of shocks are covered and risk is shared within sub-groups only (Coate and Ravallion 1993; Foster and Rosenzweig 2001; Gertler and Gruber 2002). Theory predicts that under these circumstances, mutual support should be more likely between households with uncorrelated income and when the costs of living in isolation are high (Coate and Ravallion 1993; Ligon et al. 2000; Ligon et al. 2002). The evidence is mixed. Households with larger activity overlap and correlated income streams are found to be more likely to form support arrangements (De Weerdt 2004; Fafchamps and Gubert 2007; Cassidy and Fafchamps 2020) and poorer households often seem excluded from the risk-sharing network (Jalan and Ravallion 1999; Santos and Barrett 2011).

This paper investigates the formation of risk-sharing arrangements when households differ in their probability of being in need of support. In the canonical model of risk-sharing, shocks are assumed to be random and in expectation each partner in a support arrangement has the same likelihood of being asked for support. In the theoretical framework that guides my analysis, I also assume random shocks but allow partners to differ in their resources to cope with shocks in isolation and thus their probability of being in need of support. I argue that under these circumstances the role of access to alternative resources for the formation of mutual support arrangements is less straight-forward. While households with fewer resources and thus a higher probability to become needy have a higher incentive to engage in informal support, the more two households differ in their respective probability to become needy the less likely a mutual support arrangement can be sustained. We should thus expect mutual support arrangements between households that are similar in their expected neediness.

For the analysis, I use a unique data set that covers detailed information on support networks from 22 small fishing villages in Western Visayas on the Philippines. One of the villages was surveyed

completely. Information on the support arrangements between all households residing in the village were elicited, which allows me to construct the complete inter-household support network within the village. This village is the focus of the analysis. The information from the other villages is used to construct the measures of interest and conduct robustness checks. The setting is particularly interesting for the questions I seek to answer. First, the villages are small in size and geographic dispersion, and the vast majority of villagers is born in their village. We should thus expect few information barriers (i.e. shocks and resources are to a large extent observable). Furthermore, villages are very homogeneous in terms of ethnicity and religion. It is thus reasonable to assume the village as the relevant local risk-sharing pool and not the sub caste or ethnic clan as it is the case in other settings (Grimard 1997; Mobarak and Rosenzweig 2013). Third, the data entails detailed information on the support network in case of health shocks. Health shocks can be by at large assumed to be random and idiosyncratic. They are thus particularly suitable to study informal support.[1] Finally, the data allows to distinguish between reciprocated (i.e., i names j and j names i) and unreciprocated links (i.e., i names j but j does not name i). A distinction that is crucially important (but often not made) as the one-sided support arrangements can follow very different mechanisms, where the provided support is expected to be reciprocated in a different domain, or not at all (as discussed and documented in e.g. Fafchamps 1992; Platteau 1995; Schechter 2007).

The analysis proceeds in two steps. First, I determine which characteristics predict a household's probability to become needy conditioned on a shock experience. For this analysis I revert to the larger sample from the 22 villages. I show that household size, wealth and access to sources of support outside the village (e.g. remittances) affect the probability of neediness. Households of small size, low asset wealth and little connections outside the village are significantly more likely to seek support from their neighbors. I then test in the second step the theoretical predictions using the full support network data from the focal village. I show that predictors of neediness indeed play a role for the formation of mutual support arrangements. While households with fewer resources and thus a higher probability of neediness are *not* necessarily more likely to engage in mutual support, the more households differ in characteristics that predict neediness the less likely they form a mutual support arrangement. In order to address endogeneity concerns, in a next step, I develop a propensity score applying weights that are derived from the larger data set. The score predicts each household's probability of neediness based on household characteristics that can assumed to be exogenous to the support network. Using the score as predictor confirms the first results. Households with a similar score of predicted neediness are more likely to form mutual support arrangements, yet a lower score does not necessarily increase the likelihood that a household engages in mutual support.[2] In the course of the analysis, I demonstrate how results vary depending

[1] It is shown that in countries where health insurance is non-existent or inaccessible for the poor and state-provided assistance is insufficient, monetary and in-kind support by relatives and friends are a major strategy to cover health related expenditures and to cope with foregone income (Fafchamps and Lund 2003; De Weerdt and Dercon 2006; De Weerdt and Fafchamps 2011). The same holds for this setting: despite the fact that half of the households are covered by health insurance, two out of three households report support from the immediate village network as main coping strategy in case of health shocks.

[2] The finding that more vulnerable households are not more likely to be part of mutual support arrangements are

on the specification of a mutual support arrangement, in particular depending on whether support links that are reported by one side only are distinguished from support links that are reported by both sides.

This study makes two major contributions. First, it expands the canonical framework of risk-sharing and thereby builds on the large literature that studies informal support arrangements theoretically (Kimball 1988; Coate and Ravallion 1993; Foster and Rosenzweig 2001; Ligon et al. 2002; Dubois et al. 2008; Ambrus et al. 2014). While it is shown that risk-sharing arrangements are less sustainable when the value of living in autarchy increases with the access to alternative resources (e.g. Attanasio and Rios-Rull 2000; Ligon et al. 2002), to the best of my knowledge, the concept of neediness has neither been specifically addressed theoretically nor tested empirically. In this study, I show that predicted neediness can indeed explain part of the structure of the observed support network and might be able to reconcile some of the contradictory empirical findings.

Second, the study provides evidence on the structure of intra-village support networks, explicitly distinguishing between one-sided and mutual support arrangements. It thereby contributes methodologically to the empirical literature on the formation of informal support arrangements (De Weerdt 2004; Fafchamps and Gubert 2007; Schechter and Yuskavage 2012; Comola and Fafchamps 2014). Few studies analyze the determinants for support arrangements by using network data elicited through household surveys.[3] In these studies, mutual support arrangements are typically not distinguished from one-sided support arrangements. This is often due to missing data: there is no report by the support arrangement partner, or the underlying survey question does not explicitly ask for the direction of support. Accounting for the direction of the support link as well as the report allows me to differentiate between one-sided and mutual support arrangements. I show significant differences in the estimated models depending on whether a distinction between the two types of arrangements is made or not, which indicates that neglecting this distinction can result in erroneous inference.

The remainder of the paper is structured as follows. In Section 2, I derive the two main hypotheses, and then discuss the empirical strategy to analyze the theoretical predictions. The research setting and the data are presented in Section 3. In Section 4, the empirical model is specified, the results are presented and discussed. Section 5 concludes.

in line with previous studies that suggest that very poor households are often excluded from the risk-sharing network (Jalan and Ravallion (1999) and Santos and Barrett (2011)). Potentially they have too few means to support others or they are already isolated per se. I show that in our setting the poor are more likely to be recipients of one-sided support arrangements, with richer households being the providers. Poorer households are thus not left out from informal support, but the support seems not to follow the mechanisms suggested in the canonical risk-sharing framework.

[3]Indeed, this requires very specific data which ideally cover socioeconomic information for all potential support partners within a predefined network. Importantly, this information should allow the researcher to disentangle outcomes and drivers of the formation of support arrangements. Furthermore, as risk-sharing is per definition not a unilateral arrangement, the data should contain independent statements of each household on its support links which in addition distinguish the direction of the support.

2 Framework

2.1 Theoretical Framework

The framework that guides the analysis builds on the traditional risk sharing model (e.g. see Coate and Ravallion 1993; Foster and Rosenzweig 2001; Ligon et al. 2002), for a formal treatment of the framework see Appendix A. Households in a community face regular idiosyncratic income shocks, and the available resources to deal with the shocks in isolation are not always sufficient. Households can therefore decide to form mutual support arrangements. If two households i and j form a mutual support arrangement, j is expected to provide support to i in case i is in need of support, and i is expected to provide support to j in case j is in need of support. We assume that engagement in mutual support is primarily extrinsically motivated: households agree to provide support in the expectation that, "in one form or another, there will be a tangible quid-pro-quo for their present generosity" (Platteau 1997, p.768).[4] As there is no underlying formal contract specifying the terms and conditions which could be legally enforced, the arrangement needs to be self-enforcing. This can be achieved through the threat of 'reversion to autarchy.' When the expected support is not provided, the arrangement is dissolved and the reneging individual needs to deal with future hardships in isolation.

Different to the traditional risk-sharing framework, I assume that households differ in the resources they have available to deal with shocks in isolation and therefore in their likelihood of being in need of support, or their 'expected neediness'. We could thus expect that households with fewer alternative resources are more likely to form mutual support arrangements (Hypothesis 1). Yet, when deciding with whom to form a mutual support arrangement, a household compares her own likelihood of being in need of support in the future with the other household's likelihood of being in need of support. The higher the other household's probability of neediness relatively to one's own, the less attractive is the support arrangements. We should therefore expect that a mutual support arrangement between two households is less likely the larger the difference in their respective probability to become needy (Hypothesis 2).

The framework is built on a number of assumptions that have important implications for the empirical analysis and the interpretation of the results. First, the resources a household has available are often not exogenous but depend on past decisions; in particular, the available support arrangements can affect how much a household invests in alternative resources. For the empirical specification this potential endogeneity needs to be considered and access to alternative resources should be proxied by variables that are exogenous to the mutual support arrangement. Second, resources are assumed to be observable. However, only in a small community context, as it is the case for the present

[4] By now, it is established that other motives beyond the strategic considerations also play a role in explaining support, such as social norms and a genuine interest in the welfare of others (De Weerdt and Fafchamps 2011; Ligon and Schechter 2012; Comola and Fafchamps 2014; "Formal insurance and solidarity. Experimental evidence from Cambodia" 2020). Yet, strategic considerations are still considered to be a predominant driver for support arrangements and build a corner stone to most theoretical approaches in the economic literature (*i.a.*, Coate and Ravallion 1993; Kranton 1996; Foster and Rosenzweig 2001; Ligon et al. 2002; Charness and Genicot 2009; Ambrus et al. 2014). I address alternative motives in the discussion of my results.

study, it does seem plausible to assume that resources are observable or, at least, that an agent can form rational expectations of another agent's resources based on observable characteristics. In other contexts, resources are less observable and agents might even have the incentive to send untruthful signals about their level of resources (Genicot 2016; De Weerdt et al. 2019).[5] Third, the framework makes the implicit assumption that a household prefers to employ her alternative resources first before turning to others to ask for support. This might not be the case in reality, in particular as the use of personal resources is unlikely to be cost-free. In the present study, I can provide some evidence that households are indeed inclined to employ alternative resources first before turning to others (see Section 4.1.2); yet, this does not need to be the case in other settings, and likely depends on the social and cultural context.

2.2 Empirical Model

To analyze the role of predicted neediness empirically, in the following the framework is set in a network context and a dyadic regression model is derived (Section 2.2.1), which is then expanded to account for one-sided support arrangements (2.2.2).

2.2.1 Estimating the formation of mutual support arrangements in a network context

I assume a set of agents $N = \{1, ..., n\}$ living in a community of size n. Agents are linked by different types of relationships. I focus on mutual support arrangements which are assumed to be bilateral agreements between a pair of agents as described above. The network of mutual support arrangements is represented by the graph ς, where for each pair of agents (ij), $\varsigma_{ij} = 1$ if there exists a mutual support arrangement between i and j, and $\varsigma_{ij} = 0$ else, with $i, j \in N$ and $i < j$. Thus ς is an *undirected* network with $\frac{n \cdot (n-1)}{2}$ possible links.

The expected utility of a mutual support arrangement between agents i and j within a support network can be described as

$$U_i(\varsigma_{ij} = 1) = \frac{\big(p_{ij}\, v - p_{ji}\, c\big)}{1 - \delta} \geq 0 \qquad \text{and}$$
$$U_j(\varsigma_{ij} = 1) = \frac{\big(p_{ji}\, v - p_{ij}\, c\big)}{1 - \delta} \geq 0$$

where p_{ij} is the probability that i asks j for support and p_{ji} the probability that j asks i. Time periods are short such that at any moment there is at most one agent asking another agent for support.

The mutual support arrangement is based on a bilateral agreement. A support arrangement ς_{ij} between two agents i and j is only maintained if the utility each of the two agents derives from the support network is at least as large including this specific arrangement, compared to the utility the

[5] Moreover, the probability to become needy likely depends less on resources available today and more on the resources expected to be available in the future. While this information might be inferable by other households in the community, it is difficult to be observed by researchers. We need to assume that the resources which can be observed today serve as an adequate predictor for future resources.

agents derive from the network without the arrangement.[6] That is:

$$\varsigma_{ij} = 1 \quad if \;\; [U_i(\varsigma_{+ij}) \geq U_i(\varsigma_{-ij}) \;\; and \;\; U_j(\varsigma_{+ij}) \geq U_j(\varsigma_{-ij})],$$

where ς_{+ij} describes the network of mutual support arrangements including the arrangement between i and j, while ς_{-ij} represents the network of mutual support arrangements if there is no mutual support arrangement between i and j.

I assume that the benefits from an additional arrangement depend on a vector of observable characteristics, which include characteristics that describe each agent's probability of neediness, and a residual.[7]

$$U_i(\varsigma_{+ij}) - U_i(\varsigma_{-ij}) = \alpha + X'_{ij}\beta + \epsilon_{ij}$$
$$U_j(\varsigma_{+ij}) - U_j(\varsigma_{-ij}) = \alpha + X'_{ji}\beta + \epsilon_{ji}$$

We can thus write the likelihood that a pair of agents (ij) agrees on a mutual support arrangement as

$$P(\varsigma_{ij} = 1) = P(-\epsilon_{ij} \leq \alpha + X'_{ij}\beta \;\; and \;\; -\epsilon_{ji} \leq \alpha + X'_{ji}\beta) \; .$$

The true value of ς_{ij} is unobserved. But suppose we have from each agent i, with $i = (1, ..., n)$, an independent report on her potential sources of support within her community, with s_{ij} indicating the reported support link from i to j with $i \neq j$. More specifically, $s_{ij} = 1$ if i names j as a source of support in times of need and $s_{ij} = 0$ otherwise; and $s_{ji} = 1$ if j names i as a source of support in times of need and $s_{ji} = 0$ otherwise. Thus, different to ς, s is a *directed* network with $n \cdot (n-1)$ possible links. s can be used to proxy the unobserved structure of the support arrangement network ς.

In a first step, it is assumed that each reported support link represents a mutual support arrangement; that is a mutual support arrangement exists if $s_{ij} = 1$ or $s_{ji} = 1$. We can then estimate

$$P(\varsigma_{ij} = 1) = P(s_{ij} = 1 \;\; or \;\; s_{ji} = 1) = \frac{e^{\alpha + X'_{ij}\beta}}{1 + e^{\alpha + X'_{ij}\beta}} \tag{1}$$

by maximum likelihood under the condition that there is degree variation in the characteristics across dyads; that is, $X_{ij} \neq X_{ji}$ for at least some dyads (Fafchamps and Gubert 2007).

The estimation strategy is based on a number of assumptions which have, in addition to the assumptions of the theoretical model discussed above, important implications for the empirical specification. I briefly outline them in the following; I address them in more detail in the remainder of the paper.

First, Specification 1 does not allow for interdependencies in link decisions; the strong assumption

[6] This equilibrium concept of link formation is known as pairwise stability (Jackson and Wolinsky 1996).

[7] The following specification is based on the approach suggested by Comola and Fafchamps (2014) to estimate bilateral link formation.

has to be made that the network structure cannot affect link specific utilities (Chandrasekhar 2016). In particular, the theoretical framework assumes link-specific probabilities, and thus the probability that i asks j for support might depend on the number of support arrangements i has in place; yet, interdependency between links cannot be estimated with a pairwise regression model.

Second, building dyadic regression analysis on individual choices requires two further assumptions. a) Separability of the utility functions; that is, the utility of a network is assumed to be the sum of the utility derived from each link. b) Symmetry for the case of undirected links; that is, the additional value i derives from being linked with j is assumed to be the same as the additional value j derives from being linked with i (Bramoullé and Fortin 2010). The estimated model needs to be specified accordingly; more specifically $(X_i + X_j)$ and $|X_i - X_j|$ should be included as regressors for the analysis of undirected links, and X_i, X_j and $|X_i - X_j|$ for the analysis of directed links. The specification of the regressors will be addressed in more detail in Section 4.2

Third, undirected link formation assumes mutual consent. If an agent i lists another agent j as a source of support, without j being aware of this role, the choice foundation of the estimation approach would be put into question; this would challenge the interpretation of the results (Comola and Fafchamps 2014). I will come back to this issue when specifying the variables in Section 4.1.1.

