

Organization of Disaster Aid Delivery: Spending Your Donations^{*}

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Abstract

This paper analyzes how different organizational structures between funding and implementing agencies affect the quality of aid delivered and social agendas pursued across neighboring villages in a set disaster context. We model the implied objective functions and trade-offs concerning aid quality, aid quantity, and social agendas of different types of agencies. We analyze three waves of survey data on fishermen and fishing villages in Aceh, Indonesia from 2005-2009, following the tsunami. Different organizational structures result in significantly different qualities of hard aid, differential willingness to share aid delivery with other NGOs in a village, and differential promotion of public good objectives and maintenance of village religious and occupational traditions. This is the first time these aspects have been modeled and quantified in the literature. Some well known international NGOs perform well; others badly. We also document how a social agenda of particular agencies to promote greater equality can be thwarted and distorted by village leaders, potentially increasing inequality.

Key words: natural disasters, tsunami, aid, disaster relief, moral hazard, social agendas, non-profit firms, firm organization

JEL code words: F35, H4, H5, H84, L2, L3

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I. Introduction

Extreme disasters catch the public eye, often resulting in massive infusions of aid that affect not just individual well being but the fabric of societies. We examine aid delivery in Aceh Indonesia, following the tsunami at the end of 2004. The tsunami devastated coastal villages in Aceh Indonesia, wiping out almost all physical capital and large proportions of the population. The international response was huge. For the affected areas, aid gave 134,000 houses for 120,000 houses destroyed (Xinhua News Service, February 1, 2009); and all forms of aid totaled 7.7 billion USD (Brookings, 2008), with aid officially completed in just over 4 years.¹

How do we evaluate the efficacy of aid delivery and what aid agencies do a better job than others? In examining aid delivery, the traditional aid literature focuses on the perspective of a generic donor country dealing with recipients, asking how conditionality and local buy-in affect efficacy of delivery and how delivery affects village functioning. This paper takes a new perspective. Disaster relief projects involve multiple parties in different organizational configurations delivering in-kind aid, where each party has distinct objectives. Name brand NGOs raise money from the public for general purposes and specific causes such as alleviating the devastation from a particular natural disaster. These NGOs then act as donor agencies funding aid delivery, or implementation on the ground in devastated areas, along with foreign and domestic government ministries and agencies who also donate. We examine how the organizational structure of the way in which donors deliver aid through implementers has a profound impact on the quality of aid delivered and attainment of a variety of social objectives. This aspect has not been recognized in the literature.

To understand outcomes we model and analyze how implementers behave. We distinguish four organizational structures by implementation method and give the labels we use for them in the paper: (1) donor-implementers who are NGO donors who do their own implementation in villages, (2) international implementers who represent different donors who choose not to do their own implementation, (3) domestic implementers hired by donors which have chosen neither to do their own implementation nor to hire an international implementer, and (4) a country level governmental organization, in this case BRR [Executing Agency for the Rehabilitation and Reconstruction of Aceh and Nias] used primarily by domestic and foreign governments. While we focus on these organization structures for implementation, the choice of implementation method will tell about what donor agencies value in aid delivery.

Donor-implementers are major NGOs with international reputations and sometimes associated social agendas, where there is no principal-agent problem in aid delivery between donors and implementers. While international implementers operate in an agency relationship with donors, they may

¹ When the official aid process ended in April 16, 2009, there was \$250m “left over” (Jakarta Globe March 2, 2009), although some committed funds for transport infrastructure were still in process.

themselves have strong quality preferences, as well as international reputations to maintain with an eye to fund raising and being hired by other donors in the future. The largest international implementer in our sample is Habitat for Humanity (Indonesia), which in Aceh represented a consortium of donors including Mercy Corps, Plan International, and Fidelity Investment. Habitat for Humanity's well-known mission is to work with communities in building quality housing. Domestic implementers are a heterogeneous group of some established agencies and those that arose only following the tsunami. They have no international reputation to maintain and many were short-lived, presenting obvious principal-agent and reputational problems in aid delivery. However, they tend to be more knowledgeable about local culture and better able to access local political and social networks. As such they may be more responsive to village social needs as defined by villagers. Finally, BRR was effectively a short-lived domestic implementer spending Indonesian government monies and monies from the multi-donor fund, typically governments of other countries. BRR was disbanded in 2009 as planned.

Briefly, what do we find? We focus on construction quality for the main form of hard aid, housing. BRR is the benchmark. It is the worst quality housing provider operating on a limited scale in many villages, with an aversion to operating in villages away from the capital. Its houses often financed through foreign country donations have leaky roofs, cracked walls and poor foundations. In contrast, donor-implementers offer high quality aid. They tend to completely dominate housing provision in villages where they operate. When not successful in complete domination, they appear to reduce aid quality according to the extent of deterioration of domination. Donor-implementers operate not just to provide housing but to pursue their own social agendas, which require a dominating presence in a village. International implementers despite their potential agency problem offer almost as high quality aid as donor-implementers; and they do not shade quality in the many villages where they supply limited amounts. It seems their goal is just to provide good quality housing to all comers. Domestic implementers with both agency problems and lack of reputational incentives offer low quality aid like BRR. However like donor-implementers they tend to dominate provision in villages where they operate. Their villages have better non-housing outcomes than other implementer types, in terms of public good aid and preservation of village traditions, which may explain why some donors hire them despite their low quality housing. Finally using the example of boat aid, we illustrate how substantial portions of aid can be completely wasted and how specific outside social agendas of NGOs can be thwarted or even perverted if the agenda is one village elites don't like. Overturning socio-economic order and conventions by agencies present for a short period of time seems simply unrealistic.

In analyzing the link between aid quality delivered to villages and organizational set-up, the allocation of implementation types obviously was not experimentally randomized across villages. Although the aid literature has moved in the direction of utilizing randomized experiments involving

monetary or in-kind allocations to individuals where implementation is strictly controlled, it is hard to imagine conducting randomized experiments in major disaster situations, especially on organizational structure of NGOs. Nonetheless, we believe that the variation of implementer types across villages was essentially randomized and that our results on aid quality and village life are due to the agencies that landed on the village and not because of unobserved village characteristics. Aid in Aceh was massive, immediate, and largely uncoordinated, in a region where foreign NGOs had no prior operations, regional maps of villages post-tsunami were highly inaccurate (Appendix 1), and centralized information on village characteristics almost non-existent. Which agencies ended up in which villages was a decentralized process with little effective oversight by BRR.

As an example, immediately after the tsunami, a young university lecturer from a traditional family in a village near Banda Aceh simply happened to meet French government officials in the course of his work who offered to “adopt” his village; he said yes. More generally, agencies would simply show up in a villages guided by locals helping in the immediate post-tsunami clean-up process, offering to adopt those villages, accepted on a first come first serve basis. Sometimes a village would accept an adopting agency and then the agency would never follow through. For more remote villages, BRR later offered information saying which villages they thought were yet to be served based on their limited knowledge. We note BRR did not start effective operation until more than six months after the tsunami, well after many agencies had already started the aid process; and it was 2-3 years before some agencies reported on their operations to BRR (e.g. the Canadian Red Cross). As evidence backing up what we learned from fieldwork, a multinomial logit regression reported on below supports the notion that the allocation of implementer types across villages was essentially random with respect to internal village characteristics. That is “more appealing or more deserving” villages were not matched to implementers delivering better quality aid.

However, even if there was some degree of matching, that per se does not affect our basic conclusions presented later. The more critical question for causality of implementer effects is whether certain types of villages were able to induce better quality aid out of the same implementer, compared to other villages. If so, part of our implementer-type effects would really be village influences. Later, we will find that all village characteristic variables have no effect on aid quality, conditional on organizational type. In fact, implementer-type effects are uninfluenced by whatever set of village characteristics and sub-district fixed effects we include in the analyses. Individual agency policies drive the quality of aid delivered.

As far as we know, this is the first paper to analyze the micro behavior and implied objectives of different types of aid agencies operating in a major aid relief context, with a focus on how organization set-ups themselves have profound impacts. There is a large literature on the efficacy of aid and best ways

to deliver aid including conditionality and agency questions (Collier et al. 1997, Azam and Laffont 2003, Svensson 2003, and Murrell 2002), strategic considerations (the Samaritan's dilemma in Pederson 2001 and Torsvik 2005), co-ordination across agencies, village "ownership" of the process and the like (e.g., Kanbur and Sandler 1999, Easterly 2003, and Paul 2006). While agency issues are central to our analysis, much of this literature bears only indirectly on this paper. Unlike ODAs (Official Development Assistance) or planned NGO aid projects, disaster aid is mostly unconditional and largely uncoordinated as was the case in Aceh after the tsunami. In Aceh, lack of conditionality was driven in part by the huge number of NGOs "competing" to deliver aid, in a context with little co-ordination. The government agency overseeing the process, BRR, defined its role not as coordinating aid but as a clearing house recording aid and filling in ex post gaps in the process.

Empirically, the literature on large scale aid mostly utilizes country level aid data (Alesina and Dollar 2000, Burnside and Dollar 2000) or aspects of cross-country project data (Svensson 2003, Wane 2004), rather than micro-data. Wane's working paper does look at aid quality but focuses on the relationship between aid quality and a country's degree of accountability, rather than aid agency accountability. This paper also relates to the economics literature on NGOs or not-for-profit firms, which focuses mostly on hospitals and schools and how those institutions perform and interact in the market (Newhouse 1970, Epple and Romano 1998, Malani et al., 2003). We add to this literature by examining the behavior of humanitarian aid agencies and the quality of delivered objectives.²

The next section describes how agencies are categorized and present descriptive patterns by implementer type. Section 3 presents a model of aid agency behavior within villages. Section 4 analyzes house aid delivery and Section 5 examines social agendas.