Fourth, the error term structure in Specification 1 needs to allow for correlation across observations. Error terms across observations can be correlated in at least three distinct ways: for $i, j, k \in N = (1, ..., n)$, $E[u_{ij}, u_{ik}] \neq 0$, $E[u_{ik}, u_{jk}] \neq 0$ and $E[u_{jk}, u_{ij}] \neq 0$ (Cameron and Miller 2014). This can result in inconsistent standard errors (Fafchamps and Gubert 2007). In the regression analysis, standard errors need to be corrected accordingly.[8]

Finally, it is not straightforward how to use independent reports on undirected links, if these reports mismatch. This issue will be discussed in the following Section 2.2.2 in more detail.

2.2.2 One-sided versus mutual support arrangements

How to proceed if reported support links do not correspond with each other – i.e., $s_{ij} \neq s_{ji}$? This is unproblematic as long as all reported support links can be assumed to represent mutual support arrangements; then $s_{ij} \neq s_{ji}$ is due to underreporting, and hence we can assume $\varsigma = 1$ if $s_{ij} = 1$ or $s_{ji} = 1$. However, it is not obvious that the motive of risk-sharing explains all observed support arrangements. Indeed, there is considerable evidence for one-sided support arrangements that follow quite different mechanisms: an agent might provide monetary or in-kind support to ensure the political endorsement by the recipient, to contain unwanted behavior such as theft, to gain

[8] In the analysis, I use a network corrected covariance matrix to account for the correlated standard errors proposed by Fafchamps and Gubert (2007): $AVar(\hat{\beta}) = \frac{1}{n-m}(X'X)^{-1}\left(\sum_{i=1}^{n}\sum_{j=1}^{n}\sum_{k=1}^{n}\sum_{l=1}^{n}\frac{I_{ijkl}}{2n}X_{ij}u_{ij}u'_{kl}X_{kl}\right)(X'X)^{-1}$ where β is the vector of coefficients, n is the number of observations, m is the number of regressors, X is the matrix of all regressors, X_{ij} is the vector of regressors for the dyadic observation ij, and $I_{ijkl} = 1$ if $i = k, j = l, i = l$ or $j = k$, and 0 otherwise. There are alternative approaches: Udry and Conley (2004) include individual fixed effects, and Barr and Genicot (2008) use a quadratic assignment procedure (QAP), where standard errors are estimated based on permutations of the data set to account for interdependence of the observations. However, when the number of nodes (i.e., in our case the number of households) is small the dyadic corrected standard errors is considered most suitable (Cameron and Miller 2014).

social approval by the community or due to fairness concerns (e.g. see Fafchamps (1992), Platteau (1995), Schechter (2007), and Ligon and Schechter (2012)). The provided support is expected to be reciprocated in a different domain, or not at all. In most one-sided support arrangements, expected neediness plays a different role than in mutual support arrangements: the recipient of the support is typically assumed to be resource constrained, while the provider is assumed to have access to sufficient alternative resources; and thus, contrary to the case of mutual support arrangements, a one-sided support arrangement should expected to be *more* likely the larger the difference in expected neediness. This suggests that, when analyzing the implications of expected neediness, it is important to distinguish mutual from one-sided support arrangements.

Let us denote $\dot{\varsigma}$ as the undirected support arrangement network in a community with n agents with $\frac{n\cdot(n-1)}{2}$ possible links. $\dot{\varsigma}$ includes both one-sided and mutual support arrangements. $\dot{\varsigma}_{ij}$ describes the type of support arrangement a pair of agents (ij) have agreed upon, with $i, j \in N = (1...n)$ and $i < j$. A support arrangement can have three outcomes. It might be mutual; that is, i and j agreed that j supports i if i experiences an income shock and i supports j if j experiences an income shock (in this case let $\dot{\varsigma}_{ij} = 3$); but it can also be one-sided: i and j agreed that i supports j if j experiences an income shock but j is not expected to support i in case of an income shock, though i might be compensated by other means, ($\dot{\varsigma}_{ij} = 2$); or vice versa, i and j agreed that j supports i but i is not expected to support j ($\dot{\varsigma}_{ij} = 1$).

If we observe a support network s that is directional not only with regard to who names whom but also with regard to the flow of support, we can use the structure of s to proxy one-sided and mutual support arrangements.

To distinguish unobserved support arrangements from the reported support links, for the remainder of this paper the following terminology is used.

The unobserved network of support arrangements can contain

- *One-sided Support Arrangements*,
  i and j agreed that j supports i in case of emergency but no explicit agreement has been made that i supports j (i.e., $\dot{\varsigma}_{ij} = 2$), or vice versa (i.e., $\dot{\varsigma}_{ij} = 1$), and
- *Mutual Support Arrangements*,
  i and j agreed that j supports i in case of emergency and that i supports j (i.e., $\dot{\varsigma}_{ij} = 3$).

The network of reported support links consists of

- *Unreciprocated Support Links*,
  i names j as a source of support, but j does not name i (i.e., $s_{ij} = 1$ and $s_{ji} = 0$) or vice versa (i.e., $s_{ij} = 0$ and $s_{ji} = 1$), and
- *Reciprocated Support Links*,
  i and j name each other as source of support (i.e., $s_{ij} = 1$ and $s_{ji} = 1$).

An unreciprocated support link can be used as a proxy for a one-sided support arrangement and a reciprocated support link as a proxy for a mutual support arrangement.

Which type of support arrangement two agents form is still based on a bilateral agreement; that is, a specific support arrangement $\dot{\varsigma}_{ij}$ between two agents i, j is only formed if the utility each agent derives from the support arrangement is weakly positive and there is no other type of support arrangement which *both* agents would prefer. In particular, it is assumed that two agents form a support arrangement $\dot{\varsigma}_{ij} = q$, with $q = (1, 2, 3)$, if the utility each agent i and j derives from the support arrangement network including this specific arrangement $\dot{\varsigma}_{ij} = q$ is at least as large as when a different type of arrangement or no arrangement would be formed.

Specifically, for $q = (1, 2, 3)$

$$\begin{aligned} \dot{\varsigma}_{ij} = q \;\; & \textit{if}\, [U_i(\dot{\varsigma}_{+\dot{\varsigma}_{ij}=q}) \geq U_i(\dot{\varsigma}_{+\dot{\varsigma}_{ij}=l}) \;\; \textit{and} \;\; U_j(\dot{\varsigma}_{+\dot{\varsigma}_{ij}=q}) \geq U_j(\dot{\varsigma}_{+\dot{\varsigma}_{ij}=l})], \\ & \textit{for all } l = (0, 1, 2, 3) \;\; \textit{with } l \neq q; \\ \dot{\varsigma}_{ij} = 0, \;\; & \textit{else.} \end{aligned}$$

Moreover, it is assumed that i and j can be linked by at most one type of support arrangement $\dot{\varsigma}_{ij}$.

The reported support network s is used to proxy $\dot{\varsigma}$, where $P(\dot{\varsigma}_{ij} = 3) = P(s_{ij} = 1 \; \textit{and} \; s_{ji} = 1)$, $P(\dot{\varsigma}_{ij} = 2) = P(s_{ij} = 0 \; \textit{and} \; s_{ji} = 1)$, $P(\dot{\varsigma}_{ij} = 1) = P(s_{ij} = 1 \; \textit{and} \; s_{ji} = 0)$ and $P(\dot{\varsigma}_{ij} = 0) = P(s_{ij} = 0 \; \textit{and} \; s_{ji} = 0)$. Then the likelihood that a pair of agents (ij) agrees on the support arrangement $\dot{\varsigma}_{ij} = q$ can be jointly estimated through multinomial logit via maximum likelihood as

$$P(\dot{\varsigma}_{ij} = q) = \frac{e^{\alpha + X'_{ij}\beta_q}}{1 + \sum_{l=1}^{3} e^{\alpha + X'_{ij}\beta_l}} \qquad \textit{for } q = (1, 2, 3). \tag{2}$$

For identification the set of coefficients of $\dot{\varsigma}_{ij} = 0$ is set to zero; this choice serves as the base category. The above raised points of caution related to dyadic regression analysis of binary choice models apply also for the estimation of multiple choice models. In particular, the coefficients need to be constrained to fulfill symmetry requirements and the standard errors need to be corrected to account for correlation across observations.

3 Data

3.1 Research Setting

The data is based on a household survey that was conducted in 2012 in 22 small fishing villages in the provinces Antique and Iloilo in the region Western Visayas on the Philippines.The focus of the survey was the use of financial services and the structure of the social network. In 21 of the 22 villages, a small, randomly drawn sample of on average 14 households was surveyed, covering around 15% of each village's population. One village, the 'focal village', was surveyed completely. That is, all 65 households that were residing within the village boundaries at the time of data collection were surveyed, covering in total 228 people.[9] The household survey was typically conducted with the

[9]Two households (one single-person household and one family) that had moved for temporary work to Manila and one single-person household that lived outside the village in the forest and was not reachable during the entire time

head of each household. The survey covered socioeconomic characteristics of all people who resided in the household at the time of the survey, including access and use of formal financial services, housing characteristics, as well as detailed questions on the informal support networks within and outside the community. For some analyses, I revert to the larger data set of the 22 villages. Yet, for the main analysis, I exclusively focus on the data from the focal village.

The focal village is situated in Antique on the main island Panay, the sixth largest island on the Philippines. The next town with a market is 10 km away, reachable by bus. In this region, a large proportion of the population is very poor; in 2012, 31% of the population in Antique was estimated to live below the poverty line (National Statistical Coordination Board 2013). Many people are self-employed and most economic activities are not formalized. But the conditions are changing. Financial institutions have started to expand their services to rural areas; and, with the building of new roads, which facilitates transport to urban centers, formal sector work has grown in importance. Furthermore, catching up with the general trend on the Philippines, work migration has become very common, even in more remote areas. Many young men and women seek temporary employment abroad (as so-called 'Overseas Filipino Workers,' OFW) or in the Marine. The money that is sent home has become an important source of income for the remaining families and improves their purchasing power.[10] Despite these changes, informal risk-sharing institutions and inter-household support arrangements still play a central role: the majority of the surveyed households name assistance from relatives and neighbors from within the village as the main strategy to cope with emergency situations. Also, traditional community support schemes assume an important function, such as 'abuloy,' a practice where in case of a death in the village, all inhabitants are asked to donate money and food for the family of the deceased, each contribution being meticulously documented.

The prominent role that informal support arrangements play for the villagers' day-to-day risk management, and furthermore, the fact that information is available on all households residing within the village's boundaries make the data from this village ideal to analyze the mutual support network.

3.2 Socioeconomic Characteristics

Table 1 provides summary statistics of the most important socioeconomic characteristics of the households residing in the focal village (for the socioeconomic characteristics of the respondents of all 22 villages refer to Table B.2.1 in Appendix B.2). As it is common in the region, a household is generally formed by the nuclear family, thus the household size is comparably small; a household has on average 3.5 household members, not including those members that temporarily migrated at

of the survey are treated as residing outside the village.

[10] Over one million Filipinos leave the country every year to work abroad. The estimated number of Overseas Filipino Workers in 2012 was 2.22 million, around 2.4% of the overall population; remittances accounted for about 9% of the GDP (Philippine Statistics Authority 2013). Nevertheless, work migration is generally not an option for the very poor, as the so-called placement agencies, through which most of the work migration is organized, demand high fees for their services.

time of the survey. The majority of the households are headed by men. 40% of the household heads have high school education, however one out of four household heads has no basic education. That is, they either never went to school or dropped out before finishing elementary school.

Table 1: Household Characteristics of Focal Village

	mean	sd	min	max	median	count
Household size	3.46	1.71	1	8	3	65
Female head	0.35	0.48	0	1	0	65
Head born in the village	0.72	0.45	0	1	1	65
Head has no basic education	0.28	0.45	0	1	0	65
Head completed high school	0.40	0.49	0	1	0	65
No. of family hh within village	9.46	6.51	0	25	10	65
No. of family hh outside village	3.17	2.83	0	15	3	65
% of adults working	0.57	0.35	0	1	.5	65
% of adults working outside village	0.10	0.24	0	1	0	65
Fishing as main income source$^{(*)}$	0.22	0.42	0	1	0	54
Farming as main income source$^{(*)}$	0.41	0.50	0	1	0	54
Household income last month (PHP)$^{(**)}$	14,919	43,671	160	330,975	4,000	65
Asset Wealth	0.39	0.20	.0041	1	.36	65
OFW exists	0.12	0.33	0	1	0	65
Remittances recipient	0.57	0.50	0	1	1	65
Amount remittances last year (PHP)	34,388	60,007	2,000	312,000	18,000	37
Covered by social security	0.20	0.40	0	1	0	65
Coop member	0.34	0.48	0	1	0	65
Bank account	0.05	0.21	0	1	0	65
MFI Member	0.03	0.17	0	1	0	65
Health insurance	0.62	0.49	0	1	1	65
Informal borrowing and lending	0.66	0.48	0	1	1	65
Observations	65					

Surveyed 65 households, covering 225 household members; hh - households; PHP - Philippine Pesos. (*) If at least one household member is working; (**) Income from last month; includes salary, proceeds from self-employment, remittances, loans, public assistance, pensions, payouts from savings and other income (such as gambling).

Most households in the village are connected through family: on average, a household is related to nine other households in the village; in contrast, the number of households outside the village a household is related to and in touch with is much smaller. Half of the adult household members (on average 57%) worked during the last month, most of the others reportedly stayed at home doing domestic work. The vast majority of the employment is within the village, only 10% of the adult household members work outside the village. While the village is traditionally a fishing village, only 22% of the 54 households, where at least one household member is working, report fishing as a main income source; more people work as farmers.

Households earned on average 14,919 PHP, or 3,183 PHP per capita (approx. 76 USD) in the month preceding the survey.[11] The income distribution is highly skewed, with almost 50% of the

[11] At the time of the survey, 1 USD was worth around 42 Philippine Pesos, the PPP conversion factor was 17.88 in

households having less than 4,000 PHP income per month which amounts to less than 32 USD p.c. An important source of income are transfers from family or friends living outside the village (i.e., remittances). 57% of the households report receiving some form of regular transfers from outside the village, mainly from former household members that work in larger cities in other districts. In one out of ten households, at least one former household member is working on the sea or abroad. The average amount that a remittances receiving household received over the last year is not negligible, about 34.000 PhP which is more than twice the average monthly household income. In fact, eight households report having no income besides the remittances they receive. As most of the reported income is highly irregular and income reports are not always reliable, an asset index is derived as a measure for wealth, using polychoric principal component analysis (Moser and Felton 2007).[12]

Access to financial products is still limited in this village. The majority of households have access to very basic financial services through a local cooperative located in the next town, which offers loans to its members for education and investment purposes. There are three state-run social security systems on the Philippines (SSS, GSIS and Pag-IBIG) which provide pension schemes but also credit lines for employees in the private and public sector. In one out of five households, at least one household member is covered by such a scheme. After the cooperative, these schemes form the second most important source for loans. Use of formal banking services is much rarer. Only in three households does a household member have a deposit account with a commercial bank while only two households are registered as members of a microfinance institution. Most households do not fulfill the eligibility requirements of the banks; and microfinance institutions are not yet as developed as in other regions. Therefore, informal lending plays an important role: 66% of the respondents state that their household borrowed or lent money to someone from the village during the last month. Health insurance has gained importance only recently due to a government initiative that aims to reach universal health coverage through the state run program PhilHealth. PhilHealth is a contribution based insurance scheme, but subsidizes the contribution for indigent people. In this village, 85% of those households that are covered through PhilHealth do not pay for it. Still, health insurance is barely used. When asked about the major strategies to cope with health shocks, of those insured only 30% name the insurance, while 54% name monetary support from friends, neighbors or relatives.

3.3 The Support Network

The core of the survey is a social network questionnaire. Each respondent was asked to provide a list of households ('alter household'), she would consider as close to her household ('ego household'). No limitations were made on the number of names the respondent could list, but each alter household

2012 (World Bank 2013).

[12]The asset index is derived on the basis of the larger data set of the 22 villages and includes variables that describe asset ownership and housing characteristics. Variables are chosen based on the proportion of variance they explain. Weights are assigned using the first component, and the index is standardized to be between 0 and 1. The index is checked both for internal and external validity (for details on the derivation of the index and the validity checks see Appendix B.3).

could be named only once. The respondent was then asked to further specify the relationship to each alter household. In particular whether they were related, friends or neighbors, the type of family relationship if applicable, how long they knew each other and where the alter household resided. In case the alter household was reported to reside in the same village, the respondent was asked to identify the household on a household roster of the village that was presented to her, which allowed matching the households directly. The identification was later verified with one of the village elders.[13]

Table 2: Summary Statistics of the Support Links in the Focal Village

	Total	By Household		
	no. of links	mean	min	max
All links	345	5.31	0	11
within Village	236	3.63	0	10
relative	196	3.02	0	10
friend	22	0.34	0	3
neighbor	18	0.28	0	3
outside Village	109	1.68	0	7
relative	101	1.55	0	7
friend	8	0.12	0	2

Reported support links within the village. Based on the report of the 65 surveyed households.

Different types of transfer and support relationships with each alter household were elicited. In this study, I focus on the elicited information on support arrangements.[14] For each of the alter households listed, the respondent was asked '*Would these people help you if you/the main income provider would turn very ill and would not be able anymore to earn income and in addition you would need to cover the medical expenses?*' Furthermore, '*Would you ask these people for help?*' For these questions, respondent could respond '*Immediately*,' '*After some hesitation*,' '*Only in extreme emergency situations*' or '*Never*.' I define a support link as existing, if a respondent answered '*Immediately*' for both questions. The data allows to distinguish both the direction of the report (i.e., 'who names whom') and the direction of the flow (i.e., 'who supports whom').[15] The support

[13] I am not aware of other studies that have proceeded in a similar manner. Typically, matching is done afterwards by matching the reported names with the names on lists, which can lead to a substantial loss of observations (e.g. see Fafchamps and Gubert (2007), Comola and Prina (2014), and Banerjee et al. (2013)). Admittedly, the procedure of presenting a household list is only feasible in villages with a small number of households.

[14] The other type of elicited relationships are the following. First, for each alter household the respondent was asked to specify frequency and size of larger monetary transfers provided and received during the last year. Second, focusing on the last 4 weeks, the respondent was asked to indicate whether and how often different specified types of transfers (small amounts of money, food, other in-kind goods) or support (labor services or job hints) had taken place between her and the alter household. Third, the respondent was asked to specify if and how the alter household had provided support during emergency situations the respondent's household had experienced during the last 3 years.

[15] This is different to most approaches in previous studies. For example, De Weerdt (2004), who investigates support links in a village in Tanzania, and Fafchamps and Gubert (2007), who study support networks of a random sample of households in four villages on the Philippines, construct a 'risk-sharing' link based on a survey question that does not allow to distinguish between one-sided or mutual support (in De Weerdt (2004), each adult is asked to list people in the village "*(...) [she] can personally rely on for help and/or that can rely on [them] (...)*"; in Fafchamps

link data form the core of the latter analyses.

Table 2 provides summary statistics on the reported support links in Maramig. On average, each household reported five support links, of which over two thirds are within the village. The majority of the reported support links are with relatives. Only around 17% of the reported support links within the village are with unrelated friends or neighbors. This is not surprising given that the median household is related with ten other households within the village.

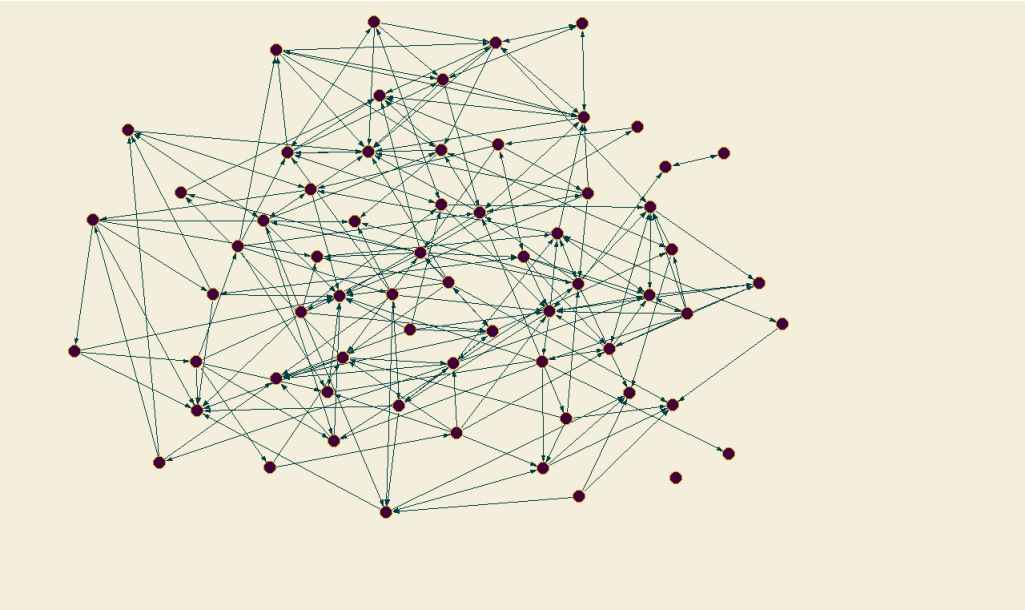

Figure 1: Network of Reported Support Links in the Focal Village, directed (map drawn by Pajek)

The resulting network of the support links within Maramig is depicted in Figure 1.[16] Each node represents one household. The network is depicted as *directed*, that is the report of each household constitutes a link, and the direction of the report is indicated by the arrow pointing towards the household that is named as a source of support. In case of reciprocated links (i.e., both household name each other as a source of support) the arrow points in both directions. Support between households is common. 55 of the 65 households name at least one other household from the village as a potential source of support. For 37 of these households at least one of the reported support links is reciprocated. 62 households are named as a potential source of support by at least one other household. One household neither names any other household as source of support nor is named by any other household; this household forms an isolate in the network.

and Gubert (2007) each household is asked to name up to four people "*(...) on which it could rely on in case of need or to whom [it] gives help when called upon to do so*" (pp. 331)). Schechter and Yuskavage (2012), on the other side, who study support links using a sample of households from 15 villages in rural Paraguay, explicitly distinguish between one-sided and mutual support links based on the direction of the flow (households are asked in two separate questions from which household they could borrow and which household would come to them to borrow); however, the authors use the reports from one side only, which can lead to erroneous inference on the underlying link formation process (see Comola and Fafchamps 2014).

[16]Figure B.1.1 in Appendix B.1 maps the support network using household locations within the village.

Besides the directed network of reported support links, also an *undirected* network can be constructed by defining a link between two households as existing if at least one of the two households mentions the other household as a source of support.

Table 3: Network Characteristics for the Support Network in the Focal Village

	Density	Clustering	Average Pathlength	Prop. reciprocated
Directed Link	0.057	0.175	4.1	0.302
Undirected Link	0.101	0.296	2.6	-

Reported support links within the village. Based on the report of the 65 surveyed households.

Table 3 describes general characteristics of the support network in Maramig, both for the directed network and for the undirected network. For the directed network, of the 4160 ($65 \cdot 64$) possible links 5.7% are identified as support links (network density), of these 30.2% are reciprocated. In case of the undirected network, 10.1% of the 2080 ($\frac{65 \cdot 64}{2}$) possible links are named. Two additional pieces of information are useful descriptives of the network structure: the average pathlength, which measures the average number of links between any two households in the network, and average clustering, which is a measure for the cohesiveness of a network (Jackson 2008).[17] The average path length of the undirected network is 2.6 and the clustering is 0.296. These measures indicate a tight knit support network. The measures are surprisingly similar to the characteristics of rural social networks in villages in Malawi, Uganda and India, where comparable network data have been collected (for an overview see Chandrasekhar (2016)).

4 Empirical Analysis

4.1 Specification

In the empirical analysis, the likelihood of a support arrangement between two households i and j is set in relation to the households' respective probability of neediness. The empirical specification thus relies on two main pieces of information: first, information on the *support arrangement* between the households, and second, household characteristics that proxy a household's *probability to become needy*. The specification of each measure is discussed in the following.

4.1.1 Support Arrangement

The specification of a support arrangement is based on the definition presented in Section 2.2.2. A support arrangement of a household pair (ij) is defined as existing if i and j have agreed that one household supports the other in the event of an emergency situation; in the case of a one-sided support arrangement, support is expected from one side only; a mutual support arrangement, on the other hand, relies on direct reciprocity: j is expected to support i in case of an emergency and

[17] A household i's clustering coefficient is calculated as the proportion of i's support links for which the alter household is linked to at least one other alter household of i.

i is expected to support j. Furthermore, the empirical model relies on the assumption that the arrangement is based on a bilateral agreement between i and j; that is, both households are aware of the arrangement and have given their consent.

In the data, a suitable description of inter-household support arrangements is provided by the reported hypothetical sources of support in case of a health emergency, described in Section 3.3. This information is used to proxy the unobserved network of support arrangements ς. A reported support link directed from household i to household j is described by s_{ij}, where $s_{ij} = 1$ if household i names household j as a source of support in the event of a health shock, and zero otherwise; and $s_{ji} = 1$ if household j names household i as a source of support in the event of a health shock, and zero otherwise.

This variable has a number of advantages. First, as the variable is defined on a hypothetical situation, the number of observations is not limited to an actual shock event.[18] Second, the arrangement is elicited for the case of a health shock, a type of shock which is, by and large, assumed to be random (i.e., controlling for household size and age structure, in general each household should face a similar probability of a health shock) and idiosyncratic (i.e., within a village, there should be no correlation between households' health shocks within a short period of time); health shocks are thus suitable for inter-household support arrangements within a village. Both assumptions will be verified below. Third, given how the variable was derived, the arrangement can be interpreted as a bilateral agreement: the question was explicitly phrased to consider the willingness of provider and recipient ('*Who would help you...?*', '*Who would you ask...?*'); therefore it seems reasonable to assume that a reported arrangement is based on mutual consent.

While the variable is in many aspects ideal for the empirical analysis, one concern is that s might underestimate the true network of support arrangements. In case support arrangements are underreported, true mutual support arrangements might be misspecified as one-sided arrangements or non-existing, and true one-sided support arrangements might be misspecified as non-existing. As long as underreporting is random and neither correlated with the explanatory variables included in the estimation nor dependent on the type of existing arrangement, the estimators should be consistent and unbiased.[19] In the main analysis, I include respondent characteristics as additional control variables to address the potential response bias.

4.1.2 Probability to become Needy

The probability that a household i becomes needy is defined as the probability that i turns to another household from within the village to ask for support in the event of an emergency situation – i.e., the probability that one of i's support arrangements is activated. As support links were

[18] Nevertheless, the hypothetical support network maps the actual support network well: 87% of the links that are listed as hypothetical support links were 'activated' in the month preceding the survey (i.e. transfers took place between these households in terms of food, money, advice etc.).

[19] Misreporting due to overreporting seems less likely. It is not clear why a household i should falsely name household j as a potential source of support. Reporting names was time consuming and required some effort; furthermore, the interviewers were strangers to the villagers and unfamiliar with the village context, making a interviewer demand effect less likely.

elicited for the case of health emergencies, in our context neediness is conditioned on the event of a health shock. If health shocks are random, then neediness should depend primarily on the alternative resources i has available to cope with a health shock.

In order to determine which household characteristics can be generally associated with a higher probability of neediness, I analyze the determinants of asking for support in case of a health shock using the survey data of the 22 villages including a random sample of 14 households from the focal village. In the survey, respondents were asked whether they had experienced a health shock in the past three years and the exact date. Of the 306 households, 48% indicate having experienced a health shock. When the event of a health shock is regressed on household characteristics that could be associated with adverse health related events (namely household wealth, whether the household head completed high school, household size, age distribution of the household members, major sources of income, as well as village fixed effects), only the number of household members that are under the age of 6 is significantly correlated with the event of a health shock (results are reported in Table C.1.1 in Appendix C.1).[20] Village fixed effects are insignificant overall. These results confirm the assumption that the experience of a health shock can be generally viewed as a random event (once household size and demographics are controlled for), and, furthermore, that the majority of health shocks are indeed of idiosyncratic nature.[21]

Respondents, who indicated having experienced a health shock, were asked to identify up to three main strategies they had employed to deal with the shock. In addition, all respondents were asked to identify up to three main strategies they would apply to deal with health emergencies if they faced such a situation today. Both for the case of an actual health shock and for the case of a hypothetical health shock, approximately two thirds of the reported strategies involve the support of neighbors, friends or relatives, the majority of which coming from within the same village (for an overview on all listed strategies, see Tables C.1.2 and C.1.3 in Appendix C.1).[22] This information allows me to investigate what determines the probability that a coping strategy involves the support of other households within the village. More specifically, I estimate the likelihood that a reported coping strategy involves support from within the village,

$$c_{k,i,v} = X_i'\beta + \xi_v + u_{k,i,v} \tag{3}$$

where $c_{k,i,v} = 1$ if the strategy k listed by household i living in village v involves support from within the village (in the form of money or in-kind), and 0 otherwise. The analysis is conducted separately for the case that an actual health shock has taken place (restricting the data set to those households that have experienced a health shock) as well as for the case of a hypothetical health shock. In line

[20] This effect can be due to illnesses of small children, but is likely also driven by complications during child births; deliveries still bear considerable health risks for the mothers as villages are remote and health centers often difficult to reach.

[21] Various other variables were tested; e.g. income instead of asset wealth, other educational variables as well as respondent characteristics to test for potential response bias. None have predictive power.

[22] Indeed, support from within the village is more likely to be named as second or third strategy supporting the assumption of the theoretical framework that households employ alternative resources first before asking for support.

with the framework outlined in Section 2.1, the probability of neediness is expected to depend on the alternative resources available to a household, which could include personal wealth, access to financial products such as credit, savings and insurance, as well as access to support outside the village. Therefore, as potential determinants, X_i includes asset wealth, whether the household is covered by health insurance and access to credit, which is defined as given if at least one household member is a member of a bank (commercial bank or microfinance institution), is covered by one of the social security schemes or is a member of a cooperative. Furthermore, X_i includes the number of close household links outside the village as well as a dummy variable for whether the household receives remittances. In addition, I control for the gender and age of the household head, whether the household head was born in the village and whether he has completed high school, the household size, and village fixed effects. Summary statistics for all household characteristics included in the analysis are provided in Table B.2.2 in Appendix B.2. The estimation of Specification 3 is conducted by logit regression with standard errors clustered on the village level.

Before turning to the results, two comments need to be made. First, one needs to be cautious not to interpret the results as causal. Indeed, there might be considerable endogeneity: households that expect less support from their neighbors might be more inclined to invest in alternative risk management tools, e.g. by acquiring insurance or fostering contacts outside the village; results should thus be interpreted as correlations and not as causal effects. Second, for the analysis of strategies applied in the past, ideally information from the past (i.e., at the time of the health shock) would be included. The data allow for a derivation of values for bank and cooperative membership, access to insurance and coverage through social security systems for the time a health shock occurred, however for the other variables I cannot infer past values. This is problematic for asset wealth, the number of links outside the village, and whether the household receives remittances, as these variables might have changed over the past years and might even be endogenous to the strategy applied at the time of the shock. In a second estimation, I therefore replace these three variables with an index of durable assets, and the number of related households outside the village, excluding former household members. (For details on the derivation and validity analysis of the durable asset index see Appendix B.3.)