II. The context and descriptive patterns by implementer type

II.1 The context

The work is based on extensive fieldwork carried out in early 2005 after the tsunami and then again in 2007 and 2009. We surveyed village heads and local heads of the fishermen's association (*Panglima Laot*) in those years and now cover 199 fishing villages, which are intended to be the universe of fishing villages in 31 sub-districts as one moves north (-east) and south from Banda Aceh, the capital (see Appendix 1). We also surveyed fishing families in those years, now following a panel of about 635 fishing families in 90 of those villages. In addition we have official government and international records. Relevant aspects of the surveys, a map and the main variables used are presented in the Data Appendix.

² Also, there are studies that examine how the salience of disasters affects donation (Stromberg 2007) and how disasters affect household health, education, and risk management (Skoufias 2003, Townsend 1994).

Being fishing villages, our villages were the most devastated by the tsunami, with almost all buildings, public works, boats and roads destroyed. Our villages account for about 30% of all house aid delivered in Aceh, with much of the balance delivered in Banda Aceh. Table 1 presents an overview of destruction in our villages, using official numbers on pre and post-tsunami populations and household counts to increase coverage.³ Table 1 gives summary statistics for the 190 villages where we have complete information for both 2007 and 2009. Our survey counts of houses and public buildings pre and post-tsunami are fairly accurate since what was destroyed is well recorded by the physical presence of remaining foundations, as well as village mapping exercises conducted soon after the tsunami. Boats are another matter since there is no written record of pre-tsunami boats nor physical evidence of what was destroyed. In 2007 villages tend to heavily exaggerate boats lost. We only report on villages surveyed in 2005, where we record boat, captain, and owner survival status.

Destruction is massive. In 104 villages around Banda Aceh surveyed in 2005, under 50% of the population survived; in the expanded set more survived as added villages experienced a weaker wave force. The destruction of physical capital in the overall sample is almost universal, given both the earthquake that created the tsunami and the wave following 20-30 minutes later. Mean survival rate of houses for the overall sample is 9% and that of public building is lower at 6%, noting that many public buildings such as mosques and fisherman halls are built on the waterfront. The survival rate of boats, based on '05 survey numbers, is under 6%.

The immediacy and extent of aid are impressive. As Table 1 illustrates, 117% of “needed” houses were replaced by late 2007; need is the number of surviving households less the number of houses that survived. Similarly, for boats the ratio of boats in the water in 2007 to surviving captains recorded in 2005 is 105%. Finally, 80% of destroyed public buildings have been replaced by 2007 even with the significant drop in village populations. Overall the picture is that by late 2007, the massive aid process had accomplished what it intended—to replace the entire per household physical capital stock. Yet, given the massive aid there was money left to spend. More public buildings trickled in between 2007 and 2009, although almost no boats. For public buildings by late 2009 the replacement rate was 96%. House aid continued with an eventual replacement rate of 145% which was accompanied by new household formation or splintering of extended families, with each part of the family getting their own house. In modeling, this will motivate the notion of excess provision.

³ We believe our survey numbers for 111 villages in 2005 are more accurate in portraying pre and post tsunami village populations than official numbers for reasons detailed in Freire, Henderson, and Kuncoro (2011). Official numbers seem to modestly undercount surviving populations. Survey numbers for the 88 added villages in 2007 on pre and post tsunami populations suffer from the fact that by then most village heads had been replaced. As such, recollections on pre-tsunami numbers were noisy. Also, later reporting on post tsunami households was subject to manipulation to increase aid allotments.

We note that aid agencies tend to specialize. Those providing public buildings, doing official mapping and planning, and providing boats tend to differ from house agencies. As we will see, in most villages one NGO provides the majority of housing. Public buildings were disproportionately provided by BRR — about 38% of 642 public buildings are from BRR (compared to 18% of houses). An Australian organization, APRID, built 51 of 121 new village halls and PLAN built 11 of 111 new health facilities. Neither provides housing. Nonetheless, housing NGOs exhibit the largest and by far most sustained presence in villages, often need to coordinate with other providers, and may influence work by other NGOs, as discussed later.

II.2 Types of housing agencies and the allocation of implementer types to villages

Each village names the main aid agencies delivering housing and other forms of hard aid. For housing usually only 1 or 2 agencies are involved in a village, with occasionally there being a 3rd. We map each named agency into one of the four types of implementers (and hence types of implementation), where typing is done based on information on donors and implementers in the “RAN” [Recovery Aceh-Nias] database,⁴ a database set up by the Indonesian government working with the UN which recorded aid delivery aspects in Aceh. Details about this mapping are in the Appendix.

As discussed in the introduction, the allocation of implementer types across villages seems essentially random with respect to *internal* village characteristics. Table 2 looks at the match between the housing implementer type and village characteristics. Since some villages have more than one housing aid project the number of observations is greater than the number of villages. We report the marginal effects from a multinomial logit regression, looking at the probability of a village getting a particular implementer type for a project, for each of the four types. There are 6 key covariates we use in all estimations, 5 of which depict internal village characteristics, with the 6th being distance to Banda Aceh. Later we detail our choice of key covariates and the use of different types of fixed effects. To the covariates in Table 2 if we add 4 district (*kabupaten*) fixed effects, all 40 marginal effects (including those for fixed effects) are insignificant but one. However, district fixed effects mask a distance effect evident from Table 2: domestic agencies and BRR had an aversion to operating in more remote locations, and tended to leave that to the international agencies. We don't see that as a match affecting our later aid quality results conditional on agency type; in fact any bias in finding better quality for international agencies would be that distance makes quality more expensive. But the aversion (which was also clear from fieldwork) is of interest itself.

With respect to internal village characteristics, the issue is whether more appealing or more deserving villages get better agencies, as measured by observables. If so, that means there are also potentially unobservables affecting match as well. For this first issue, villages with a pre-tsunami *arisan*

⁴ <http://rand.brr.go.id/RAND/>

group are 18% more likely to get a donor-implementer, relative to other implementer types. As explained later *arisan* groups are rotating saving and credit associations (RoSCA). It could be that villages with *arisan* groups have environments of greater social capital appealing to donor-implementers, or it could be that the finding of 1 significant effect out of 20 (non-distance) covariates is spurious. The more major question is that, even if there is some degree of matching, are then certain villages able to influence better (or worse) agencies to get even better quality aid. Later we see that as far as we can tell the answer is no.

II.3 Housing aid and quality

These four types of implementers operate differently across villages and deliver different qualities of aid. We show some patterns in the raw data. Table 3 compares the scale of housing aid operation by implementer type across the 199 villages, with individual numbers for the 8 largest housing providers in our sample. Each village has 1 to 3 housing projects led by different agencies. Table 3 reports some numbers at the project level and some at the village level. House aid tends to be given mostly by one agency in any village.⁵ Apart from numbers in the table, only 14% of all village-implementer projects involve a third project in a village; and, in about in 46% of all villages, over 90% of housing comes from one agency.

BRR is the largest single provider, using multi-donor and government monies. It is involved in many villages with a small number of houses per village, with a relatively high fraction of occurrences where its provision is minimal (under 15% of total house aid), and a small fraction where it is the almost sole provider (over 90%). Donor-implementers provide a sharp contrast. Their provision is much more focused: they are sole providers in a high fraction of villages and are minimal providers in only a few villages they are present in. Overall, donor-implementers are dominant [almost sole] providers in 80% [43%] of villages where they are present, compared to 45% [16%] for domestic implementers, 34% [14%] for international implementers and 34% [17%] for BRR. The Canadian and British Red Cross's stand out as dominant providers; for the Canadian Red Cross, in 8 of its 11 villages it is literally the only provider. Domestic implementers compared to international (non-donor) ones have a greater relative presence in villages, with somewhat more houses per village and modestly greater likelihood of being the dominant agency. This occurs despite their greater within group heterogeneity; we identified 28 different domestic implementers delivering housing in our villages compared to 12 international ones.

How does house aid quality differ by implementer type? We report on two rankings here. First for each housing aid project in a village, the village head was asked to rate the quality of construction in terms of the likelihood of “leaky roofs, cracked walls, faulty plumbing, and mould” with 3 categories: (i) high (all houses well built) (ii) medium (some well built and some not) and (iii) low (most not). A high

⁵ While BRR is a specific agency, other numbers are for group types. For group-types, different agencies of the same type may appear in the same village. For example, if two different donor-implementers appear in a village, although that is just one village where any donor-implementer appears, it counts as two donor-implementer projects.

rating is a 3, medium 2, and low 1. In the survey, we distinguished early and later batches for each agency. Ratings are generally the same for both batches, but if not we average the ratings, so in fact for each project our scale can be 1, 1.5, 2, 2.5, or 3. For each type of implementer we calculate the average ranking over all projects. Most projects get a 3, so this is a coarse measure. Second, individual fisherman list house faults: leaky roof, cracked walls, poor foundation, or faulty plumbing, so each fisherman can list 0-4 faults in his house. We average across fishing families served by each type of implementer to obtain another ranking by average number of faults.

Figure 1 shows these two rankings. While the averages are not significantly different, they point to patterns that in econometric work will be significant. BRR is the worst ranked by both village heads and individual fishermen. Donor-implementers offer the highest quality housing as rated by village heads, and correspondingly have the fewest counts of faults as reported by fishermen, reflecting what we believe to be their greater ability to deal with moral hazard issues. For international implementers the evidence is more mixed. Village level data suggests they have a relatively good record for house quality construction, but the averaged fisherman data suggest their number of faults is the same as domestic implementers. In the econometric results international implementers will score better than domestic ones as rated by fishermen but only weakly so.