The results are reported in Table 4. Columns 1 and 2 report the results for strategies applied in the past, Column 3 for hypothetical strategies. (Estimators are presented as odds ratios, thus they need to be interpreted as the effect of a one unit change in the independent variable on the probability of neediness.) The results indicate that indeed households with access to alternative resources are less likely to be in need of support from within the village. In particular, more wealth, a larger number of connections outside the village and more household members (who could potentially work more to cope with the consequences of a shock) are negatively correlated with being in need of support from within the village. Surprisingly, access to credit is positively correlated with neediness, significantly in the case of hypothetical shocks. One potential explanation is that households with credit access have more possibilities to draw on village level support, potentially because they are

Table 4: Determinants of Neediness (all villages)

	(1) Needy in past	(2) Needy in past	(3) Needy hypothetically
Age of head	1.006	0.991	1.003
	(0.009)	(0.008)	(0.005)
Female head	0.924	0.944	0.833
	(0.227)	(0.239)	(0.144)
Head completed high school	1.553	1.446	0.821
	(0.507)	(0.487)	(0.156)
Head is native	1.049	1.832	1.226
	(0.431)	(0.782)	(0.273)
Household size	0.805***	0.797***	0.879***
	(0.058)	(0.060)	(0.037)
Asset wealth	0.039***		0.341**
	(0.028)		(0.173)
No. links outside village	0.788***		0.840***
	(0.068)		(0.048)
Remittances recipient	0.310***		0.531***
	(0.091)		(0.097)
Durable asset wealth		0.037***	
		(0.030)	
No. of family hh outside village		0.945**	
		(0.025)	
Access to credit(*)	1.196	1.343	1.456**
	(0.378)	(0.382)	(0.234)
Health insurance(*)	0.560**	0.553**	0.848
	(0.148)	(0.147)	(0.134)
Village fixed effects	Yes	Yes	Yes
Observations	380	380	896
Mean of DV	0.324	0.324	0.333
χ^2	138.317	85.231	130.089
r_p^2	0.209	0.146	0.101

Likelihood that a reported coping strategy in case of a health shock involves support from within the village. Logit estimation. Estimators reported as odds ratios. Standard errors in parentheses, clustered at village level. Columns 1 and 2: determinants of past neediness for households who experienced a health shock. Column 3: determinants of hypothetical neediness for all households. (*) In Columns 1 and 2 values for the year of the health shock, in Column 3 values at time of the survey.

more trusted.[23] To summarize, asset wealth, number of connections outside the village and the size of the household are shown to determine the probability of neediness in case of a health shock and should thus be included as predictors of neediness in the main analysis.

4.2 Dyadic Analysis

We now turn to the main analysis of the study and analyze the support arrangement network in the focal village. The likelihood that a mutual support arrangement ς_{ij} between a household i and a household j is formed is described as

$$P(\varsigma_{ij} = 1) = P(\alpha + X'_{ij}\beta + \epsilon_{ij} \geq 0) \tag{4}$$

where X_{ij} includes characteristics of i and j that proxy their respective probability to become needy, and ϵ_{ij} is the link specific error term.

For the characteristics to be included in X, I draw on the findings from Section 4.1.2. The following variables are included as proxies for a household's probability to become needy: *Asset wealth*, *Household size*, the proportion of household members between 16 and 59 (*% hh members (16-59)*), as well as the number of related households outside the village excluding former household members (*No. of family hh outside village*), which is used instead of the number of links outside the village due to reverse causality concerns (e.g. a household might invest more in outside connections or have household members working outside if there are little support possibilities within the village). As discussed in Section 2.2, the size of a household's support network within the village likely affects the probability that one of the support links is activated and should thus be accounted for in the analysis; as the number of support links is inherently endogenous to the model, instead, the number of related households within the village (*No. of family hh within village*) is included as a proxy. Finally, I include as additional household level controls, age and gender of the household head, whether the household head was born in the village and whether (s)he completed high school (*Age of head*, *Female head*, *Head is native Education of head*).[24] Potentially endogenous variables, such as access to remittances, coverage by health insurance and access to credit, are excluded for now. I come back to the analysis of these variables further below. Dyadic summary statistics including the sum and the absolute difference of all variables are reported in Table B.2.3 in Appendix B.2.

The dependent variable, ς_{ij}, is based on the reported source of support in case of health emergency, as outlined in Section 4.1.1. For reasons of comparison, I conduct three different types of estimations.

[23] While households with access to credit report on average slightly less links within their village than households without access to credit, it might still be the case that these households are on average more confident that they can seek support from their network than households without access to credit. This observation points towards a limitation of the theoretical framework: in the framework, personal household level resources are viewed as a substitute for intra-village support, while indeed a higher level of resources could enhance support options from within the village if used as signal of trustworthiness.

[24] In 90% of the cases, the household head was also the respondent to the survey; thus the head's characteristics overlap considerably with the respondents' characteristics. All of the following estimations have also been conducted including the respondents' characteristics, the coefficients of interest do not change significantly.

First, I analyze the likelihood that household i reports household j as a source of support (Section 4.2.1). This specification follows the analysis by Fafchamps and Gubert (2007). It does not yet inform us about the characteristics of mutual support arrangements but serves as an informative baseline. Second, I investigate the likelihood of a mutual support arrangement assuming that each reported support link indicates a mutual support arrangement (Section 4.2.2). This is a common approach used in the literature (e.g. see De Weerdt (2004)), which however does not account for potential one-sided support arrangements. Finally, I turn to the main specification analyzing the likelihood of a support arrangement, distinguishing one-sided from mutual support arrangements by accounting for whether or not a reported support link is reciprocated (Section 4.2.3). This approach builds on Schechter and Yuskavage (2012).

4.2.1 Likelihood of Support Link

As a baseline, I analyze how i's and j's respective probability to become needy, proxied by their alternative resources, affect the likelihood that i names j as a potential source of support (i.e., $s_{ij} = 1$), disregarding whether or not a support link is reciprocated.

$$s_{ij} = \alpha + \beta_1 X_i + \beta_2 X_j + \delta|X_i - X_j| + \epsilon_{ij} \qquad \text{for } i, j \in N = (1, ..., 65),\ i \neq j. \tag{5}$$

The analysis is conducted on the directed network, that is for each pair (i, j), with $i, j \in \mathcal{N} = 1, ..., 65$ and $(i \neq j)$; i.e., 4160 observations. X contains the above described proxies for a household's probability of becoming needy. Note, that the variables are defined such that a higher value in X is associated with a lower probability of neediness. Level and difference effects of each variable are accounted for: β_1 estimates the effect of i's predicted neediness on the likelihood of naming other households within the village as a source of support. β_2 estimates the effect of j's predicted neediness on the likelihood of being named as a source of support. δ estimates the effect of the absolute difference in i's and j's predicted neediness on their likelihood to have a support link.

Specification 5 is estimated by a logit model. There are two estimations. First, household characteristics are included as outlined above and standard errors are corrected to account for the correlation across observations, i.e. using dyadic robust standard errors (Fafchamps and Gubert 2007). Second, instead of the household characteristics X_i and X_j, fixed effects for i and j (i.e., for the ego and for the alter household) are included as well as the absolute differences in the household characteristics. Using fixed effects controls for unobserved household characteristics that affect link formation, yet, in this case, only the impact of the differences in alternative resources, and not the level effects can be analyzed. When fixed effects are included, households that do not report any support links within the village as well as households that are not named as potential sources of support drop out of the analysis (in total 13 households).

Results are reported in Table 5. Estimated coefficients for the household head characteristics are excluded from this and the following tables (for the complete tables for the following estimations see Tables C.2.1 - C.2.4 in Appendix C.2). The results suggest that wealthier households as well

Table 5: Likelihood of Support Link

	(1) $P(s_{ij} = 1)$	(2) $P(s_{ij} = 1)$
Asset wealth	-0.643	
	(0.601)	
Household size	0.031	
	(0.058)	
% hh members (16-59)	0.079	
	(0.244)	
No. of family hh within village	0.037**	
	(0.016)	
No. of family hh outside village	-0.028	
	(0.022)	
Alter: Asset wealth	1.708***	
	(0.628)	
Alter: Household size	0.120**	
	(0.061)	
Alter: % hh members (16-59)	0.027	
	(0.294)	
Alter: No. of family hh within village	0.008	
	(0.015)	
Alter: No. of family hh outside village	-0.068**	
	(0.033)	
AbsDiff in Asset wealth	-1.531***	-2.485***
	(0.470)	(0.635)
AbsDiff in Household size	0.062	0.151**
	(0.045)	(0.063)
AbsDiff in % hh members (16-59)	0.229	0.041
	(0.288)	(0.287)
AbsDiff in No. of family hh within village	-0.031	-0.035**
	(0.022)	(0.017)
AbsDiff in No. of family hh outside village	-0.000	-0.040
Ego fixed effects	No	Yes
Alter fixed effects	No	Yes
Observations	4160	3357
Control variables	Yes	Yes
Mean of Dependent Variable	0.057	0.070
log likelihood	-856.041	-756.004
χ^2	270.91	
p	0.000	

Logit Estimation on the directed network. $s_{ij} = 1$ if i names j as a potential source of support. (1) Dyadic robust standard errors in parentheses. (2) Standard errors clustered on individual level. Control for the level of and the absolute difference in Age of head, Head completed high school, Female head, Head is native.

as households of larger size are more likely to be named as a potential source of support; however, differences in wealth should not be too large: the larger the difference, the less likely a support link between two households exists. Households with less family outside the village name on average more support links. When household fixed effects are included (Column 2), the estimated coefficient of differences in wealth becomes more pronounced;[25] the difference in household size becomes significantly positively correlated with the existence of a support link, indicating that a support link is typically formed between a smaller and a larger household. Furthermore, a support link is more likely between households with a similarly sized family network.

However, while Specification 5 uses the complete information of all reported support links, the results cannot be interpreted in the context of mutual support arrangements. The analysis is conducted on the directed network where each link is counted separately and the symmetry requirements of mutual support arrangements, outlined in Section 2.2.2, are only fulfilled when fixed effects are included. This limitation is addressed by the following second estimation approach.

4.2.2 Likelihood of Mutual Support Arrangement – Naïve Approach

In order to account for the symmetry requirements of mutual support arrangements, the network of support arrangements is analyzed under the assumption that all reported support links represent mutual support arrangements and that unreciprocated support links are due to underreporting. This approach follows Specification 1 described in Section 2.2.1.

$$\begin{aligned} \varsigma_{ij} &= \tilde{\alpha} + \tilde{\beta} X_i + \tilde{\beta} X_j + \tilde{\delta} |X_i - X_j| \\ \text{where } \varsigma_{ij} &= 1 \ \textit{if } s_{ij} = 1 \ \textit{or } s_{ji} = 1 \\ \varsigma_{ij} &= 0 \ \textit{if } s_{ij} = 0 \ \textit{and } s_{ji} = 0 \qquad \text{for } i, j \in N = (1, ..., 65), \ i < j. \end{aligned} \tag{6}$$

The analysis is conducted on the undirected network graph ($i, j \in \mathcal{N} = 1, ..., 65$ and ($i < j$), i.e., 2080 observations). Regressors are included to maintain the symmetric structure – i.e., the sum, $(X_i + X_j)$, to measure level effects, and the absolute difference, $|X_i - X_j|$.[26] A higher X is associated with a lower likelihood of neediness. Estimation is done by logit regression; in a first estimation, dyadic robust standard errors account for the correlation across observations, in the second estimation household fixed effects are included. $\tilde{\beta}$ measures the effect of the combined level of i's and j's predicted neediness on their likelihood to form a mutual support arrangement, while $\tilde{\delta}$ measures the effect of the absolute difference of i's and j's expected neediness. In line with Hypothesis 1, $\tilde{\beta}$ is expected to be smaller than zero; the more resources i and j have available, and thus the smaller i's and j's predicted neediness, the lower the likelihood that they engage in a mutual support arrangement. In line with Hypothesis (2), $\tilde{\delta}$ is expected to be smaller than zero; the

[25] The change is to some extent driven by those ten households that do not name any support links within the village and drop out of the analysis when fixed effects are included; these households are overall wealthier than the other households.

[26] Note that $\tilde{\beta}(X_i + X_j)$ is split in $\tilde{\beta} X_i + \tilde{\beta} X_j$, for presentation reasons only.

larger the differences in i's and j's predicted neediness, the less likely it is that they form a mutual support arrangement.

Results are reported in Table 6; as in the previous table, Column 2 reports the results of the fixed effects regression. The estimated coefficients differ considerably from the estimation of Table 5. The combined level effects of households' asset wealth as well as of household size is significant and positive. Wealthier households and larger households seem *more* likely to form mutual support arrangements than poorer households or households of smaller size. When including household fixed effects, the estimates effects are similar to the fixed effect estimation of Table 5: households are more likely to form support arrangements if they have a similar level of wealth and if household size differs.[27]

In summary, if indeed every support link indicates a mutual support arrangement, then, based on these results, Hypothesis 1 would be rejected. While small household size and low wealth have shown to be strong predictors of neediness, these variables do not affect the formation of mutual support arrangements as expected; indeed households with more alternative resources in terms of household members and wealth, are predicted to be *more* likely to engage in mutual support arrangements. With regard to Hypothesis 2, the interpretation is not as straightforward. Households with a larger difference in wealth indeed seem to have a lower likelihood to form a mutual support arrangement, yet the effect is only significant when fixed effects are included. The differences in the other variables of interest (i.e., resources within the household, within the village or outside the village) have either no significant effect or the effect is opposite to our expectation (as for the case of household size).

However, the definition of mutual support arrangements used in Specification 6 might be inadequate. As discussed in Section 2.2.2, the definition does not account for one-side support arrangements, which might not follow the motive of risk-sharing. Hence, in a next step we differentiate between support links that are reciprocated from those that are unreciprocated.

4.2.3 Likelihood of Mutual Support Arrangement – Accounting for Reciprocation

The third estimation approach, following Model 2 described in Section 2.2.2, accounts for the direction of a support link and for whether or not a support link is reciprocated. The model builds on the approach by Schechter and Yuskavage (2012).[28] I estimate the joint likelihood using a multinomial logit specified as follows:

[27] This is not particularly surprising, Specification 5 with fixed effects is similar to Specification 6 with fixed effects, with the exception that the estimation of the latter is conducted on a subset of the support links analyzed in the former.

[28] However Schechter and Yuskavage (2012) cannot address the issue of bilateral and unilateral link formation as their analysis is based on reports from one side only.

Table 6: Likelihood of Mutual Support Arrangement – Naïve Approach

	(1) $P(\varsigma_{ij} = 1)$	(2) $P(\varsigma_{ij} = 1)$
Asset wealth	0.609*	
	(0.337)	
Household size	0.088**	
	(0.041)	
% hh members (16-59)	0.101	
	(0.193)	
No. of family hh within village	0.015	
	(0.012)	
No. of family hh outside village	-0.031**	
	(0.013)	
Alter: Asset wealth	0.609*	
	(0.337)	
Alter: Household size	0.088**	
	(0.041)	
Alter: % hh members (16-59)	0.101	
	(0.193)	
Alter: No. of family hh within village	0.015	
	(0.012)	
Alter: No. of family hh outside village	-0.031**	
	(0.013)	
AbsDiff in Asset wealth	-0.529	-1.278*
	(0.525)	(0.704)
AbsDiff in Household size	0.109**	0.225***
	(0.049)	(0.072)
AbsDiff in % hh members (16-59)	0.116	-0.394
	(0.261)	(0.429)
AbsDiff in No. of family hh within village	-0.021	-0.023
	(0.021)	(0.020)
AbsDiff in No. of family hh outside village	0.005	-0.035
	(0.038)	(0.048)
Ego fixed effects	No	Yes
Alter fixed effects	No	Yes
Observations	4160	1854
Mean of Dependent Variable	0.055	0.062
log likelihood	-646.674	-567.520
χ^2	65.01	
p	0.0000	

Logit Estimation on the undirected network. $\varsigma_{ij} = 1$ if $s_{ij} = 1$ or $s_{ji} = 1$, where $s_{ij} = 1$ if i names j as a potential source of support. (1) Dyadic robust standard errors in parentheses. (2) Standard errors clustered on individual level. Control for the level of and the absolute difference in Age of head, Head completed high school, Female head, Head is native.

$$
\begin{aligned}
P(\dot{\varsigma}_{ij} = 1) &= e^{\alpha'' + \beta_1'' X_i + \beta_2'' X_j + \delta_1'' |X_i - X_j|} k^{-1} \\
P(\dot{\varsigma}_{ij} = 2) &= e^{\alpha'' + \beta_2'' X_i + \beta_1'' X_j + \delta_1'' |X_i - X_j|} k^{-1} \\
P(\dot{\varsigma}_{ij} = 3) &= e^{\alpha'' + \beta_3'' X_i + \beta_3'' X_j + \delta_3'' |X_i - X_j|} k^{-1} \\
k = 1 + e^{\alpha'' + \beta_1'' X_i + \beta_2'' X_j + \delta_1'' |X_i - X_j|} &+ e^{\alpha'' + \beta_2'' X_i + \beta_1'' X_j + \delta_1'' |X_i - X_j|} + e^{\alpha'' + \beta_3'' X_i + \beta_3'' X_j + \delta_3'' |X_i - X_j|} \\
\text{where } \dot{\varsigma}_{ij} &= 1 \ \textit{if } s_{ij} = 1 \ \textit{and } s_{ji} = 0 \\
\dot{\varsigma}_{ij} &= 2 \ \textit{if } s_{ij} = 0 \ \textit{and } s_{ji} = 1 \\
\dot{\varsigma}_{ij} &= 3 \ \textit{if } s_{ij} = 1 \ \textit{and } s_{ji} = 1 \\
\dot{\varsigma}_{ij} &= 0 \ \textit{if } s_{ij} = 0 \ \textit{and } s_{ji} = 0 \qquad \text{for } i, j \in N = (1, ..., 65), \ i < j.
\end{aligned}
\tag{7}
$$

Again the analysis is conducted on the undirected graph, that is for each pair (i, j), with $i, j \in \mathcal{N} = 1, ..., 65$ and $(i < j)$; i.e., 2080 observations. Estimation is done by multinomial logit with $\dot{\varsigma}_{ij} = 0$ as reference category. Two-way cluster-robust standard errors account for the correlation across observations (Cameron et al. 2011).[29] The parameters are constrained to account for symmetry.[30]

$\dot{\varsigma}_{ij} = 3$ is assumed to describe mutual support arrangements. I expect that these arrangements are more likely if the predicted neediness of both parties is sufficiently high ($\beta_3'' > 0$), yet the difference in their predicted neediness is small ($\delta_3'' < 0$). Furthermore, I investigate the difference in reciprocated versus unreciprocated support links. If size and direction of the coefficients of interest differ considerably for reciprocated support links ($\dot{\varsigma}_{ij} = 3$) compared to unreciprocated support links ($\dot{\varsigma}_{ij} = 1$ and $\dot{\varsigma}_{ij} = 2$), then this is an indication that unreciprocated support links follow different mechanisms than reciprocated support links. The multinomial logit model is based on the assumption of independence of irrelevant alternatives (IIA); that is, the proportion of probabilities between two alternatives should be independent on the existence of a third alternative (Greene 2012). This assumption can be tested formally using the Hausman-McFadden Test (Hausman and McFadden 1984). In particular, I test whether the coefficients for one-sided suport arrangements change significantly when the option of mutual support arrangements is excluded. This hypothesis can be rejected.[31]

[29] Due to the complexity of the model, it is difficult to use the more conservative dyadic corrected standard errors with multinomial regressions. As a robustness check, I re-estimated each multinomial logit estimation with three separate binomial logit estimation using the dyadic corrected standard errors. Results do not change significantly (available upon request).

[30] More specifically, the estimation of $P(\dot{\varsigma}_{ij} = 2)$ mirrors the estimation of $P(\dot{\varsigma}_{ij} = 1)$: the coefficients of the receivers' characteristics in one-sided support – i.e., the ego household in arrangement $\dot{\varsigma}_{ij} = 1$ and the alter household in $\dot{\varsigma}_{ij} = 2$ – are constrained to be equal, and the same holds for the providers' characteristics; the intercept as well as the coefficients of the absolute differences in characteristics are constrained to be the same in $\dot{\varsigma}_{ij} = 1$ and $\dot{\varsigma}_{ij} = 2$. Furthermore, in the estimation of $P(\dot{\varsigma}_{ij} = 3)$ – i.e., the mutual support arrangement – level effects are constrained to be the same for the characteristics of i and the characteristics of j (similar to Specification 6).

[31] Comparing the two models leads to a test statistics of $\chi^2(27) = 0.10$.An alternative approach is to include the covariance when estimating the variance of the estimates' differences (Weesie 1999). This ensures that testing results are always well defined; furthermore, it allows for clustering standard errors, which is not feasible with the conventional Hausman-McFadden Test, and for testing the models separately. This test supports the results for both

Results are reported in Table 7; in Column 1, results are reported for one-sided support arrangements – where i (the ego household) names j (the alter household) as a source of support, but j does not name i ($\dot{\varsigma}_{ij} = 1$); in Column 2, results are reported for a one-sided support arrangement – where j names i as a source of support but i does not name j ($\dot{\varsigma}_{ij} = 2$); in Column 3, results are reported for mutual support arrangements – i.e., i names j and j names i ($\dot{\varsigma}_{ij} = 3$). With regard to one-sided arrangements, I find that wealthier households and households of larger size are typically named as providers in one-sided support arrangements. The effect of absolute differences in wealth is negative but insignificant. Furthermore, one-sided support arrangements are more common between households that differ in size.

Different characteristics play a role for mutual support arrangements (Column 3). Mutual support arrangements are more likely when both parties have a similar level of wealth and a similarly large family support network. Furthermore, households with more relatives in the village are more likely to engage in mutual support. Difference in wealth seems to play an especially important role. The effect is much more pronounced than for the case of one-sided arrangements. In particular, if the difference in wealth reduces by one standard deviation (0.17), two households are twice as likely to engage in a mutual support arrangement than to engage in no arrangement ($e^{-4.27 \cdot -0.17} = 2.07$).

So far, I have ignored alternative resources which are potentially endogenous to support arrangement formation but have, nevertheless, been shown to explain the probability of neediness (Section 4.1.2). When I include these variables (namely, coverage by health insurance, access to credit and receiving remittances) the predictive power of the main variables remains overall unchanged (results are reported in Appendix C.2 in Table C.2.5). But expectedly, the newly included, potentially endogenous variables also play a role in explaining support. One-sided support links are more likely if the recipient has access to credit (which is reminiscent of the previous results discussed in Section 4.1.2) and if the provider is covered by health insurance. Whether or not the recipient or provider receives remittances has no predictive power for one-sided support links. Contrary to this, mutual support arrangements are less likely between households that receive remittances. However, neither access to credit nor coverage by health insurance can explain a mutual support arrangement.

In summary, the empirical findings are partly in line with the predictions of the theoretical framework. We predicted that households which differ in their probability to become needy are less likely to form mutual support arrangements. In some aspects this hypothesis is confirmed. Mutual support arrangements are mainly formed between households of a similar wealth level and with a similarly large family network within the village. Differences in the other resources seem to play no role. The level effect of predicted neediness is less straight-forward. While we expected that households with less alternative resources on hand and thus with a larger probability of neediness are generally more likely to form mutual support arrangements, neither wealth, nor household size, nor member composition, which all are found to play an important role in predicting neediness, determine whether a household is part of a mutual support arrangement or not. Only the number

types of one-sided support arrangements ($\chi^2(28) = 18.80$, $p = 0.90$).

Table 7: Likelihood of Mutual Support Arrangement – Accounting for Reciprocation

	(1) $P(\dot{\varsigma}_{ij} = 1)$	(2) $P(\dot{\varsigma}_{ij} = 2)$	(3) $P(\dot{\varsigma}_{ij} = 3)$
Asset wealth	-0.700	1.842**	0.389
	(0.582)	(0.725)	(1.019)
Household size	0.061	0.141*	0.040
	(0.079)	(0.073)	(0.115)
% hh members (16-59)	0.074	0.011	0.014
	(0.251)	(0.444)	(0.587)
No. of family hh within village	0.023	-0.010	0.060***
	(0.024)	(0.025)	(0.022)
No. of family hh outside	0.002	-0.047	-0.142
	(0.044)	(0.042)	(0.122)
Alter: Asset wealth	1.842**	-0.700	0.389
	(0.725)	(0.582)	(1.019)
Alter: Household size	0.141*	0.061	0.040
	(0.073)	(0.079)	(0.115)
Alter: % hh members (16-59)	0.011	0.074	0.014
	(0.444)	(0.251)	(0.587)
Alter: No. of family hh within village	-0.010	0.023	0.060***
	(0.025)	(0.024)	(0.022)
Alter: No. of family hh outside	-0.047	0.002	-0.142
	(0.042)	(0.044)	(0.122)
AbsDiff in Asset wealth	-0.926	-0.926	-4.274***
	(0.621)	(0.621)	(1.006)
AbsDiff in Household size	0.131**	0.131**	-0.129
	(0.060)	(0.060)	(0.195)
AbsDiff in % hh members (16-59)	-0.024	-0.024	0.897
	(0.324)	(0.324)	(0.680)
AbsDiff in No. of family hh within village	-0.015	-0.015	-0.070*
	(0.024)	(0.024)	(0.040)
AbsDiff in No. of family hh outside	0.020	0.020	-0.049
	(0.057)	(0.057)	(0.188)
Observations	2080		
Control variables	Yes		
log likelihood	-809.370		
χ^2	541.320		
p	0.000		

Multinomial logit estimation $\dot{\varsigma}_{ij} = 1$ if $s_{ij} = 1$ and $s_{ji} = 0$, $\dot{\varsigma}_{ij} = 2$ if $s_{ij} = 0$ and $s_{ji} = 1$ and $\dot{\varsigma}_{ij} = 3$ if $s_{ij} = 1$ and $s_{ji} = 1$ where $s_{ij} = 1$ if i names j as a potential source of support. Two-way cluster-robust standard errors on ego and alter household level in parentheses. Control for the level of and the absolute difference in Age of head, Head completed high school, Female head, Head is native.

of family outside the village and access to remittances is negatively correlated with the formation of mutual support arrangements. Furthermore I show that the determinants for reciprocated support links differ considerably from the determinants for unreciprocated support links. The results indicate that indeed unreciprocated support links rather describe one-sided support arrangements that follow a different mechanism. Assuming the estimation model is correctly specified, the results suggest that the proposed framework described in Section 2.1 can explain some of the structure of the support network, while other aspects remain unexplained. Part of this might be driven by shortcomings of the empirical specification. This will be addressed in the following section.

4.3 Limitations and Extended Analysis

There are a number of potential shortcomings of the estimation approach. First, what I call a mutual support arrangement, might indeed just be two one-sided support arrangements; that is, the report by i and the report by j do not refer to the same arrangement but to two different one-sided arrangements. Second, in the specification above, household characteristics are included as if each had a separate effect on the formation of support arrangements, while indeed these characteristics are supposed to function as a combined predictor of neediness. Third, asset wealth is estimated to have a strong effect on support link formation; however, wealth can be endogenous to the formation of support arrangements: similar levels of wealth might be an outcome rather than a driver of the formation of a support arrangement (as shown theoretically in Bramoullé and Kranton (2007) and Bourlès et al. (2017)). These concerns are addressed in the following.

4.3.1 Analyzing Reciprocity

Could potentially a reciprocated support link represent not a mutual support arrangement but rather two one-sided support arrangements? If this is the case, a model which accounts for reciprocity should not have better explanatory power than a model which does not account for reciprocity. This is analyzed by comparing the estimation results of Specification 5, which estimates all support links independently of whether they are reciprocated or not, with a specification, that takes reciprocity into account. In this latter specification, links that are reciprocated ($s_{ij} = 1$ *and* $s_{ji} = 1$) are distinguished from links that are not reciprocated ($s_{ij} = 1$ *and* $s_{ji} = 0$). The estimation is conducted by multinomial logit on the directed network graph (i.e., for each pair (i, j), with $i, j \in \mathcal{N} = 1, ..., 65$ and $(i \neq j)$ – i.e. 4160 observations), with the reference category of ($s_{ij} = 0$ *and* $s_{ji} = 0$). Note that this specification is very similar to Specification 7. Likewise, for reciprocated links coefficients are constrained to fulfill symmetry requirements.

$$
\begin{aligned}
P(s_{ij} = 0 \ and \ s_{ji} = 1) &= e^{\alpha_1'(X_i)+\alpha_2'(X_j)+\delta_1'|X_i-X_j|}k^{-1} \\
P(s_{ij} = 1 \ and \ s_{ji} = 1) &= e^{\alpha_3'(X_i)+\alpha_3'(X_j)+\delta_3'|X_i-X_j|}k^{-1} \\
k = 1 + e^{\alpha_1'(X_i)+\alpha_2'(X_j)+\delta_1'|X_i-X_j|} &+ e^{\alpha_3'(X_i)+\alpha_3'(X_j)+\delta_3'|X_i-X_j|}
\end{aligned} \tag{8}
$$

The estimation of Specification 5 is compared with the estimation of Specification 8. Goodness of fit measures for both analyses are reported in Table 8. Yet, the measures cannot be directly compared as the models are not nested. Two aspects can be analyzed. First, I test whether the estimators for the probability to initiate a support link significantly differ when we account for reciprocity, that is we compare the estimators of Specification 5 with the estimators for the unreciprocated support links in Specification 8. The Wald test indicates that indeed these estimators differ significantly: with a $\chi^2(28) = 204.03$ we can reject the hypothesis that both estimators are similar.

Table 8: Model Comparison

	Specification 5 (1) Logit	Specification 8 (2) Multinomial Logit
Observations	4160	4160
log likelihood	-856.041	-953.039
χ^2	270.909	948.705
p	0.000	0.000
Mean squared error		
- of unreciprocated links	0.0395	0.0391
	(0.0027)	(0.0027)
- of reciprocated links	0.0147	0.0141
	(0.0019)	(0.0017)

Specification 5 does not distinguish reciprocated from unreciprocated links.
Specification 8 distinguishes reciprocated from unreciprocated links.
Standard errors in parentheses.

Second, we can analyze whether Specification 5 performs better in predicting reciprocated and unreciprocated links than Specification 8, by calculating the mean squared prediction error for each type of link. For unreciprocated links the mean squared error is 0.0395 for the predictor based on Specification 5 and 0.0391 for the predictor for Specification 8. While the difference is not large, it is significantly different from zero. For unreciprocated links the mean squared error is 0.0147 for the predictor based on Specification 5 and 0.0141 for the predictor for Specification 8. Again the difference is significantly different from zero. That is, Specification 8 performs overall better in predicting both unreciprocated and reciprocated links than Specification 5.

4.3.2 Neediness Score

To address the concerns related to the explanatory variables, I develop a predictor of neediness that is based on household characteristics that are exogenous to the support arrangement formation process. In particular, exogenous household characteristics are weighted by a factor that is derived by analyzing past neediness using the larger data set of the 22 villages (including a sample of 14 households from the focal village), the same data set which is used in Section 4.1.2.[32]

[32] Using the larger data set and not limiting the analysis to the data of the focal village circumvents the potential problem of reverse causality; if the predictor would be developed based on the focal village data only, the derived

Based on the derived weights, for each household in the focal village, a score is developed that describes this particular household's probability to become needy. This score is similar to the score derived in propensity score matching techniques used for treatment effect analyses (Greene 2012). In particular I estimate

$$Y_{m,v} = \beta X_m + \xi_v + \epsilon_{m,v} \text{ for } m = 1, ..., n \text{ and } v = 1, ..., 22 \tag{9}$$

where $Y_{m,v} = 1$ if household m living in village v has been needy in the past (i.e., if m has experienced a health shock and has turned to another household within her village to ask for support) and $Y_{m,v} = 0$ otherwise. X includes household level characteristics that are exogenous to the probability of neediness. In addition, village fixed effects ξ are included. Based on the estimator $\widehat{\beta}$, I can derive for each household i in Maramig a neediness score $\widehat{needy}_i$:

$$\widehat{needy}_i = \hat{\beta} X_i \text{ for } i = 1, ..., 65 \tag{10}$$

The following variables are included in X: the education of the household head, the gender and age of the household head, whether the head was born in the village, the age distribution of household members and the number of other households within the village the respondent household is related to. Specification 9 is estimated via maximum likelihood. Results are reported in Table C.3.1 in Appendix C.3. The score is standardized to be between 0 and 1. Summary statistics for the derived neediness score for the households of Maramig are described in Table C.3.2 and the distribution is depicted in Figure C.3.1 in Appendix C.3.

I then reestimate Specification 6 using as explanatory variables only the level and the differences in the neediness score of the ego and the alter household, controlling for household head characteristics (see Table B.2.3 in Appendix B.2 for the summary statistics). Results are reported in Table 9 (for the full table see Table C.2.4 in Appendix C.2). While one-sided support arrangements are slightly more likely if households differ in their predicted neediness, the opposite holds for mutual support arrangements.

In particular, a one standard deviation reduction in the absolute difference in predicted neediness (0.26), increases the likelihood of a mutual support arrangement compared to having no arrangement by around 50% ($e^{-1.54 \cdot -0.26} = 1.49$). Again, households with a higher probability of neediness are *not* more likely to form a mutual support arrangement; while the coefficients are not significant, the direction of the effect is opposite to what was expected.

In summary, the findings of the previous analysis can be confirmed: while households with a particularly high probability of neediness are not more likely to be part of mutual support arrangements, households that form mutual support arrangements have a similar probability of becoming needy.

weights might be affected by the existing support links.