Table 4 gives detailed data on individual agencies providing housing in our villages. Here we list all agencies that operate in two or more villages. Those who operate in only one village are listed in Appendix 2. We list implementers by name; readers may want to check out their favorite recipients for donations. We list implementer type as they operate in Aceh, number of houses provided, number of villages involved, and average ratings by the village head. For international and domestic implementers, we list in brackets the donor agencies often associated with the implementing agency. Some village heads report the funding agency but not the domestic-implementer working on the ground. In this case, we list the funding agency associated with the anonymous domestic implementer. For the limited number of villages where fishermen report in the sample, we also list the average count of faults associated with the relevant implementer type. Given village heads' rather positive overall assessment, we think an average rating near or below 2.5 isn't good and ratings at 2 or below are bad. Clearly, domestic implementers and BRR don't do well, but some international agencies also perform poorly. For counts of faults, there is a sharp divide with international agencies scoring below 1 and domestic ones over 1 in general.

II.4 Socio-economic agendas

A second aspect of aid delivery concerns socio-economic agendas. Today, aid agencies tend to have a loftier objective of “sustainable development”, beyond just hard aid delivery. This is reflected in mission statements on NGO websites that talk about (*italics added*) “*sustainable development*”, “*long term rehabilitation*”, “continue to stay long after the emergency is over, working with communities to *rebuild*

their lives...”, or “help restore and *strengthen* their pre-disaster *capacities*”.⁶ However in some cases lurking behind these code-words are socio-political-religious agendas that are intended to influence village way of life and social institutions. These are reflected in statements (italics added) about having “decent communities in which people...can grow into all that *God intended*”⁷ and “addressing *structural causes of poverty and related injustice*”⁸.

Some international agencies that arrived in Aceh in 2005 intended to implement social agendas, through “adoption” of specific villages whereby they would provide all aid in the village, as noted in the Introduction. As an example, in early June 2005 we interviewed British Red Cross officials in Banda Aceh, who were operating an intensive training program for their field workers. They were planning for their then four adopted and remote fishing villages. Apart from planning delivery of hard aid, they articulated goals of both modernization and social reform. Modernization involved community planning, registering all lands for formal title, requiring villagers to carry retinal scan ID’s (despite a lack of use for such ID’s) and learning how to operate ATM’s despite the local absence of bank accounts or ATM’s. On social reform, one intention was to provide just enough money to villagers so that they could only acquire a motorized boat through joint ownership, as opposed to the traditional form of sole ownership with crew. They wanted villagers to formally contract with potential partners and for all boats to be jointly owned. More generally, adoption in 2005 was also very much in the vocabulary of village heads. Two years later the idea of strict adoption was muted. Given the massive aid relief, by 2007 villages faced many alternative donors. Delivery of aid had become specialized as noted above, with different NGOs delivering different kinds of hard aid. However, housing aid agencies were necessarily involved in village planning (lay-out, road access, water delivery, etc.) and had a sustained presence in the village during construction. With such a presence in villages, housing aid agencies could still pursue certain social agendas for specific villages.

A specifically defined socio-economic agenda in our data concerns boat aid, with the imposition of shared ownership and its relation to the quality of boat aid. We first note a feature of aid boats: their poor quality. Many boats were too light-weight or improperly designed for use on the open ocean, sank upon first launching due to bad design, or were poorly constructed so as to leak (green wood) or fall apart within a few months. For boats, we look just at this stark dimension of quality: failure rates where boats

⁶ The respective websites for these quotes are <http://www.wvi.org/wvi/wviweb.nsf/maindocs/7A0A54FD44BC11C38825737500737C8A?opendocument> , <http://www.gitec-consult.com/TheCompany.htm>, <http://www.redcross.ca/article.asp?id=11724&tid=001>, <http://www.redcross.org.uk/What-we-do/Emergency-response/International-emergency-response>, and <http://crs.org/emergency>.

⁷ http://www.cwrc.org/pages/cwrc_international_relief.cfm.

⁸ <http://www.oxfam.org/en/about/what/mission>.

are unusable for fishing within a short space. We believe about 35% of aid boats failed within two years, an incredible waste of aid. By 2007 just after most boats had been given, the overall abandonment rate was already about 22% in our villages. Many of these were clearly unusable for fishing at time of delivery and were not assigned to fishermen.

From that village level data in 2007, Table 5 provides a list of individual agencies operating in 2 or more villages with Appendix 2 listing those operating in just one village. The table gives the number of boats in aid, villages, and the initial failure rate. We cannot identify implementer type for boats, because many boat agencies are not reported in the RAN database. Hence, we do not report implementer type in the table but will later utilize the few NGOs that can be typed as boat donor-implementers in the empirical work. Clearly NGOs like Oxfam, International Medical Corps, and certain foreign governments like France, Kuwait, and the Japan International Cooperation Agency have appalling records. After 2007, some initially usable boats fell apart within a year, where minimal boat life even with heavy ocean pounding is expected to be 5 years.

For the boats which were assigned to fishermen, Figure 2 illustrates the agenda of shared ownership and boat aid quality, using individual fishermen data. Some of these boats failed almost immediately (e.g., sank or were judged useless for fishing); others fell apart within months of delivery. For shared boats, failure rates are much higher than for non-shared boats (53% vs. 16%); and, regardless of failure, joint ownership fails to persist with only 20% still sharing in 2009. Of course the high failure rate plays into that. Among surviving boats that were initially shared, only 35% still had shared ownership in 2009. While high failure of shared boats could occur because NGOs emphasizing shared ownership gave bad quality boats, econometrically we will find a key strategic reaction by villages. In the presence of within agency heterogeneity in boat quality, poor quality boats were steered by village and lagoon fishing leaders towards those upon whom shared ownership was imposed, often lower status fishermen. Presumably, this was not what donors intended. Social agendas can be manipulated in villages, both to thwart an agenda and, as we will see later, to impose its costs on families of lower social status.

III. Modeling agency behavior

In this section we present a stylized model of aid agency preferences and behavior, as well as that of village heads. We will not estimate a structural model, but the modeling informs how we think about and specify key aspects of the problem. In each village in line with basic patterns in the data, we assume there is a lead agency which provides the vast majority of house aid in the village and that we are in a region of parameter space where this agency provides at least as much as is “needed”. There is also a residual agency that gives excess houses in villages if requested by the village head. The model does not allow for a third type of agency in a village but that is unusual in the data. The notion of excess is motivated by the

fact that by 2009, overall, villages had been supplied 145% of “needed” housing. Contextually in Aceh, we think of the residual agency as being BRR, the temporary government clearing house that, as illustrated in Table 4, operates at a low level in many villages, with low quality housing. In reality, the “residual” agency is not always BRR; and the quality of residual housing can be high. In fact some international implementers were often a residual, late-in-the game provider but in some villages were a lead provider. The model can deal with this dual role.

We relate the four implementer types presented in the introduction to aspects of lead (implementer) agency objective functions and behavior, relative to how we type-cast BRR in the model. While principal-agent and reputational issues arise, for simplicity, we do not set the model up as either a full-blown principal-agent or reputational problem per se, but rather as a reduced form that accounts for these influences.

III.1 Preferences and costs of aid agencies

The lead agency derives utility from two components: the benefit of house aid provided to the village and socio-political activities such as sustainable development or proselytizing. Socio-political activities generate benefits

$$Ae_1^\delta \left(\frac{\bar{n} + \Delta}{\bar{n} + \Delta + n_0} \right)^\theta .$$

The value and nature of A may differ by agency type and may be zero. Effort devoted to social activities is e_1 , subject to diminishing returns, or $0 < \delta < 1$.

For the number of houses, we assume there is a count of eligible, or needed housing, \bar{n} , in each village. Needed housing is the number of surviving families with houses destroyed which is documentable by the inspection of slab foundations. We focus on regions of parameter space where all of \bar{n} is supplied by the main agency. After that, there are two potential sources of excess: Δ units provided by the lead agency and n_0 by the residual provider. Those numbers are determined jointly through decisions made by the village head and lead agency and may result in either an interior solution where both the lead agency and residual provider operate in the village, or a corner solution where the lead agency acts strategically to exclude the residual provider. Any value of social agendas is non-decreasing in the degree to which the lead agency dominates all housing provision in the village, or the higher $(\bar{n} + \Delta) / (\bar{n} + \Delta + n_0)$ is. For example, village health conditions may be related to the fraction of houses supplied with piped water; or proselytizing success may depend on the fraction of households where there is direct contact. The relative value of control is increasing in θ , $0 \leq \theta$.

The lead agency's benefit in providing housing aid is defined by both per house quality q and the number of houses provided. Quality of aid q is determined by the effort put into providing each house, e_2 , and is subject to diminishing returns, so $q = Be_2^\alpha$, $0 < \alpha < 1$. The lead agency's total benefit from housing can be expressed as $Be_2^\alpha(\bar{n} + \Delta^z)$, $0 < z \leq 1$, so that agencies may perceive less benefit from excess houses. For simplicity, we assume all houses in a village from the same agency are of the same quality; but, as a matter of agency policy, earlier or later batches of houses from the same agency do not differ significantly in quality in the data. Differences in the value of B could be interpreted as the outcome of principal-agent or reputational considerations. A higher B could mean either fewer principal agent problems as with a donor-implementer or stronger reputational considerations facing an international implementer. In short, lower B means less value to the agent in providing higher quality.

On the cost side, there is a fixed cost, C , to entering and operating in the village. Aid agency workers involved in the village, e_1 , are paid a wage w_1 , while housing construction effort e_2 is paid at a rate w_2 . Later we give more of a monitoring flavor by allowing employment of agency workers, e_1 , to reduce the cost of quality.

In sum, the lead agency seeks to maximize its total benefit, U , of operating in the village

$$U = Ae_1^\delta \left(\frac{\bar{n} + \Delta}{\bar{n} + \Delta + n_0} \right)^\theta + Be_2^\alpha (\bar{n} + \Delta^z) - [C + w_1 e_1 + w_2 e_2 (\bar{n} + \Delta)] \quad (1).$$

How do we determine the extent of the agency's housing provision? That determination has two parts. One concerns the residual provider and the other the village head's optimization. We assume residual housing involves no fixed cost nor socio-religious-political agenda, We assume such agencies don't care about oversupply and their $z = 1, A = 0$ and that, in this context, $e_1 = 0$. For the moment, we assume they provide a minimum quality level \underline{q} as set by outside observers, although later it will be made endogenous.⁹

III.2 Village head's problem

The village head sees benefits of getting more houses and the benefit depends on quality. However, as the number of houses rises above \bar{n} , he perceives a social cost to splitting the traditional extended family across houses — in particular moving unmarried adult children out, moving elderly parents out, separating wives (if multiple wives), moving daughters and married husbands out, and the like. And if there are in-migrants (tsunami refugees), these extra houses may be valued less. He may also see a cost to

⁹ We can and later will manipulate parameter values so $\underline{q} = \underline{B}\underline{e}_2^\alpha$ where \underline{e}_2 is given by the FOC $\alpha \underline{B}\underline{e}_2^{\alpha-1} = w_2$.

socio-political agendas of agencies, but we ignore that. Assuming the leading agency provides at least \bar{n} , the village head seeks to maximize

$$Be_2^\alpha (\bar{n} + \Delta) + \underline{q}n_0 - (\Delta + n_0)^\gamma, \quad \gamma > 1, \quad (2)$$

where the village head can limit the amount of housing provided by any agency.

Assuming simultaneous choices of e_1 , e_2 , and Δ by the lead agency and n_0 by the village head, the village head limits n_0 so that the marginal utility from n_0 is non-negative, i.e., $\underline{q} - \gamma(\Delta + n_0)^{\gamma-1} \geq 0$. Knowing this, the lead agency sees

$$n_0 = (\underline{q} / \gamma)^{1/(\gamma-1)} - \Delta, \quad (3)$$

If it chooses, the lead agency can set $\Delta = (\underline{q} / \gamma)^{1/(\gamma-1)}$, so the village head sets $n_0 = 0$ and the agency becomes the exclusive provider in the village. [Note that the village head only chooses to limit n_0 , not Δ . At $n_0 = 0$, the village head would like greater than Δ of extra housing from the lead agency where we restrict parameters so that in equilibrium $Be_2^\alpha > \underline{q}$.¹⁰]

In summary for the agency's maximization problem, (3) is substituted into (1) to get

$$U = Ae_1^\delta \left(\frac{\bar{n} + \Delta}{\bar{n} + (\underline{q} / \gamma)^{1/(\gamma-1)}} \right)^\theta + Be_2^\alpha (\bar{n} + \Delta^\varepsilon) - [C + w_1e_1 + w_2e_2(\bar{n} + \Delta)] \quad (4)$$

III.3 Aid agency choices

If a lead agency has no social agenda and hence $e_1 = 0$, it can be shown that a lead agency only provides excess housing if $z / \alpha > 1$.¹¹ The full problem is more complicated with FOC's $\partial U / \partial e_1$, $\partial U / \partial e_2 = 0$. For choices of e_1, e_2 that satisfy these equations at the relevant Δ , we consider 3 types of solutions:

$$(1) \text{ Corner at } \bar{n} (\Delta = 0): \partial U / \partial \Delta \Big|_{\Delta=1} < 0, \partial U / \partial \bar{n} \Big|_{\Delta=0} > 0.$$

¹⁰ Also, we restrict the parameter space so that the lead agency's marginal net benefit of supplying more housing is negative for $\Delta > (\underline{q} / \gamma)^{1/(\gamma-1)}$. An alternative would be to have the lead agency want to provide more housing than $(\underline{q} / \gamma)^{1/(\gamma-1)}$ with a limit potentially being set by the village head.

¹¹ The lead agency maximizes $Be_2^\alpha (\bar{n} + \Delta^\varepsilon) - [C + w_2e_2(\bar{n} + \Delta)]$ choosing e_2 so $B\alpha e_2^{\alpha-1} (\bar{n} + \Delta^\varepsilon) - w_2(\bar{n} + \Delta) = 0$. The agency only supplies beyond \bar{n} if, for $\Delta = 1$, $Be_2^{\alpha-1}z - w_2 > 0$, where e_2 is then given by $B\alpha e_2^{\alpha-1} - w_2 = 0$. Thus the agency stops at \bar{n} if $z / \alpha < 1$. For $z / \alpha > 1$, there can be an interior solution where the agencies choices of e_2, Δ are given by its FOC's, with or without further supply from a residual supplier. Note, we ignore the corner where the village head wants no more housing from the lead agency despite its high quality (i.e. the village head imposes a $\Delta_{\max} = (Be_2^\alpha / \gamma)^{1/(\gamma-1)}$ based on his optimization).

$$(2) \text{ Interior: } \partial U / \partial \Delta = 0, 0 < \Delta < (\underline{q} / \gamma)^{1/(\gamma-1)} \quad (5)$$

$$(3) \text{ Corner at } \Delta = (\underline{q} / \gamma)^{1/(\gamma-1)} : \partial U / \partial \Delta \Big|_{\Delta \rightarrow (\underline{q} / \gamma)^{1/(\gamma-1)}} > 0, \partial U / \partial \Delta \Big|_{\Delta = (\underline{q} / \gamma)^{1/(\gamma-1)}} < 0$$

At the first corner, the lead agency allows the residual provider to give all housing beyond \bar{n} . At the other corner the lead agency strategically crowds out the residual provider but stops just at the Δ sufficient to do that.¹² Case 2 is the interior solution between the two corners, where the lead agency shares excess housing provision with the residual provider.

The model does not lend itself to closed form solutions. While in principle one can differentiate to do comparative statics, the model has problems of corners and non-existence. To illustrate comparative static forces based on what are feasible (equilibrium) outcomes as opposed to infeasible ones, we do simulations. Before identifying stereo-type agencies, we give some intuition, with more to follow. Agencies with higher B value housing quality more and thus we expect them to provide higher quality housing. Agencies with higher values of z have less aversion to oversupply, meaning the lead agency has less loss of benefits with over-provision done to retain village “control”. They also have a smaller rate of decline in benefits to quality provision in the expression $Be_2^\alpha (\bar{n} + \Delta^z)$ as scale of operation rises. Similarly, agencies with higher values of θ place greater weight on not admitting a residual provider, given shared provision reduces the benefits from social agendas.

To illustrate comparative statics, we fix parameters: $\bar{n} = 100, w_1 = 2, w_2 = 1, A = 17, \underline{q} = 40, \gamma = 2, \alpha = .5$ and $\delta = .6$. Outcomes are very sensitive to z , so we start by fixing $z = .8$. We focus first on what happens as we vary B , the value of house quality, and θ , the value of dominating supply for social purposes. Table 6 presents a caricature classification of our four types of agencies, recognizing that we could vary other parameters to achieve a similar schema. BRR, the residual provider, has no social agenda ($A = \theta = 0$), does not care about oversupply of housing ($z = 1$), and offers a basic low quality house, which we fix quality level at 40. The table gives the value $B = 8.94$ consistent with this quality level coming from optimizing behavior by BRR, as opposed to an exogenous minimum standard. For this BRR quality, village heads want at most 20 additional houses beyond their basic needs ($\bar{n} = 100$).

In comparison to BRR, donor-implementers have high housing value ($B = 12$), a social agenda, and a strong desire to have full control in the village ($\theta = .9$). They offer high housing quality and have

¹² An alternative to case (3) being a corner would be to allow the region of parameter where the lead agency is willing to provide beyond $(\underline{q} / \gamma)^{1/(\gamma-1)}$. If so, there could be an interior solution before $\Delta_{\max} = (Be_2^\alpha / \gamma)^{1/(\gamma-1)}$, or the village head could set that upper limit.

almost complete control of the village: 119.5 out of 120 “houses” (ignoring issues of fractions). International implementers also highly value housing quality ($B = 12$), but don’t care so much about dominating provision ($\theta = .2$). Thus they offer fewer houses: 114.4 of 120. Note their quality level is slightly higher than donor-implementers; this occurs because they are supplying fewer excess houses and so perceive higher marginal quality benefits (under the restriction that all houses they build in the village are of the same quality). Also their social effort is less. We note that modest reductions in z in these examples result in big supply reductions as additional houses have low value; for example Δ falls rapidly to 0 as we lower z from .8 to .7. Finally, we caricature domestic implementers as having low house quality value like BRR ($B = 10$), but having a social agenda where they want some degree of control ($\theta = .6$). Thus their house quality is near BRR but like donor-implementers they supply almost the whole village, 119.2 out of 120, and they have high social effort.

There are two loose ends. First concerns the two corner solutions. In Table 6 all examples involve interior solutions where $0 < \Delta < 20$. An example satisfying a corner where $\Delta = 20$ and condition 3 is met in equation (5) occurs for $B = 12$, $z = .8$, and $\theta = .95$. That is, for a donor-implementer a slight rise in θ leads to domination in Table 6. At this point we also note what happens as we decrease the village head’s aversion to extra housing by lowering γ . If we are at this corner with domination, lowering γ can move the solution back into sharing, with increased overall housing provision. This heterogeneity in village preferences will play a role in the empirical work and in the next paragraph. For the other corner, condition 2 in equation (5) is satisfied for $B = 10$, $\theta = .6$ and $z = .4$, achieved by increasing the degree of diminishing returns to providing extra housing (lower z).