Table 9: Likelihood of Mutual Support Arrangement - Neediness Score

	Mutual Support		
	$P(\dot{\varsigma}_{ij} = 1)$	$P(\dot{\varsigma}_{ij} = 2)$	$P(\dot{\varsigma}_{ij} = 3)$
$\widehat{needy}$	-0.357	0.484	-0.101
	(0.224)	(0.509)	(0.641)
Alter: $\widehat{needy}$	0.484	-0.357	-0.101
	(0.509)	(0.224)	(0.641)
AbsDiff in $\widehat{needy}$	0.669*	0.669*	-1.544**
	(0.367)	(0.367)	(0.706)
Observations	2080		
Control variables	Yes		
log likelihood	-827.991		
χ^2	231.200		
p	0.000		

Multinomial logit estimation. $\dot{\varsigma}_{ij} = 1$ if $s_{ij} = 1$ and $s_{ji} = 0$, $\dot{\varsigma}_{ij} = 2$ if $s_{ij} = 0$ and $s_{ji} = 1$ and $\dot{\varsigma}_{ij} = 3$ if $s_{ij} = 1$ and $s_{ji} = 1$ where $s_{ij} = 1$ if i names j as a potential source of support. Two-way cluster-robust standard errors on ego and alter household level in parentheses. Control for the level of and the absolute differences in Age of head, Education of head, Female head, Head is native.

5 Discussion

In this study I analyze the role of households' probability of neediness for the formation of mutual support arrangements within villages. Building on a risk-sharing framework I predict, first, that households are more likely to engage in mutual support arrangements the less alternative resources they have available, that is the higher their probability of neediness (Hypothesis 1); and second, that a mutual support arrangement between two households is less likely to sustain the more households differ in their respective probability of neediness (Hypothesis 2).

The predictions are tested using census data of a fishing village in the Western Visayas, Philippines. There is no evidence for the first hypothesis. While households that form mutual support arrangements seem to have generally less resources from outside the village and are thus more dependent on support from within the village, they are not necessarily more deprived in terms of wealth, number of working-age household members or access to credit. However, I find clear support for the second hypothesis. Mutual support arrangements are more likely between households that have a similar level of alternative resources they can draw on in case of a shock and thus are predicted to have a similar probability of being in need of informal support. This suggests that expected neediness indeed plays a role for the formation of support arrangements. Previous literature shows that risk is often shared within sub-groups, such as the (extended) family, castes or ethnicity (Grimard 1997; Fafchamps and Lund 2003; Mazzocco and Saini 2012). My findings suggest that households also consider the relative likelihood of being in need of support when deciding with whom to engage in a mutual support arrangement. This automatically limits the pool of partners with

which a household can share risk. The findings can thus further help to explain why risk-sharing on community level is typically found to be incomplete.

Throughout the analysis, I emphasize the importance to account for the reports of both sides of a reported link and to consider the direction of the flow of support: characteristics of reciprocated support links differ significantly from characteristics of unreciprocated support links. Not taking these differences into account can lead to erroneous inference, which might explain some of the contradictory findings of previous empirical studies.

A finding that persists throughout the analysis is that, against our expectations, households with a higher probability of neediness are not more likely to be part of a mutual support arrangements. This finding is reminiscent of previous findings which show that the very poor are often left out of the risk-sharing network (Jalan and Ravallion 1999; Santos and Barrett 2011; Delpierre et al. 2016). Santos and Barrett (2011) suggest that this is due to isolation: the poor are less well known. This is less likely to be the case in our study as the village is very small and houses are located close to each other (see Figure B.1.1 in Appendix B.1). A more likely explanation is that while the poor might be more in need of support arrangements, they have too little resources to make a desirable partner for a mutual support arrangement. They have little to provide and might be more reluctant as their marginal costs of providing support is high (Delpierre et al. 2016). Indeed the distribution of support arrangements across wealth quintiles (see Table C.4.1 in Appendix C.4) indicates that the poor are more likely to be recipients of one-sided support arrangements, while richer households are more likely to be providers. Poorer households are in this case not necessarily left out, but the support seems not to follow the mechanisms suggested in the canonical risk-sharing framework. Also the type of support differs. Analyzing the transfers that a household reports to have received or provided over the last month, reveals that poorer households are more likely to receive support in terms of food, whereas monetary support is rather provided to households in the middle of the wealth distribution. This suggests that the motive of risk-sharing under the principle of balanced reciprocity, is not entirely well-suited to explain the structure of support arrangements.[33] Other motives need to be accounted for, such as social norms or social preferences which are shown to explain part of inter-household transfers (e.g. see Ligon and Schechter 2012).[34]

As pointed out throughout the paper, there are a number of important limitations that point to avenues for future research. First, the analysis is confined to support arrangements within a village. But households might maintain support arrangements outside the village. Indeed, the fact that households with more family links outside the village are less likely to engage in mutual support suggests that family support from outside functions as a substitute to the support network within the village. Second, in dyadic regression analysis the network structure cannot be incorporated. With pairwise regressions, link decisions are assumed to be independent, yet in the case of support

[33]This is in line with De Weerdt (2004) and De Weerdt and Fafchamps (2011) who show that some of the common prediction of risk-sharing models do not hold when analyzing actual inter-household transfer data.

[34]There is still relatively little known about the mechanisms underlying one-sided support arrangements: e.g. whether households return the provided support in other domains, whether there are local social norms that govern the support from richer to poorer households and how these norms can be sustained. These are avenues for future research.

arrangements, this probably does not hold.[35] Furthermore, I only analyze direct links, yet it has been shown both theoretically (Bourlès et al. 2017) and empirically (Kinnan and Townsend 2012) that indirect support links matter; e.g. h might support i so that i can support j, but we do not observe a link between h and j. Such link interdependencies cannot be incorporated well in dyadic regression analysis, yet might directly affect the results. Other models, such as exponential random graph models, are more able to capture observed network structures, but accommodate individual attributes only to a limited extend, which makes these models less suitable for testing specific predictions e.g. regarding household characteristics (Lusher et al. 2013). Testing the role of predicted neediness for the formation of support arrangements while taking into account the network structure is avenue for future research.

[35]For example, the number of support arrangements an agent i maintains with her neighbors, $N_i(\varsigma) = \{j \mid ij \in \varsigma\}$, likely affects the probability that one of the links will be activated – i.e., the probability that neighbor j is asked by i probably reduces with the number of support arrangements i maintains. Thus, the net utility an agent j derives from having a support link with i would depend on N_i, a feature that the estimation approach cannot incorporate.

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Expected Neediness and the Formation of Mutual Support Arrangements: Evidence from the Philippines

- Supplementary Material -

A Theoretical Framework

The theoretical framework that guides the analysis builds on the model of favor exchange by Jackson et al. (2012) and is modified to reflect the probability of neediness. Two agents i and j live over an infinite number of discrete time periods $t = \{0, 1, ...\}$. In each time period, an agent can experience a negative income shock with probability π, with $0 < \pi < 1$. The time between periods is small such that at most one of the two agents faces a shock. Agents discount their payoffs over time with $0 < \delta < 1$. At the beginning of period $t = 0$, the two agents decide whether to form a mutual support arrangement. If a support arrangement is formed, then in case i is in need of support, j provides support to i; and in case j is in need of support, i provides support to j. For simplicity, it is assumed that providing support costs the provider a fixed amount c while the value of receiving support is v, with $v > c$; thus engaging in mutual support over time is ex-ante pareto-efficient. Let p_i represent the probability that i is in need of support in a given period, i's *probability to become needy*. More specifically, we assume $p_i = \pi(1 - r_i)$, where r_i is the probability that agent i can cope with the shock individually, with $0 \leq r_i \leq 1$. r_i depends on the alternative resources i has available to cope with the shock individually. While π is fixed, agents differ in r_i and thus their likelihood of neediness p_i.

The game proceeds as follows. At the beginning of each time period the two agents decide simultaneously whether they keep the arrangement. The arrangement is maintained only if it is beneficial for both agents; in particular, if

$$U_i = \frac{\big(p_i\, v - p_j\, c\big)}{1 - \delta} \geq 0 \qquad \text{and}$$
$$U_j = \frac{\big(p_j\, v - p_i\, c\big)}{1 - \delta} \geq 0$$

In case the arrangement is maintained, i asks j for support with probability p_i and j asks i for support with probability p_i. The agent that is asked for support decides whether to provide support. If support is not provided, the arrangement is dissolved and agents live henceforth in isolation. Support is thus only provided if the costs of providing support do not exceed the discounted benefit of continuing the arrangement

$$c \leq \frac{\delta\big(p_i\, v - p_j\, c\big)}{1 - \delta} \tag{11}$$

Once an arrangement is dissolved, it cannot be restored.

Agent i's incentive to maintain the arrangement thus increases in p_i and decreases in p_j. Ceteris

paribus, the incentive to deviate increases the larger $|p_i - p_j|$. For the arrangement to be sustainable it must hold that

$$c \leq \frac{\delta\big(p_i\, v - p_j\, c\big)}{1-\delta} \quad \text{and} \quad c \leq \frac{\delta\big(p_j\, v - p_i\, c\big)}{1-\delta}.$$

Consequently, as long as c and v are constant, the larger the difference in the agents' likelihood of neediness, the less likely it is that an arrangement can be sustained.

Based on this framework, the following predictions are derived which can be tested empirically:

Hypothesis 1

For a given p_j, agent i's willingness to engage in a mutual support arrangement is higher the lower her alternative resources to cope with a shock in isolation, that is, the higher p_i.

Hypothesis 2

A mutual support arrangement between two agents is less likely the larger the difference in their respective probability to become needy.

B Descriptives

B.1 Support Network

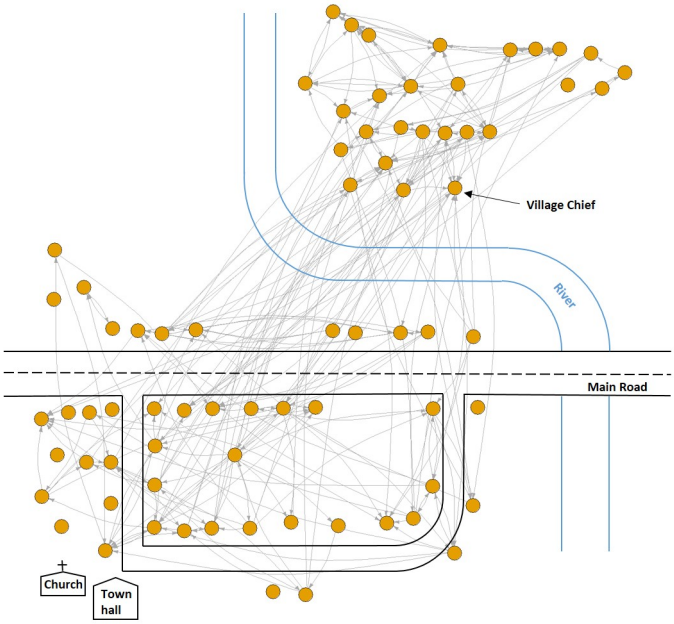

Figure B.1.1: Map of focal village with directed network of reported support links

B.2 Summary Statistics

Table B.2.1: Household Characteristics (all villages)

	mean	sd	min	max	median	count
Household size	4.14	2.01	1	11	4	359
Female head	0.34	0.47	0	1	0	359
Head born in the village	0.79	0.41	0	1	1	358
Head has no basic education	0.24	0.43	0	1	0	358
Head completed high school	0.35	0.48	0	1	0	358
No. of family hh within village	10.77	7.15	0	40	10	359
No. of family hh outside village	3.30	3.99	0	50	3	359
% of adults working	0.53	0.35	0	1.5	.5	357
% of adults working outside village	0.08	0.19	0	1	0	357
Covered by social security	0.27	0.44	0	1	0	359
Fishing as main income source	0.20	0.40	0	1	0	294
Farming as main income source	0.19	0.39	0	1	0	294
HH income last month (PHP)	13,225.56	31,225.09	0	330,975	5,800	359
Asset wealth	0.36	0.21	0	1	.33	358
OFW exists	0.13	0.33	0	1	0	357
Remittances recipient	0.52	0.50	0	1	1	359
Amount remittances last year (PHP)	34,228.40	47,443.59	100	312,000	12,300	187
Coop member	0.13	0.34	0	1	0	359
Bank account	0.06	0.24	0	1	0	359
MFI member	0.16	0.37	0	1	0	359
Health insurance	0.53	0.50	0	1	1	359
Informal borrowing and lending	0.63	0.43	0	1	1	359
Observations	359					

Surveyed 359 households from 22 villages, covering 1485 household members; hh - households; PHP - Philippine Pesos.
*) Income from last month; includes salary, proceeds from self-employment, remittances, loans, public assistance, pensions, payouts from savings and other income (such as gambling).

Table B.2.2: Summary Statistics of Variables used in Neediness Analysis

	mean	sd	min	max	median	count
Age of head	53.84	15.72	4	98	53	306
Female head	0.33	0.47	0	1	0	306
Head completed high school	0.33	0.47	0	1	0	306
Household size	4.25	1.98	1	11	4	306
Head is native	0.79	0.41	0	1	1	306
Asset wealth	0.36	0.21	0	.99	.33	306
No. links outside village	1.99	1.73	0	9	2	306
Remittances recipient	0.52	0.50	0	1	1	306
Durable asset wealth	0.42	0.20	0	.99	.41	306
No. of family hh outside village	3.42	4.21	0	50	3	306
Access to credit	0.52	0.50	0	1	1	306
Health insurance	0.52	0.50	0	1	1	306
Observations	306					

Based on the sample of 306 surveyed households from 22 villages; including a random sample of 14 households from the focal village.

Table B.2.3: Summary Statistics of Variables used in Dyadic Regressions

	mean	sd	min	max	median	count
Sum in Asset wealth	0.77	0.28	.049	1.8	.77	2080
Sum in Household size	6.92	2.39	2	16	7	2080
Sum in % hh members (16-59)	1.00	0.43	0	2	1	2080
Sum in No. of family hh within village	18.92	9.07	0	49	18	2080
Sum in No. of family hh outside village	4.4	3.29	0	18	4	2080
Sum in Age of head	110.89	22.84	51	176	111	2080
Sum in Head completed high school	0.80	0.69	0	2	1	2080
Sum in Female head	0.71	0.67	0	2	1	2080
Sum in Head is native	1.45	0.63	0	2	2	2080
Sum in Health insurance	1.23	0.68	0	2	1	2080
Sum in Access to credit	0.89	0.70	0	2	1	2080
Sum in Receives remittances	1.14	0.69	0	2	1	2080
Sum in $\widehat{needy}$	0.68	0.36	.0049	2	.6	2080
AbsDiff in Asset wealth	0.23	0.17	0	1	.2	2080
AbsDiff in Household size	1.91	1.49	0	7	2	2080
AbsDiff in % hh members (16-59)	0.35	0.26	0	1	.33	2080
AbsDiff in No. of family hh within village	7.35	5.56	0	25	6	2080
AbsDiff in No. of family hh outside village	2.51	2.20	0	10	2	2080
AbsDiff in Age of head	18.98	13.33	0	66	17	2080
AbsDiff in Head completed high school	0.49	0.50	0	1	0	2080
AbsDiff in Female head	0.46	0.50	0	1	0	2080
AbsDiff in Head is native	0.41	0.49	0	1	0	2080
AbsDiff in Health insurance	0.48	0.50	0	1	0	2080
AbsDiff in Access to credit	0.50	0.50	0	1	1	2080
AbsDiff in Receives remittances	0.50	0.50	0	1	0	2080
AbsDiff in $\widehat{needy}$	0.28	0.24	.00021	1	.22	2080
Observations	2080					

Based on 2080 undirected links; hh - household

B.3 Asset Wealth

Derivation of Asset Index

I derive two asset indices: an index on general asset wealth (the variable *Asset wealth*) and an index on durable asset wealth (the variable *Durable asset wealth*). These indices are derived, using polychoric principal component analysis (Moser and Felton 2007), on the basis of the larger data set of the 22 villages. Variables are chosen based on the proportion of variance they explain. For the summary statistics of all included variables for both indices see Table B.3.1. The weights are assigned using the first component. Each index is standardized to be between 0 and 1.