For the other loose end, in the model as a lead agency increases house supply beyond what is needed, it lowers overall quality. However in the data the quality of housing provided by donor-implementers quality rises as their domination rises. We can make two adjustments to the model, to account for this fact. First as just noted, we have heterogeneity in village preferences for extra houses by varying γ in $(\underline{q} / \gamma)^{1/(\gamma-1)}$. Second we allow use of social agenda labor, e_1 , to improve housing quality, implicitly allowing monitoring of contractors by this labor. More agency workers in a village, e_1 , make the realization of a given quality level cheaper, or reduce the cost of employing construction workers. A simple version of this defines the true cost of a construction worker as $w_2 - re_1 (> 0)$.

$$U = Ae_1^\delta \left(\frac{\bar{n} + \Delta}{\bar{n} + \Delta + n_0} \right)^\theta + Be_2^\alpha (\bar{n} + \Delta^z) - [C + w_1 e_1 + (w_2 - re_1) e_2 (\bar{n} + \Delta)]. \quad (6)$$

We then re-solve the model for $B=12$, $z=.8$, and $\theta=.5$. For this we make $r=.0002$. In this region of parameter space as γ declines and excess housing rises from 20, the lead agency’s share of total housing

declines not surprisingly; and its per house quality also declines. As share declines there is less incentive to invest in social agendas and thus to monitor for better quality, but less excess also means fewer direct diminishing returns to construction labor. We note that there are regions of parameter space where quality rises with the permitted excess and others where the relationship is non-monotonic. Appendix 3 depicts cases of this relationship based on different values of r .

III.4 Donor choice of implementers

The model covers, by definition, the preferences and actions of donor-implementers. However, donors can choose international implementers, domestic implementers, or BRR. Modeling the donor’s choice is beyond the scope of the paper, but we make some comments. For donors who hire international implementers, we presume their focus is on housing quality and not much on effects of aid on village way of life. To get better quality housing than residual provision, they hire good reputation international implementers. It is possible that they do have socio-religious-political agendas, but to set up their own operations in Aceh to pursue such agendas could be too expensive for them. Local or international donors may hire domestic implementers because these donors perceive domestic implementers to be more knowledgeable and respectful of local traditions, and better aware of village needs beyond housing. Such donors could also have socio-political beliefs about employing local agencies (institution building), even if they realize that could result in lower quality provision. Finally, donors who chose BRR were typically foreign governments and international consortiums, whose long term reputational concerns about aid quality may be low. “Cynically” they may only want to announce to their public that they gave so much money or built so many houses, with less regard for quality.¹³

IV. Empirical Evidence on the Quality of Housing Aid

In this section we examine econometrically how aid quality differs across implementer types. We examine how the degree of agency dominance within the village affects quality. We look at outcomes from both village level data and individual fishing family data.

IV.1 Base specification and covariates

We have two base specifications. First is

$$y_{pv} = c + \sum_t \beta_t D_{tpv} + \gamma X_v + \Lambda_k + \varepsilon_{pv}, \quad (7)$$

where y_{pv} is the quality measure for housing aid project p in village v as reported by the village head overall for the village, or by fishermen for their specific house provided under project p . For the quality

¹³ There is also the issue of agency competition, where, for example, two different donor-implementers both perceive high benefits from operating exclusively in the same village. Heuristically, we assume a degree of coordination, where different donor-implementers can agree to enter and not enter different villages. In Table 1 housing supply from donor-implementers who wanted to adopt villages could only cover a fraction of villages.

measure, we look at village heads' subjective assessments based on construction quality, fishermen's subjective assessments of problems related to construction, as well as their report of additional rooms in their houses. D_{tpv} are indicators for whether the village project was implemented by type t implementer, that is, donor-implementer, international implementer, or domestic implementer. BRR serves as the base type. Λ_k is a set of district or sub-district fixed effects we discuss in detail momentarily. We are primarily interested in β_t and expect donor-implementers and international implementers to have larger coefficient estimates than domestic providers.

The second specification further distinguishes whether a project is the dominant project in a village or the 2nd or 3rd order project by the number of houses given in aid. This order in general corresponds to the order of aid delivery as well: biggest projects are for the earliest donor. The specification with project order is

$$y_{pv} = c + \sum_t \sum_r \beta_{tr} D_{tpv} \cdot r_{pv} + \gamma X_v + \Lambda_k + \varepsilon_{pv}, \quad (8)$$

where r_{pv} is an indicator for project order which can go from 1 to 3. Here we are interested in whether some implementer types shade quality for 2nd and 3rd order projects.

In both specifications, \mathbf{X}_v are a vector of village level covariates. Throughout the paper, we use a common set of covariates for base village characteristics, representing village demographics (number of post tsunami households, population survival rate), distance from Banda Aceh, amount of physical capital destroyed, and pre-tsunami social capital. These are characteristics which from other work affect outcomes to do with volunteerism and labor market choices in our villages (Friere, Henderson, and Kuncoro, 2011 and Nose, 2011). We eliminate 8 villages with missing or very bad population numbers, 5 with missing numbers on houses destroyed, and 7 with other missing data (e.g., GPS readings to calculate distance to Banda Aceh or aspects of social capital).¹⁴ When we analyze individual fishermen's assessments, we will add family controls as well. Standard errors are always clustered at the village level.

The village covariates include two direct social capital measures. The first is the pre-tsunami existence of *arisan* groups. Such groups of women meet regularly, with each member contributing a fixed sum to a pot and then taking the pot on a rotating schedule.¹⁵ The other is whether the mullah, the spiritual leader of the village, survived the tsunami or not, providing continuity in village spiritual

¹⁴ For the 8 with poor government data on post-tsunami population and household counts, including those has a strong effect on the coefficient on post tsunami household, which becomes much smaller presumably because of measurement error, although still positive and significant. But aid results are not affected.

¹⁵ In Indonesia, *arisan* groups are part of the norm of *gotong royong* (mutual assistance). A village having an *arisan* group indicates the existence of a volunteer association outside the mosque and governance structure. While, the original theoretical work on such associations (Besley, Coate, and Loury, 1994) suggests RoSCA's exist to alleviate credit market imperfections, empirical work suggests a strong social component, with participation rising with wealth and complementing (in terms of correlations) rather than substituting for credit institutions, at least in Indonesia (Varadharajan, 2004).

leadership. In a companion paper, Freire, Henderson and Kuncoro (2011) find that village traditions of volunteer labor are better maintained in the 68% of our villages which had *arisan* groups pre-tsunami. They also find that mullah survival is important in maintaining village traditions of volunteer labor; but that survival of village heads is not, given few heads remain in office even two years after the tsunami.¹⁶ We view villages with pre-existing *arisan* groups as having higher social capital and spirit of mutual assistance and villages with surviving mullahs as being more resistant to external interventions (spiritual pollution) in village affairs. Hence, we include both variables in analyzing the impacts of aid agencies. We also note that village size and survival rates may affect social cohesion.

For fixed effects, we do not include village fixed effects, because these eliminate effective variation in implementer types, given so many villages have just one provider and many agencies operate almost exclusively at one level or another. A basic control for cultural-institutional differences across sets of villages is fixed effects for the 4 districts in our sample and we use this throughout. In principle a better control would be fixed effects for the 31 sub-districts (*kecamatan*) for the 179 villages in the main estimating sample. This is a tight control, since sub-districts on the coast are small geographic areas of several neighboring villages usually with common geographic and social characteristics. In particular, they closely mimic lagoon divisions, where fishing activities are governed informally at the lagoon level. For our main result with its large village-project level sample, we report results with and without sub-district and district fixed effects. We discuss the effect on all reported result of adding replacing district with sub-district fixed effects. The problem especially in smaller samples of villages is that individual aid agencies tends to cluster their operations spatially to reduce costs of operation and some of that clustering spreads to the implementer type at the sub-district level. In smaller samples of villages, in the few cases where adding sub-district fixed effects actually makes a difference, the effects are spurious because of lack of variation within sub-districts of certain implementer types. But we detail this below.

IV.2 Project-level analysis: Subjective quality ratings by village heads

IV.2.1 Basic results

We start with the subjective quality ratings as reported by village heads for the four implementer types. Table 7 looks at subjective quality ratings by the village head of each project on a scale of 1, 1.5, 2, 2.5 or 3, with 3 being highest as noted for Figure 1. The first four columns all have base village characteristics with column 1 including only village covariates and district fixed effects. The fifth column redoes column 4 (our main result), replacing district with sub-district fixed effects. The last column redoes column 4

¹⁶ Given the insurgency movement in Aceh which was settled in early 2006, most village heads at the time of the tsunami were not formally elected and were often figureheads representing village elites. Following political reforms in early 2006, with widespread elections, by late 2007 only 35% of original village heads were still in office; by late 2009 the number was 12%.

dropping all covariates and fixed effects. Even in column 1, all of the village level variables are completely insignificant.

For implementer-type effects, in column 2 we control for the provider for each specific project, regardless of order as in equation (7). Donor-implementers and international implementers bring similar positive effects, compared to local ones or BRR. In column 3 which represents equation (8), the base case is 1st level BRR projects, with effects for 2nd and 3rd level projects for that implementer type. We then distinguish the 3 other implementer types by project level. We note that sample sizes at 3rd level projects are tiny, with each cell containing 2.1-4.8 % of all village projects. Thus in the end we focus on column 4 where we constrain all 2nd and 3rd level project pairs to have the same coefficient.¹⁷

The pattern we see in columns 3 and 4 is that, relative to the base case of 1st level projects of BRR, 1st level donor-implementer projects offer higher subjective quality projects by 0.44 on the scale to 3. International implementers offer higher subjective quality projects by about 0.33, regardless of project level. That is a basic result. If the implementer in the village is an international agency (donor-implementer or international implementer) they offer higher quality housing, through better monitoring and insistence on quality of construction. For other implementer types, BRR offers the same quality at its 2nd and 3rd level as its 1st level, not surprisingly. Domestic implementers offer projects at all levels where quality does not differ significantly from BRR.

However, there is a twist for donor-implementers. The gain in quality for donor-implementer 1st level projects evaporates at the 2nd and 3rd level. This could suggest that donor-implementers act strategically to put less effort in quality as their prominence in a village fades. That is a relationship we explore in the next table. For international implementers there is no quality decline as they lose dominance: they seem to offer a generic good construction quality house.

The discussion presumes the effects we are talking about are causal, in the sense that village quality levels are associated with the implementer type they draw, not directly with their own characteristics. The idea is that agency housing quality policies are exogenous to the village, set by the agency, with some randomness based on difficulties with specific contractors, construction crews, or materials the agency happens to assign to any particular village. In Table 2 we argued that evidence of

¹⁷ We originally thought there were similarities to the child quality-quantity trade-off literature (in particular Black, Devereux, and Salvanes, 2005), where parents make decisions about children's education and numbers of children and birth order matter. If villages were really in control of this, absent aid agency choices and strategic interaction with agencies, we would model quality as a function of whether a project was in a 1, 2 or 3 project village and whether "birth order" mattered, or whether this was the 1st, 2nd, or 3rd level project in the village. In this case, we are ordering projects by size, and while our information on order is limited, it appears that in general the largest project in a village was the first one. In such a formulation coefficients on number of projects and project order are usually insignificant; and once we control for implementer types all traces of order and number of project effects go away.

matching, so that “nicer” villages get better agencies, is at most very limited.¹⁸ Here we argue that even if there is matching, conditional on type of implementer a village gets, there is no further consistent influence of the village on quality of aid delivered. In column 1 without implementer types, no village covariates are correlated with quality. In column 5, relative to 4, adding a fine control for culture and informal institutions in the form of 31 sub-district fixed effects has no impact on implementer-type outcomes. Finally in column 6, when we remove all village covariates and all fixed effects that has no real impact on point estimates of implementer-type effects. We did experiment with IV work focusing on the major housing provider in a village. Instruments would be based first on the weak matching covariates. Second, as noted earlier, individual NGOs tend to cluster in sub-districts. So using RAN, we constructed measures of the extent of clustering by agency type (outside the own village) in a sub-district. These as well as the matching variables are too weak instruments to use in IV estimation.¹⁹

Before proceeding, we note that a number of projects have what we call “guarantees”: they test for quality of cement used in construction and they may offer a six month to one year guarantee to repair defects. There is an association between the offering of guarantees and quality, but we can’t argue the relationship is causal as reported in Appendix 4. We don’t have evidence that failing a cement test or failing to honor a repair “guarantee” brings any penalty. For some agencies, guarantees are not correlated with better quality. While offering guarantees could mean some agencies may then build better houses, it could also mean that, in the presence of within agency heterogeneity in quality, agencies only offer guarantees for the better houses they provide. Better agencies like the Canadian or British Red Crosses or Catholic Relief Services almost always offer both guarantees, but they also have an almost perfect record for quality.

IV.2.2 The donor-implementer twist

An intriguing aspect of Table 7 is that donor-implementers shade quality once they lose dominance. We now explore this finding in detail. We start with a general version, where to isolate effects we alter the structure in column 3 of Table 7 by removing the constant term and having dummy variables for each project level by type of implementer. Then for all 1st level projects by implementer type, we add that variable interacted with the fraction provided by other projects in the village. While fractions are endogenous, we note in the model that quality is only affected by the unobserved γ through its effect on fractions provided. That is, in optimizing in equation (4), γ does not directly affect the choice of e_2 . The

¹⁸ We also tried a multinomial logit regression focusing only on the lead housing implementer of the village. Similar patterns arise with the *arisan* group positively matched with donor-implementers, but also negatively associated with domestic-implementers.

¹⁹ Part of the issue on clustering could be that actual clustering is at the individual agency level, not at the type level.

only fraction variable across all implementer types that is significant is the one for donor-implementer.²⁰ Accordingly, we run a restricted, “preferred” specification in column 1 of Table 8, based on column 4 of Table 7 to illustrate that results are consistent with earlier discussion.

In column 1 of Table 8, as the fraction of housing provided by other projects rises from 0, donor-implementers reduce quality of their first level projects. By the time that fraction of others hits 40% (generally about the maximum of others relative to a 1st level project), the advantage of quality for a donor-implementer on a 1st level project is down from 0.6 to about 0.21. This suggests donor-implementers are sensitive to their degree of control in paying for better quality construction and monitoring.

An issue with this finding concerns whether or not these effects reflect agency policies per se. The effects might arise if there are differences in the composition of specific donor-implementers at different project levels and differential overall policies of those NGOs. In particular, British and Canadian Red Cross’s never have 2nd or 3rd level projects and almost always totally dominant housing provision in their villages. Maybe the results arise because they have better quality housing than all other donor-implementers. We rerun the base specification in column 1 of Table 8 for two sub-samples. First in column 2, we drop the British and Canadian Red Cross villages from the sample, getting almost the same results as in column 1. Then as an extreme, we drop all villages except those where the 6 largest donor-implementers (UN, WVI, CRS, German Red Cross, Australian Red Cross, Turkish Relief) who routinely operated at different levels in different villages appeared. The results in column 3 are not highly significant given the small and special sample but the coefficient patterns are consistent with columns 1 and 2. Composition does not seem to be driving the results.²¹ Finally, we note that replacing district by sub-district fixed effects in Table 8 has no significant effect on outcomes.²²

IV.3 Individual level analysis: Quality ratings by fishermen

We now turn to a sample of several hundred fishing families who received a house on aid, name an agency we can identify and categorize, and have corresponding information on different house quality dimensions. The fisherman data have much more detail about individual house quality, but fishermen reside in only 90 of our villages in 2009. We note before starting that the basic results in column 4 of Table 7 are maintained in our sample of just 90 villages. As reported for relevant variables in Appendix 4, column 3, the only noticeable change for this sample of 157 projects is that the coefficient on first level projects for domestic implementers (relative to BRR) becomes strongly negative and significant.

²⁰ The estimates of the coefficient [standard error] of the fraction variables are as follows: donor-implementers -0.98 [0.33], international implementers -0.23[0.74], domestic implementers -0.23[0.68], and BRR -0.43[0.59].

²¹ More generally, we also worked to find heterogeneity of donor-implementer effects by specific grouping such as all the Red Cross’s or all Christian based NGOs, but found no consistent evidence of differential effects.

²² Column 1 and 2 results are not affected. In column 3 the coefficient on ratio of others is weakened (changed to -.425) but the sample is tiny and spatially clustered.

For fishing families, of central interest, they are asked about specific faults: do they have a leaky roof, cracked walls, a poor foundation, or faulty plumbing. We look at these as a count of total faults, as well as individually. The question is whether the findings on house quality and implementer type from the village level data are confirmed with individual micro data, for the sub-sample of villages where we survey fishermen. By design, fishing families consist primarily of traditional fishing boat owners and captains (rather than crew, where the typical boat (*thep-thep*) has a captain and 2-3 crew often family members). We have results on two samples. First are 529 families, where we type housing agencies according to the agency named by the household head. Second is a smaller sample of 371, where we require an agency named by a household head to have a correspondence to one of the agencies named by his village head. The intention is to reduce noise in household head responses. While the matching worked well for BRR and domestic implementers (with *Bahasa* Indonesian names), for specific international NGOs matching was not as good. Village heads negotiate and sign contracts with agencies, so that they, rather than individual fishermen, have a good sense of specific names of foreign NGOs and who really were the agencies responsible for housing. Given the myriad of agencies operating in villages, villagers are sometimes confused about exact foreign names and what actual agency supervised the contractor who built their house.²³ We match just over half the sample on name alone and add another 20% by matching by implementer type.²⁴ We note our fishermen are representative of overall types of agencies operating in the 90 villages.²⁵ Unfortunately, the small matched sample of 371 has only 29 international implementer projects which makes inference for this implementer type for this sample tenuous.

As before, we keep BRR as the base, and compare with donor-implementers, international-implementers, and domestic implementers in terms of the quality of housing received by fishermen. For fishing families, in Table 9 we examine overall fault counts and then probits for each individual fault. In each column in the table (except one), we have the basic village controls from before, the type of implementer providing housing to the family, and basic family controls of size and age and education of the household head. None of these family and village controls are significant and we don't report their coefficients in this table. For the moment we focus on the total fault results. Estimation in column 1 is a

²³ There are also other aspects of error in matching. A village head may name one agency (say, a donor) and the villager may name another (say, the implementer) when both are involved, although we worked hard to overcome this problem (a specific donor typically hires just one or from a small set of implementers). Finally, occasionally village heads may group different affiliated agencies in a village under one name.

²⁴ When the level 1 type is the same as the level 2 or 3 type we assign it as the level 1 type. There are 34 instances of these and we also try dropping such cases but the results are similar.

²⁵ To see, if our fishermen data represent the agency composition from the village data well we compare the actual and expected (if randomly assigned within the village) counts of houses received by our fishermen by agency types for the larger sample of fishermen. The actual counts and expected counts for donor implementer are [174, 178], international-implementer [60, 46], domestic implementer [207, 189] and BRR [118, 146]. Though there are some slight differences, the fishermen data seem to represent well the counts reported by the village heads.