Table B.3.1: Assets included in Asset Indices

	mean	sd	min	max	p50	count
land	0.36	0.89	0	4	0	358
cooking	1.23	0.61	1	5	1	358
lighting	4.74	0.60	1	5	5	358
water	3.57	1.26	2	6	4	358
walls	2.70	0.84	1	4	3	358
roof	3.21	1.85	1	5	5	358
floor	3.37	1.11	1	5	4	358
toilet	2.91	0.63	1	4	3	358
fridge	0.25	0.43	0	1	0	358
tv	0.55	0.50	0	1	1	358
ricecook	0.15	0.35	0	1	0	358
dvd	0.33	0.47	0	1	0	358
radio	0.50	0.50	0	1	1	358
pc	0.05	0.22	0	1	0	358
Observations	358					

Based on 358 households from 22 villages.

The general asset wealth index includes variables that describe assets and housing characteristics. The following variables are included: land size; wall-, roof- and floor material of the house; source of energy for cooking and lighting; source of water; type of toilet; furthermore, an indicator for whether the household owns one of the following assets: ricecooker, fridge, tv, washing machine, dvd recorder, radio and PC. The outcome of the component analysis is reported in Table B.3.2.

The durable asset wealth index includes the following variables: land size; wall-, roof- and floor material of the house; source of energy for cooking and lighting; source of water; and the type of toilet (see Table B.3.3). The outcome of the component analysis is reported in Table B.3.3.

Table B.3.2: General Asset Wealth - Principal Components

k	Eigenvalues	Proportion explained	Cumulative proportion explained
1	7.02	0.50	0.50
2	1.31	0.09	0.59
3	1.04	0.07	0.67
4	0.92	0.07	0.74
5	0.71	0.05	0.79
6	0.68	0.05	0.83
7	0.54	0.04	0.87
8	0.53	0.04	0.91
9	0.36	0.03	0.94
10	0.31	0.02	0.96
11	0.23	0.02	0.98
12	0.17	0.01	0.99
13	0.15	0.01	1.00
14	0.03	0.00	1.00

Polychoric principal component analysis.

Based on asset ownership of 358 households from 22 villages.

Table B.3.3: Durable Asset Wealth - Principal Components

k	Eigenvalues	Proportion explained	Cumulative proportion explained
1	3.62	0.45	0.45
2	1.20	0.15	0.60
3	0.84	0.10	0.71
4	0.74	0.09	0.80
5	0.58	0.07	0.87
6	0.47	0.06	0.93
7	0.38	0.05	0.98
8	0.17	0.02	1.00

Polychoric principal component analysis.

Based on asset ownership of 358 households from 22 villages.

Internal Validity

For an index to be internally valid, the correlation among the variables included should be sufficiently high. This is the case both for the general asset wealth (Table B.3.4) as well as for the durable asset wealth (Table B.3.5).

Table B.3.4: Correlation among Assets for General Asset Wealth Index

	land	cooking	lighting	water	walls	roof	floor	toilet	fridge	tv	ricecook	dvd	radio
land	1.00												
cooking	0.06	1.00											
	0.24												
lighting	0.11	0.03	1.00										
	0.04	0.58											
water	0.05	0.17	-0.05	1.00									
	0.30	0.00	0.35										
walls	0.20	0.25	0.17	0.15	1.00								
	0.00	0.00	0.00	0.00									
roof	0.27	0.22	0.17	0.16	0.61	1.00							
	0.00	0.00	0.00	0.00	0.00								
floor	0.20	0.18	0.23	0.10	0.53	0.40	1.00						
	0.00	0.00	0.00	0.05	0.00	0.00							
toilet	0.08	0.21	0.16	0.22	0.33	0.21	0.26	1.00					
	0.15	0.00	0.00	0.00	0.00	0.00	0.00						
fridge	0.25	0.32	0.14	0.12	0.46	0.40	0.39	0.27	1.00				
	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00					
tv	0.18	0.21	0.30	0.12	0.39	0.44	0.36	0.25	0.44	1.00			
	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
ricecook	0.18	0.34	0.12	0.14	0.31	0.27	0.25	0.24	0.47	0.35	1.00		
	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00			
dvd	0.19	0.21	0.20	0.12	0.40	0.34	0.35	0.23	0.43	0.58	0.42	1.00	
	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
radio	0.23	0.09	0.11	0.16	0.24	0.29	0.17	0.20	0.22	0.26	0.22	0.22	1.00
	0.00	0.11	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
pc	0.14	0.26	0.02	0.15	0.23	0.16	0.20	0.21	0.29	0.16	0.36	0.26	0.16
	0.01	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Based on 358 households from 22 villages; p-values in second line of each row

Table B.3.5: Correlation among Assets for Durable Asset Wealth Index

	land	cooking	lighting	water	walls	roof	floor
land	1.00						
cooking	0.06	1.00					
	0.24						
lighting	0.11	0.03	1.00				
	0.04	0.58					
water	0.05	0.17	-0.05	1.00			
	0.30	0.00	0.35				
walls	0.20	0.25	0.17	0.15	1.00		
	0.00	0.00	0.00	0.00			
roof	0.27	0.22	0.17	0.16	0.61	1.00	
	0.00	0.00	0.00	0.00	0.00		
floor	0.20	0.18	0.23	0.10	0.53	0.40	1.00
	0.00	0.00	0.00	0.05	0.00	0.00	
toilet	0.08	0.21	0.16	0.22	0.33	0.21	0.26
	0.15	0.00	0.00	0.00	0.00	0.00	0.00

Based on 358 households from 22 villages; p-values in second line of each row.

External Validity

To test the external validity of the derived indices, we compare the distribution of each asset index with the income distribution (Table B.3.6 for the general asset wealth index and Table B.3.8 for the durable asset wealth index) as well as with the distribution of a measure of subjective wealth (Table B.3.7 for the general asset wealth index and Table B.3.9 for the durable asset wealth index). The subjective wealth measure is based on the question *'On a scale from 1 to 10 how would you describe your household's wealth status compared to the other households in the barangay? (1 - much less wealthy; 10 - much more wealthy).'* The distributions are, by and large, similar which supports the external validity of the indices.

Table B.3.6: Quartile Comparison: General Asset Wealth Index vs. Household Income

	Quartiles of Household Income Distribution				
	1	2	3	4	Total
1	35.56	30.00	22.22	12.22	100.00
2	34.83	26.97	23.60	14.61	100.00
3	20.00	28.89	26.67	24.44	100.00
4	12.36	11.24	28.09	48.31	100.00
Total	25.70	24.30	25.14	24.86	100.00
Observations	358				

Based on 358 households from 22 villages.

Table B.3.7: Quartile Comparison: General Asset Wealth Index vs. Selfreported Wellbeing

	Quartiles of Selfreported Wellbeing Distribution				
	1	2	3	4	Total
1	64.44	30.00	5.56	0.00	100.00
2	46.07	32.58	19.10	2.25	100.00
3	30.00	24.44	38.89	6.67	100.00
4	5.62	7.87	48.31	38.20	100.00
Total	36.59	23.74	27.93	11.73	100.00
Observations	358				

Based on 358 households from 22 villages.

Table B.3.8: Quartile Comparison: Durable Asset Wealth Index vs. Household Income

	Quartiles of Household Income Distribution				
	1	2	3	4	Total
1	36.96	30.43	20.65	11.96	100.00
2	31.03	31.03	24.14	13.79	100.00
3	17.78	22.22	32.22	27.78	100.00
4	16.85	13.48	23.60	46.07	100.00
Total	25.70	24.30	25.14	24.86	100.00
Observations	358				

Based on 358 households from 22 villages.

Table B.3.9: Quartile Comparison: Durable Asset Wealth Index vs. Selfreported Wellbeing

	Quartiles of Selfreported Wellbeing Distribution				
	1	2	3	4	Total
1	60.87	30.43	6.52	2.17	100.00
2	44.83	34.48	18.39	2.30	100.00
3	25.56	21.11	42.22	11.11	100.00
4	14.61	8.99	44.94	31.46	100.00
Total	36.59	23.74	27.93	11.73	100.00
Observations	358				

Based on 358 households from 22 villages.

C Data Analysis

C.1 Healthshocks and Coping Strategies

Table C.1.1: Determinants of Health Shock in the Past (all villages)

	(1) Health Shock
Female head	-0.266
	(0.284)
Head completed high school	0.280
	(0.306)
No. hh members (<6)	0.405**
	(0.181)
No. hh members (6-15)	-0.167
	(0.130)
No. hh members (16-49)	0.059
	(0.109)
No. hh members (50-69)	-0.134
	(0.187)
No. hh members (>70)	0.101
	(0.269)
Asset wealth	0.861
	(0.776)
Main work in public sector	0.162
	(0.575)
Main work in agriculture	0.262
	(0.379)
Main work in trade or craftmenship	-0.045
	(0.495)
Main work in transport or construction	-0.032
	(0.517)
Main work in services	-0.287
	(0.576)
Constant	-0.965
	(0.819)
Village fixed effects	Yes
Observations	306
Mean of Dependent Variable	0.484
log likelihood	-190.630
χ^2	42.620
p	0.147
r_p^2	0.101

Logit estimation. Standard errors clustered on village level in parentheses
Based on the sample of the 306 surveyed households in the 22 villages, including a random sample of 14 households from the focal village.

Table C.1.2: Actual Coping Strategy (all villages)

	freq	pct
Loan from informal group/moneylender	6	1.58
Loan from formal institution (bank, mfi)	5	1.32
Use of savings	6	1.58
Use benefits from insurance	43	11.32
Sale of assets	14	3.68
State assistance, assistance from community	14	3.68
Work more	4	1.05
Reduce food consumption	1	0.26
Nothing	40	10.53
Other specify	1	0.26
Loan from SSS, GSIS, Pag-ibig	3	0.79
Loan from association, coop	1	0.26
Monetary gift from relatives - within Barangay	57	15.00
Monetary gift from relatives - outside Barangay	105	27.63
Monetary gift from friends, neighbors - within Barangay	4	1.05
Monetary gift from friends - outside Barangay	7	1.84
Nonfinancial help by relatives - within barangay	35	9.21
Nonfinancial help by relatives - outside barangay	2	0.53
Nonfinancial help by friends, neighbors - within barangay	7	1.84
Nonfinancial help by friends - outside barangay	0	0.00
Loan from relatives - within Barangay - with interest	0	0.00
Loan from relatives - within Barangay - without interest	10	2.63
Loan from relatives - outside Barangay - with interest	1	0.26
Loan from relatives - outside Barangay - without interest	1	0.26
Loan from friends/neighbors - within Barangay - interest	3	0.79
Loan from friends/neighbors - within Barangay - no interest	7	1.84
Loan from friends - outside Barangay - interest	0	0.00
Loan from friends - outside Barangay - no interest	3	0.79
Total	380	100.00
Observations	380	

Coping strategies listed in response to a health emergency in past 3 years. Responses of the 148 households who experienced a health emergency. Based on the sample of 306 surveyed households in the 22 villages, including a random sample of 14 households from the focal village.

Table C.1.3: Hypothetical Coping Strategy (all villages)

	freq	pct
Loan from informal group/moneylender	5	0.56
Loan from formal institution (bank, mfi)	26	2.91
Use of savings	9	1.01
Use benefits from insurance	97	10.84
Sale of assets	52	5.81
State assistance, assistance from community	61	6.82
Assistance by ngo	3	0.34
Work more	12	1.34
Nothing	42	4.69
Other specify	2	0.22
Loan from SSS, GSIS, Pag-ibig	27	3.02
Loan from association, coop	4	0.45
Monetary gift from relatives - within Barangay	148	16.54
Monetary gift from relatives - outside Barangay	220	24.58
Monetary gift from friends, neighbors - within Barangay	23	2.57
Monetary gift from friends - outside Barangay	11	1.23
Nonfinancial help by relatives - within barangay	58	6.48
Nonfinancial help by relatives - outside barangay	5	0.56
Nonfinancial help by friends, neighbors - within barangay	9	1.01
Nonfinancial help by friends - outside barangay	1	0.11
Loan from relatives - within Barangay - with interest	2	0.22
Loan from relatives - within Barangay - without interest	35	3.91
Loan from relatives - outside Barangay - with interest	2	0.22
Loan from relatives - outside Barangay - without interest	8	0.89
Loan from friends/neighbors - within Barangay - interest	2	0.22
Loan from friends/neighbors - within Barangay - no interest	21	2.35
Loan from friends - outside Barangay - interest	0	0.00
Loan from friends - outside Barangay - no interest	10	1.12
Total	895	100.00
Observations	895	

Coping strategies listed in response to a hypothetical health emergency. Based on the sample of 306 surveyed households in the 22 villages, including a random sample of 14 households from the focal village.

C.2 Dyadic Analysis - Full Tables

Table C.2.1: Likelihood of Support Link, full table

	(1) $P(s_{ij}=1)$	(2) $P(s_{ij}=1)$
Asset wealth	-0.643	
	(0.601)	
Household size	0.031	
	(0.058)	
% hh members (16-59)	0.079	
	(0.244)	
No. of family hh within village	0.037**	
	(0.016)	
No. of family hh outside	-0.028	
	(0.022)	
Age of head	-0.017***	
	(0.006)	
Head completed high school	-0.319*	
	(0.191)	
Female head	-0.157	
	(0.217)	
Head is native	0.064	
	(0.248)	
Alter: Asset wealth	1.708***	
	(0.628)	
Alter: Household size	0.120**	
	(0.061)	
Alter: % hh members (16-59)	0.027	
	(0.294)	
Alter: No. of family hh within village	0.008	
	(0.015)	
Alter: No. of family hh outside	-0.068**	
	(0.033)	
Alter: Age of head	-0.003	
	(0.009)	
Alter: Head completed high school	-0.022	
	(0.220)	
Alter: Female head	0.022	
	(0.151)	
Alter: Head is native	-0.009	
	(0.169)	
AbsDiff in Asset wealth	-1.531***	-2.485***
	(0.470)	(0.635)
AbsDiff in Household size	0.062	0.151**
	(0.045)	(0.063)
AbsDiff in % hh members (16-59)	0.229	0.041
	(0.288)	(0.287)
AbsDiff in No. of family hh within village	-0.031	-0.035**
	(0.022)	(0.017)
AbsDiff in No. of family hh outside	-0.000	-0.040
	(0.044)	(0.040)
AbsDiff in Age of head	-0.015**	-0.018**
	(0.007)	(0.008)
AbsDiff in Head completed high school	-0.009	0.036
	(0.149)	(0.143)
AbsDiff in Female head	0.070	0.080
	(0.185)	(0.139)
AbsDiff in Head is native	0.447**	0.454***
	(0.174)	(0.172)
Ego fixed effects	No	Yes
Alter fixed effects	No	Yes
Observations	4160	3357
Control variables	Yes	Yes
Mean of Dependent Variable	0.057	0.070
log likelihood	-856.041	-756.004
χ^2	270.91	
p	0.000	

Logit Estimation on the directed network. $s_{ij}=1$ if i names j as a potential source of support. (1) Dyadic robust standard errors in parentheses. (2) Standard errors clustered on individual level.

Table C.2.2: Likelihood of Mutual Support Arrangement – Naïve Approach

	(1) $P(\varsigma_{ij} = 1)$	(2) $P(\varsigma_{ij} = 1)$
Asset wealth	0.609*	
	(0.337)	
Household size	0.088**	
	(0.041)	
% hh members (16-59)	0.101	
	(0.193)	
No. of family hh within village	0.015	
	(0.012)	
No. of family hh outside village	-0.031**	
	(0.013)	
Age of head	-0.013***	
	(0.005)	
Head completed high school	-0.268**	
	(0.107)	
Female head	-0.103	
	(0.123)	
Head is native	0.105	
	(0.138)	
Alter: Asset wealth	0.609*	
	(0.337)	
Alter: Household size	0.088**	
	(0.041)	
Alter: % hh members (16-59)	0.101	
	(0.193)	
Alter: No. of family hh within village	0.015	
	(0.012)	
Alter: No. of family hh outside village	-0.031**	
	(0.013)	
Alter: Age of head	-0.013***	
	(0.005)	
Alter: Head completed high school	-0.268**	
	(0.107)	
Alter: Female head	-0.103	
	(0.123)	
Alter: Head is native	0.105	
	(0.138)	
AbsDiff in Asset wealth	-0.529	-1.278*
	(0.525)	(0.704)
AbsDiff in Household size	0.109**	0.225***
	(0.049)	(0.072)
AbsDiff in % hh members (16-59)	0.116	-0.394
	(0.261)	(0.429)
AbsDiff in No. of family hh within village	-0.021	-0.023
	(0.021)	(0.020)
AbsDiff in No. of family hh outside village	0.005	-0.035
	(0.038)	(0.048)
AbsDiff in Age of head	-0.014*	-0.018**
	(0.007)	(0.008)
AbsDiff in Head completed high school	-0.070	-0.091
	(0.148)	(0.205)
AbsDiff in Female head	0.139	0.269
	(0.197)	(0.176)
AbsDiff in Head is native	0.344**	0.408*
	(0.174)	(0.237)
Ego fixed effects	No	Yes
Alter fixed effects	No	Yes
Observations	4160	1854
Mean of Dependent Variable	0.055	0.062
log likelihood	-646.674	-567.520
χ^2	65.01	
p	0.0000	

Logit Estimation on the undirected network. $\varsigma_{ij} = 1$ if $s_{ij} = 1$ or $s_{ji} = 1$, where $s_{ij} = 1$ if i names j as a potential source of support. (1) Dyadic robust standard errors in parentheses. (2) Standard errors clustered on individual level.