Poisson count model with robust and village clustered standard errors. We note that households don't routinely report faults in all categories: in the larger sample 52% report none, 18% one fault, 17% two, 8.6% three, and 6.7% four.

For total faults in the set of column (1) results we report first for the 2 samples: (a) for the larger and (b) for the better matched, with district fixed effects. Then as in Table 7 we report a column (c) with no village or family controls and no fixed effects. In columns 1a-1c, consistent with village head results, donor-implementers offer lower counts of faults than BRR—a 40% reduction for the larger sample and about a 60% reduction for the better matched sample. International-implementers also have lower counts. In the large sample the estimate is small (regardless of controls). In the better matched sample the reduction is 81% with controls and 91% without, but both are insignificant. To column 1a, if we add sub-district fixed effects, results are unaffected. In column 1b with its smaller sample, the only effect is to strengthen (and make significant) the reduction in faults for international implementers. However, we think that strengthening is probably spurious because of the restricted variation left in the data. The inference is based on 29 international implementer observations, 13 of which are in one sub-district with no donor-implementers and only 2 BRR projects.

We also looked at these effects on total faults according to whether the household got the implementer-type house from a 1st, 2nd, or 3rd level project, as well as the extent to which a 1st level project dominated aid in the village. Here we must use the better matched sample that distinguishes the levels of the agency reported by the fishermen. The results are consistent with the column 4 results of Table 7 for village head ratings. The noticeable difference is that, for donor-implementers, now 2nd or 3rd level projects, as well as 1st bring significant reductions in counts of faults, but cell counts are small.

In Table 9, columns 2-5 report probits on whether the house has a leaky roof, cracked walls, poor foundation, or faulty plumbing. We report just on the smaller better matched sample which has stronger results for donor-implementers and international implementers, consistent with less measurement error in for those two variables. In the probits, donor-implementers are significantly less likely to have 2 of the 4 faults at the 5% level, one significantly less at the 10% and one just missing the 10% mark. However for international implementers, only one fault is significantly less at the 5% level and one at the 10% level. Domestic implementers show no differences relative to BRR.

IV.3.1 Other dimensions of quality

In Table 10 in columns 1 and 2, we look at two “quality” related items. One is the fraction of houses in a village provided with a piped water connection. Since these are village level data, we ask whether the dominant house provider in a village affects the fraction of houses served. Not surprisingly in column 1, the better quality donor-implementer houses are more likely to be connected; effects for international implementers relative to BRR are positive but not significant.

The other dimension of quality is house size. We asked for total number of bedrooms (ranging from 0-6, heavily centered on 2) and about additional special rooms, namely kitchen and bathroom. While about 90% of houses come with a bathroom, in 1/3 of the cases agencies leave the family to build a kitchen onto the house, rather than providing it up front. We get a count of total additional rooms (additional to a one room box) by adding one if there is a kitchen and one if there is a bathroom to the count of bedrooms. We estimate whether initial house size, in terms of count of additional rooms relative to a one room box, is influenced by the implementer type. Here we report on the whole set of control covariates in columns 3 of Table 10 for the larger fishermen sample. None are significant at the 5% level. In particular, a larger family size does not mean a larger house, raising an issue of poor matching to families.²⁶ In terms of implementer effects, relative to BRR, the count of additional rooms is the same across agencies except for domestic implementers. They provide on average 9% fewer rooms. Going to the better matched sample doesn't change results. Overall, the indication is that domestic implementers offer lower quality and smaller houses than donor-implementers. As in Tables 7 and 8, results are not significantly affected by replacing district with sub-district fixed effects.²⁷

IV.4 Quantity of aid

In this sub-section we look at the determinants of the quantity of house aid provided in each village. In the last two columns of Table 10, we examine also what determines the quantity of house aid offered in a village, in a reduced form equation. In Table 10, column 3 shows that the level of house aid is related to basics: increasing in houses destroyed (aid claim) and numbers of surviving households (need). In column 3 the only other significant determinant is the village population survival rate, where aid is decreasing in survival rate, conditional on houses destroyed and surviving numbers of households. It may be that there was more sympathy in giving to villages with the lowest population survival rates. Distance from Banda Aceh and social capital measures have no significant effect on total house aid. In terms of aid agency activities, in column 4 we add in controls for having two or more housing providers and for the dominant implementer type. None of these variables are significant at the 5% level, although having a second provider is significant at the 10% level. Adding sub-district fixed effects has no impact on implementer-type coefficients. If we add agency fixed effects as a more general control on agency tastes for housing provision, the multiple provider coefficient is completely insignificant (coefficient (s.e.) of .060 (.084)). Having no multiple provider effects is consistent with the notion in the theory section that if all villages have the same tastes for excess housing and heterogeneity is in first implementer tastes for, say,

²⁶ If we restrict attention just to bedrooms, larger families got significantly more bedrooms, suggesting a trade-off in terms of what an additional room is called; but the effect is tiny. Increasing family size by 4 (slightly more than doubling mean size of 3.9) increases the number of bedrooms by about 8-10%.

²⁷ In column 1, with its small sample, the key donor-implementer effect is unaltered. The other two implementer-type coefficients are insignificant to begin with; with sub-district fixed effects the absolute values of their coefficients are reduced. Column 2 results are unaffected.

domination or quality, villages will still opt for the same amount of housing regardless of their first implementer tastes.²⁸

If villages are heterogeneous in their unobserved tastes for extra houses, there is a margin where extra houses are associated with having an extra provider. As noted in the theory section, if we are just at the margin of a corner solution where the main provider strategically dominates (as opposed to shares provision), then an increase in village unobserved demand for housing will induce a solution with an extra provider and more housing. This may create the weak correlation between quantity and having two or more providers. [Note in cases where provision is already shared, an increase in village tastes for housing creates no association between more houses and having a second agency.]

V. Social agendas: Why choose a domestic implementer for housing?

In this section we look at two issues. First, is there evidence that donor-implementers in our model pursue and value social agendas? Second, why do some donors choose domestic implementers, given they deliver low quality housing. Does the notion that domestic implementers may “work better with the community” in the pursuit of village social goals have feet? We have no evidence meeting a reasonable standard of causality on either set of issues. Matching by agencies to village unobservables is now an explicit problem; village measured covariates now influence outcomes; and we are not looking at specific agency actions, only associations with their presence. Still the patterns of association are so pointed that we report them.

We look specifically at two types of village social outcomes: (i) public goods we recorded in the form of public buildings and infrastructure (specifically paved roads and environmental protection of the coast) and (2) preservation of local traditions specifically mosque attendance post-aid in 2009 and choice of traditional occupation, fishing. For domestic implementers for public goods, the idea is that they are more knowledgeable about the local scene (speak the language and know the culture), have a less top-down approach, and may be better connected personally with BRR officials who are the key providers of many public goods. Thus domestic implementers may be more willing and able to help villages get more public goods. Since generally housing NGOs don’t provide these facilities (and there is no “trade-off”, or

²⁸ We also considered the issue of quantity-quality trade-off. This issue steps somewhat outside the domain of the model, to ask, if village heads have a taste for more housing, does that affect the quality of housing they get, implicitly through the choice of agencies which can be lobbied for more houses. This is not the micro quantity-quality trade-off analyzed in the human capital literature on children—just correlations in the data. We computed residuals for excess housing from column 3 of Table 10 and added them to a column 1 Table 7 quality specification (with the full set of village covariates or one with a reduced list and in both cases with no implementer types). That measure of excess housing and adding that measure also interacted with whether a village has two or more providers produces zero coefficients on the excess housing variable and any interaction with multiple providers. It seems excess housing per se is not associated with lower quality.

correlation between having more public buildings versus private housing), it means that the main house provider would work with other implementers to help a village get particular public buildings or infrastructure. For social agendas involving local traditions, Aceh is a conservative Islamic area of Indonesia. Foreign NGOs in villages bring exposure to new ideas and social influences—an issue of foreign “spiritual pollution”. Domestic implementers may associate more with village traditions and have the same religion as villagers. For donor-implementers their objective function may weigh more heavily on villages getting public goods than, say international implementers. They may possibly be more sensitive and respectful of village traditions (as donors willing to be on-the-ground in the village).

Results are summarized in Table 11. The first four columns look at village level outcomes, where we see if the main housing implementer type²⁹ is correlated with the count of public buildings, the count of cooperatives and village enterprises, the fraction of roads paved, and whether coastal protection initiatives were undertaken for the sub-sample of coastal villages through planting of mangroves, pines and grasses.³⁰ Public buildings include mosques, village halls, fishermen halls, Islamic and state schools and health facilities. On the role of domestic implementers, they shine, being associated with consistently better outcomes than BRR and relatively better outcomes than at least international implementers. On the issue of donor-implementers and social agendas, donor-implementers do a better job than international implementers, as presumed in the modeling section. Note that all NGO types dominate BRR; certainly none are worse than BRR for any item in the first 4 columns.

In columns 5 and 6 of Table 11, we look at social outcomes. In column 5, mosque attendance in 2009 after aid delivery is complete, as a function of the type of major housing provider.³¹ Village tradition is that the household head answers the call to mosque once a day and we examine weekly attendance with counts for household heads ranging from 0-7 days.³² Column 6 concerns the issue of whether NGOs influence aspirations and occupational choice. Is the choice to remain fishing in 2009 for a sample of pre-tsunami fishermen relates to the type of main house implementer? Both columns have a full set of relevant controls with complete results presented in Appendix 5. In columns 5 and 6, compared to either BRR or international implementers, domestic implementers are associated with higher mosque attendance of adult males and higher probabilities of fishermen remaining in fishing (the difference between domestic implementers and international implementers in column 6 is significant). Although donor-implementers have an advantage in point estimates over international implementers, their coefficients in columns 5 and 6 are not significantly different. In Appendix 5, we also take a different

²⁹ We also experimented with a formulation where covariates are the fraction of houses in a village provided by each type of agency. The sign and significance patterns are the same as for the dummy variables for dominant providers.