Table C.2.3: Likelihood of Mutual Support Arrangement – Accounting for Reciprocation

	(1) $P(\dot{\varsigma}_{ij} = 1)$	(2) $P(\dot{\varsigma}_{ij} = 2)$	(3) $P(\dot{\varsigma}_{ij} = 3)$
Asset wealth	-0.700	1.842**	0.389
	(0.582)	(0.725)	(1.019)
Household size	0.061	0.141*	0.040
	(0.079)	(0.073)	(0.115)
% hh members (16-59)	0.074	0.011	0.014
	(0.251)	(0.444)	(0.587)
No. of family hh within village	0.023	-0.010	0.060***
	(0.024)	(0.025)	(0.022)
No. of family hh outside	0.002	-0.047	-0.142
	(0.044)	(0.042)	(0.122)
Age of head	-0.022***	-0.006	-0.001
	(0.008)	(0.010)	(0.014)
Head completed high school	-0.554**	-0.119	0.223
	(0.226)	(0.311)	(0.379)
Female head	-0.208	0.042	-0.110
	(0.230)	(0.240)	(0.393)
Head is native	0.246	0.114	-0.408
	(0.267)	(0.261)	(0.475)
Alter: Asset wealth	1.842**	-0.700	0.389
	(0.725)	(0.582)	(1.019)
Alter: Household size	0.141*	0.061	0.040
	(0.073)	(0.079)	(0.115)
Alter: % hh members (16-59)	0.011	0.074	0.014
	(0.444)	(0.251)	(0.587)
Alter: No. of family hh within village	-0.010	0.023	0.060***
	(0.025)	(0.024)	(0.022)
Alter: No. of family hh outside	-0.047	0.002	-0.142
	(0.042)	(0.044)	(0.122)
Alter: Age of head	-0.006	-0.022***	-0.001
	(0.010)	(0.008)	(0.014)
Alter: Head completed high school	-0.119	-0.554**	0.223
	(0.311)	(0.226)	(0.379)
Alter: Female head	0.042	-0.208	-0.110
	(0.240)	(0.230)	(0.393)
Alter: Head is native	0.114	0.246	-0.408
	(0.261)	(0.267)	(0.475)
AbsDiff in Asset wealth	-0.926	-0.926	-4.274***
	(0.621)	(0.621)	(1.006)
AbsDiff in Household size	0.131**	0.131**	-0.129
	(0.060)	(0.060)	(0.195)
AbsDiff in % hh members (16-59)	-0.024	-0.024	0.897
	(0.324)	(0.324)	(0.680)
AbsDiff in No. of family hh within village	-0.015	-0.015	-0.070*
	(0.024)	(0.024)	(0.040)
AbsDiff in No. of family hh outside	0.020	0.020	-0.049
	(0.057)	(0.057)	(0.188)
AbsDiff in Age of head	-0.012	-0.012	-0.030
	(0.013)	(0.013)	(0.019)
AbsDiff in Head completed high school	-0.186	-0.186	0.335
	(0.189)	(0.189)	(0.425)
AbsDiff in Female head	0.193	0.193	-0.217
	(0.216)	(0.216)	(0.399)
AbsDiff in Head is native	0.168	0.168	1.188**
	(0.206)	(0.206)	(0.552)
Observations	2080		
Mean of DV			
ll	-809.370		
chi2	541.320		
p	0.000		

Multinomial logit estimation. $\dot{\varsigma}_{ij} = 1$ if $s_{ij} = 1$ and $s_{ji} = 0$, $\dot{\varsigma}_{ij} = 2$ if $s_{ij} = 0$ and $s_{ji} = 1$ and $\dot{\varsigma}_{ij} = 3$ if $s_{ij} = 1$ and $s_{ji} = 1$ where $s_{ij} = 1$ if i names j as a potential source of support. Two-way cluster-robust standard errors on ego and alter household level in parentheses.

Table C.2.4: Likelihood of Mutual Support Arrangement - Neediness Score

	Mutual Support		
	$P(\dot{\varsigma}_{ij} = 1)$	$P(\dot{\varsigma}_{ij} = 2)$	$P(\dot{\varsigma}_{ij} = 3)$
$\widehat{needy}$	-0.357	0.484	-0.101
	(0.224)	(0.509)	(0.641)
Age of head	-0.025***	0.011	-0.008
	(0.006)	(0.009)	(0.011)
Head completed high school	-0.633***	0.647**	-0.059
	(0.225)	(0.301)	(0.416)
Female head	-0.368	0.101	-0.127
	(0.245)	(0.252)	(0.363)
Head is native	0.373*	-0.176	0.185
	(0.220)	(0.210)	(0.524)
Alter: $\widehat{needy}$	0.484	-0.357	-0.101
	(0.509)	(0.224)	(0.641)
Alter: Age of head	0.011	-0.025***	-0.008
	(0.009)	(0.006)	(0.011)
Alter: Head completed high school	0.647**	-0.633***	-0.059
	(0.301)	(0.225)	(0.416)
Alter: Female head	0.101	-0.368	-0.127
	(0.252)	(0.245)	(0.363)
Alter: Head is native	-0.176	0.373*	0.185
	(0.210)	(0.220)	(0.524)
AbsDiff in $\widehat{needy}$	0.669*	0.669*	-1.544**
	(0.367)	(0.367)	(0.706)
AbsDiff in Age of head	-0.017**	-0.017**	-0.019
	(0.009)	(0.009)	(0.017)
AbsDiff in Head completed high school	-0.149	-0.149	0.308
	(0.191)	(0.191)	(0.445)
AbsDiff in Female head	0.159	0.159	-0.387
	(0.206)	(0.206)	(0.406)
AbsDiff in Head is native	0.140	0.140	1.200**
	(0.208)	(0.208)	(0.531)
Observations	2080		
Control variables	Yes		
log likelihood	-827.991		
χ^2	231.200		
p	0.000		

Multinomial logit estimation. $\dot{\varsigma}_{ij} = 1$ if $s_{ij} = 1$ and $s_{ji} = 0$, $\dot{\varsigma}_{ij} = 2$ if $s_{ij} = 0$ and $s_{ji} = 1$ and $\dot{\varsigma}_{ij} = 3$ if $s_{ij} = 1$ and $s_{ji} = 1$ where $s_{ij} = 1$ if i names j as a potential source of support. Two-way cluster-robust standard errors on ego and alter household level in parentheses.

Table C.2.5: Likelihood of Mutual Support Arrangement - incl. endogenous predictors

	Mutual Support		
	$P(\dot{\varsigma}_{ij} = 1)$	$P(\dot{\varsigma}_{ij} = 2)$	$P(\dot{\varsigma}_{ij} = 3)$
Asset wealth	-1.107	1.561*	0.793
	(0.683)	(0.836)	(0.999)
Household size	0.021	0.140*	0.121
	(0.088)	(0.073)	(0.133)
% hh members (16-59)	0.025	0.306	0.099
	(0.269)	(0.430)	(0.566)
No. of family hh within village	0.033	-0.016	0.066**
	(0.027)	(0.022)	(0.026)
No. of family hh outside (excl. formers)	0.002	-0.035	-0.167**
	(0.042)	(0.036)	(0.085)
Health insurance	-0.275	0.527**	0.401
	(0.222)	(0.222)	(0.348)
Access to credit	0.477**	-0.223	-0.434
	(0.233)	(0.332)	(0.422)
Receives remittances	-0.230	-0.029	-1.245**
	(0.210)	(0.216)	(0.494)
Alter: Asset wealth	1.561*	-1.107	0.793
	(0.836)	(0.683)	(0.999)
Alter: Household size	0.140*	0.021	0.121
	(0.073)	(0.088)	(0.133)
Alter: % hh members (16-59)	0.306	0.025	0.099
	(0.430)	(0.269)	(0.566)
Alter: No. of family hh within village	-0.016	0.033	0.066**
	(0.022)	(0.027)	(0.026)
Alter: No. of family hh outside (excl. formers)	-0.035	0.002	-0.167**
	(0.036)	(0.042)	(0.085)
Alter: Health insurance	0.527**	-0.275	0.401
	(0.222)	(0.222)	(0.348)
Alter: Access to credit	-0.223	0.477**	-0.434
	(0.332)	(0.233)	(0.422)
Alter: Receives remittances	-0.029	-0.230	-1.245**
	(0.216)	(0.210)	(0.494)
AbsDiff in Asset wealth	-1.019	-1.019	-5.170***
	(0.635)	(0.635)	(1.475)
AbsDiff in Household size	0.154**	0.154**	-0.117
	(0.065)	(0.065)	(0.177)
AbsDiff in % hh members (16-59)	-0.086	-0.086	0.692
	(0.334)	(0.334)	(0.681)
AbsDiff in No. of family hh within village	-0.016	-0.016	-0.091*
	(0.027)	(0.027)	(0.048)
AbsDiff in No. of family hh outside (excl. formers)	0.022	0.022	0.007
	(0.051)	(0.051)	(0.119)
AbsDiff in Health insurance	-0.174	-0.174	0.528*
	(0.165)	(0.165)	(0.309)
AbsDiff in Access to credit	-0.111	-0.111	-0.296
	(0.201)	(0.201)	(0.364)
AbsDiff in Receives remittances	0.024	0.024	-0.196
	(0.204)	(0.204)	(0.419)
Observations	2080		
Control variables	Yes		
log likelihood	-792.582		
χ^2	406.306		
p	0.000		

Multinomial logit estimation. $\dot{\varsigma}_{ij} = 1$ if $s_{ij} = 1$ and $s_{ji} = 0$, $\dot{\varsigma}_{ij} = 2$ if $s_{ij} = 0$ and $s_{ji} = 1$ and $\dot{\varsigma}_{ij} = 3$ if $s_{ij} = 1$ and $s_{ji} = 1$ where $s_{ij} = 1$ if i names j as a potential source of support. Two-way cluster-robust standard errors on ego and alter household level in parentheses. Control for the level of and the absolute differences in Age of head, Education of head, Female head, Head is native.

C.3 Neediness Score

Table C.3.1: Predicting Neediness

	(1)
female members between 0 and 5	1.548*
	(0.378)
female members between 6 and 15	0.471***
	(0.131)
female members between 16 and 49	0.560***
	(0.097)
female members between 50 and 69	0.423**
	(0.179)
female members above 69	0.807
	(0.393)
male members between 0 and 5	2.485***
	(0.758)
male members between 6 and 15	0.928
	(0.179)
male members between 16 and 49	1.749**
	(0.427)
male members between 50 and 69	1.754
	(0.670)
male members above 69	3.506**
	(1.898)
Household head no basic education	0.964
	(0.286)
Female head	1.118
	(0.359)
Age of head	0.979*
	(0.011)
hh head is native	2.270*
	(1.073)
No. of family hh outside village	0.990
	(0.050)
Village fixed effects	Yes
Observations	303
Mean of Dependent Variable	0.380
log likelihood	-160.476
r^2_p	0.202

Likelihood that a household asked for support from within the village in case of a health shock. Logit estimation; estimators reported as odds ratios; standard errors clustered on village level in parentheses. Based on the sample of 306 surveyed households in the 22 villages, including a random sample of 14 households from the focal village.

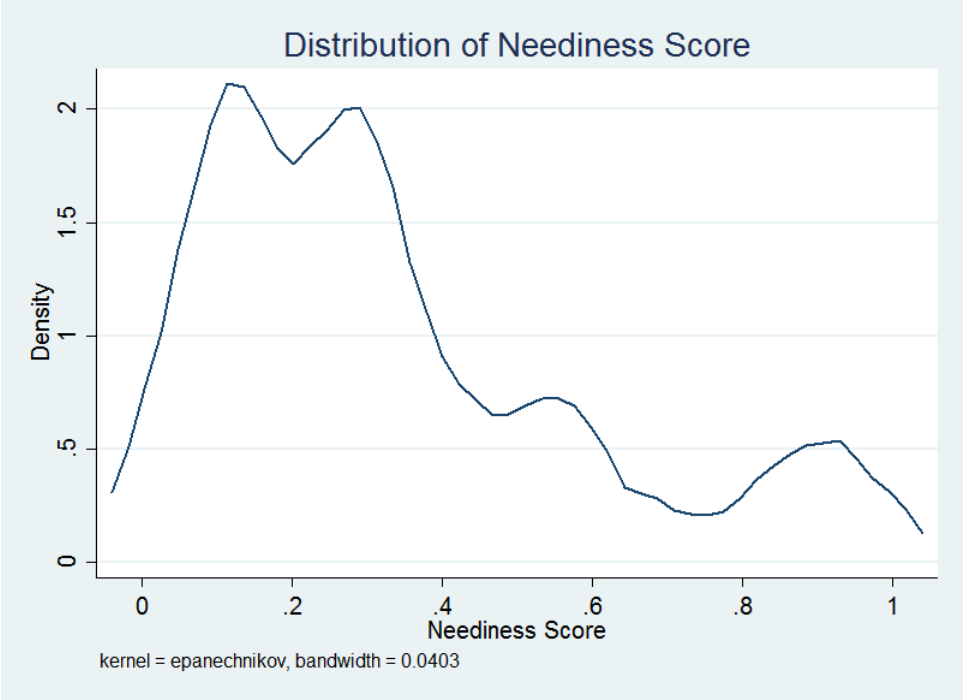

Figure C.3.1: Distribution of Neediness Score in Focal Village

Table C.3.2: Neediness Score for the Focal Village

	mean	sd	min	max	median
$\widehat{needy}$	0.34	0.26	0	1	.27
Observations	65				

C.4 Support Arrangements across Wealth Quartiles

Table C.4.1: Average Number of Support Links by Wealth Quartiles

	Wealth Quartile				t test
	1	2	3	4	1 - 4
$i \leftarrow j$	3.824	2.813	2.063	1.938	1.886***
	(1.944)	(2.316)	(1.914)	(1.843)	(0.660)
$j \leftarrow i$	1.588	2.000	2.938	4.250	-2.661***
	(1.176)	(1.789)	(2.568)	(2.933)	(0.769)
$i \leftrightarrow j$	1.176	0.625	1.250	0.750	0.426
	(0.883)	(0.806)	(1.291)	(1.065)	(0.400

Average size of support links by wealth quartile. Standard deviation in parentheses. $i \leftarrow j$: number of support links where i is named as recipient of support but not as provider; $j \rightarrow i$: number of support links where i is named as provider of support but not as recipient; $i \leftrightarrow j$: number of support links where i is named both as recipient and as provider. Last column: two sided t test comparing number of support links in the 1st and 4th quartile. Significance at or below 1 percent (***), 5 percent (**) and 10 percent (*).

Table C.4.2: Support Received by Neediness Quartiles

	Wealth Quartile				t test
	1	2	3	4	1 -4
Money	0.647	1.125	0.688	0.563	0.085
	(0.862)	(1.360)	(0.946)	(1.315)	(0.385)
Food	4.471	3.250	3.000	3.000	1.470**
	(1.875)	(1.732)	(1.592)	(1.549)	(0.601)
In-kind	0.176	0.250	0.125	0.125	0.051
	(0.529)	(0.683)	(0.342)	(0.342)	(0.156)
Assistance	0.0588	0.125	0.188	0.250	-0.191
	(0.243)	(0.500)	(0.544)	(0.775)	(0.197)
Job hint	0.000	0.000	0.000	0.250	-0.250
	(0)	(0)	(0)	(0.775)	(0.188)

Type of support received the month preceding the survey by wealth quartile. Standard deviation in parentheses. Last column: two sided t test comparing support incidences in the 1st and 4th quartile. Significance at or below 1 percent (***), 5 percent (**) and 10 percent (*).