³⁰ About 45% of coastal villages plant mangroves, pines and grasses.

³¹ For mosque attendance in 2007, with NGOs still directly present in villages, we find no agency effects.

³² In 09 we registered a few higher counts, for those who may have gone to mosque more than once a day. To be comparable with 07 numbers we capped responses at 7. Uncapped results for 09 are little different.

perspective and look explicitly at whether the fraction of houses provided by Christian based NGOs had differential effects.³³ The negative effect for evening prayer is quite large, though statistically not significant. The effect on reduced fishing probabilities is large and significant.

Table 11 associations are consistent with the ideas that (1) some donors hire domestic implementers compared to international ones or BRR to help preserve local traditions and work more towards sustainable development and village quality of life and (2) donor-implementers work better with villages than international implementers at least in securing village public goods. Adding sub-district fixed effects does not alter these general results. In columns 1-4, with their small samples adding sub-district fixed effects alters a number of point estimates, but the overall pattern of results is unaffected.³⁴ Columns 5 and 6 with their focus on social outcomes are the one place in the paper where a tight control on culture and informal institutions could be important. While the overall pattern of results is similar, domestic-implementer effects are actually strengthened, although we worry about restrained variation from the limited number of villages in 10 sub-districts. With sub-district fixed effects, in column 5 the domestic implementer coefficient is a little higher and still significant at the 5% level; and in column (6) the domestic implementer effect is strengthened rising to 0.14, significant at the 10% level.

While we have these associations, they may not be causal. For example unobserved devoutness in a village may have induced matching with domestic implementers of the same religion and sensitive to village traditions. We now turn to an explicit social agenda where we can draw strong inferences.

V.1 Imposition of social agendas: boat aid

For boats a social agenda imposed shared ownership on a substantial fraction of aid boats. As noted in the introduction, some NGOs had a shared ownership agenda, to try to force a move away from the traditional captain-owner-crew social and economic structure. From Figure 2, this sharing did not survive well with time: by 2009 little sharing of ownership remained. But the examination is complicated by the fact that failure is associated with sharing. It could be that the agencies where sharing was a strong social agenda happened to also give poor quality boats. However, there is heterogeneity of boat quality within agencies and aid boats were distributed by village heads or fishermen leaders. The question we explore here is whether the village and lagoon fishing leaders who allocated boats further thwarted the unpopular sharing agenda by assigning poor quality boats to shared ownership. That is, for boats from the same

³³ We also tried specifications where we control for the type of provider of the individual fisherman's house, in addition to the village level controls. Those variables had no independent effect and left other results intact, so we don't report them.

³⁴ Column 1 results show little change in coefficients but a modest increase in standard errors. In column 2 the domestic implementer coefficient is halved but so is its standard error. Column 3 coefficients remain all positive with 25-50% reduction in magnitudes. Column 4 coefficients are all increased in magnitude by 15% or more with no change in standard errors.

agency, better quality ones were not shared, while worse ones were. Further, sharing is not random across fishermen; it is disproportionately imposed on lower status fishermen. We assume (1) that leaders knew which boats would fail, which is plausible since construction materials and ex post quality as well as design are all observable to these experienced fishing leaders and (2) sharing per se did not induce failure, a possibility we directly address.

We use individual fishermen data, which cover 88 villages in the estimating sample. These data allow us to tease out the sharing-failure association in detail, which we can't do with the village level data. In the micro data, two international implementers, Triangle and International Medical Corps (IMC), dominate boat implementation, providing over 45% of boats to the fishermen we sample, with no other individual agency providing more than 5.5 % and most offering just a handful of boats in the survey. Donor-implementers as identified in RAN for boats are a small group. Despite the limitation on villages covered, we have strong findings.

V.2 Was sharing targeted?

In Table 12 columns 1 and 2, we look at the correlates of sharing as reported in 2007 by fishermen. Family or fishermen characteristics are related to sharing— previous ownership and higher education lower the likelihood of shared ownership. So sharing to some extent seems to have been imposed on lower status fishermen, who had poorer claims to ownership. Across villages, keeping in mind that we cover a limited sample of villages, sharing increases in villages with higher initial social capital (*arisan* group), which have been more willing to better accept the equality agenda underlying shared ownership. Sharing declines as boat aid rises in a village, suggesting that, in villages with fewer aid boats relative to need, sharing was more likely to occur.

In terms of aid agencies which favored sharing, in the small sample of villages, it is difficult to separate NGO effects from the 3 district fixed effects let alone 31 sub-district fixed effects; and we include no fixed effects. IMC which gave 16% of boats in the estimating sample with an 87% share rate are all in one district. Triangle which gave 29% of boats with only a 36% share rate is entirely in another district. As Table 12 shows, IMC has significantly more and Triangle significantly less than typical sharing (compared to the base of small, ungrouped boat NGOs). Results with district fixed effects follow the same pattern but are weaker. While we know specific agencies, such as the British Red Cross (BRC), imposed shared ownership, they only appear rarely in the sample (3 boats for BRC). Given all agencies besides IMC and Triangle appear infrequently in the sample, we tried other groupings. Getting a boat from a boat donor-implementer identified in RAND (3.6% of boats), or from BRR (8.8% of boats) are unrelated to shared ownership. Regardless, what drove differences in sharing across villages is not critical to the basic results in columns 3 and 4.

V.3 Assigning sharing to failure

In columns 3 and 4 of Table 12, we turn to boat failure of aid boats, as recorded after aid is done in 2009. Failure is not related to household or village observables; in general any traditionally built boat is expected to last at least 5 years even with hard usage. However, sharing an aid boat significantly increases the likelihood of boat failure, 30% more often in column 3.

Column 4 shows specifically that failure is associated with being assigned a shared boat, not with an implementer type per se. In column 4, we examine how sharing versus non-sharing, in association with the NGO group classification in column 2, affects failure. The base case is non-shared boats given by “all other” agencies; there are no BRR boats left in the sample. No non-shared IMC boats fail so there is no estimated coefficient. Triangle and IMC shared boats fail at significantly higher rates, by about 40%, compared to the base and even more compared to Triangle non-shared boats. Non-shared boats by donor-implementers fail less than other non-shared boats, consistent with the house results, again the idea of better resolved moral hazard problems.

Overall the results suggest that fishing leaders in allocating boats in villages knew which were good and bad boats at the point of assignment. They then assigned the low quality boats to be shared, to satisfy the shared ownership objectives of NGOs. Such sharing was assigned to villagers lower in the social hierarchy (lower education, not pre-tsunami owners).³⁵

One might worry that sharing is an institution that people did not like and so they used the boats very hard to raise money to buy out partners. They could have used them so hard that rather than starting to fail after 5 years they failed within 1-2 years or less. However, in a smaller matched sample of 2007 and 2009 fishermen, we control for intensity of use in 2007 in terms of length and numbers of trips per week to make sure that higher usage of shared boats is not driving later failure rates. As reported in columns 5 and 6 of Table 12, the two usage variables have tiny coefficients and are completely insignificant; other results are the same as in columns 3 and 4. Boats which failed were simply badly built.

VI. Conclusion

In recent years, many countries have experienced major natural disasters and the massive accompanying humanitarian aid efforts have not been well scrutinized at a micro level. Understanding and analyzing the organization of aid delivery is essential to evaluating aid efficacy. The paper examines the organizational structure of how implementing agencies are related to funding ones.

We find that donor-implementers offer the highest quality housing as rated by village heads and have fewer counts of faults as reported by fishermen, reflecting their greater ability to deal with moral hazard issues. However, evidence suggests they shade in quality as they lose dominance as the leading aid agency in a village. International implementers fare relatively well in providing housing quality,

³⁵ A “reduced” form for failure (remove sharing variables in columns 3 and 4) gives anticipated effects by status but they are not statistically significant.

regardless of degree of dominance. In contrast, domestic implementers are associated with “sustainable development” objectives through the construction of public buildings and seashore conservation, even though they provide low quality housing. They also are associated with better maintenance of village religious and occupational traditions

We investigate the interaction of aid quality and social agendas by examining boat aid. Shared ownership was the primary social agenda pursued by many agencies delivering boat aid, perhaps in the hopes of reducing within village inequality and improving contractual practices. However, boat aid was extremely heterogeneous with many boats literally failing. We find that village and fishing leaders steered poor quality boats towards those upon whom shared ownership was imposed, often lower status fisherman. In other words, under heterogeneity of boat quality, shared ownership which was imposed as a means to decrease inequality resulted in the contrary, where higher status fishermen receive better boats and the lower status poorer quality boats.

We conclude with two general points relevant for policy. First, the behavior of an aid agency that operates on the ground is a composite outcome of the organizational structure of the donating and implementing arms. Depending on how that organization is set up, the quality of hard aid and the delivery of social agendas may vary considerably within the same disaster area. Donors face potential trade-offs between higher quality aid, pursuit of certain social agendas, and paying the cost to do their own implementation. Second, the village is an integral part of aid distribution and the behavior of its leaders affects how the agencies’ social agendas are delivered among village members. This can result in uneven distribution of aid quality, especially when hard aid is tied directly to the agencies’ social agendas.

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Figure 1. Housing Aid: Quality by types of aid agencies, village head and fishermen 2009

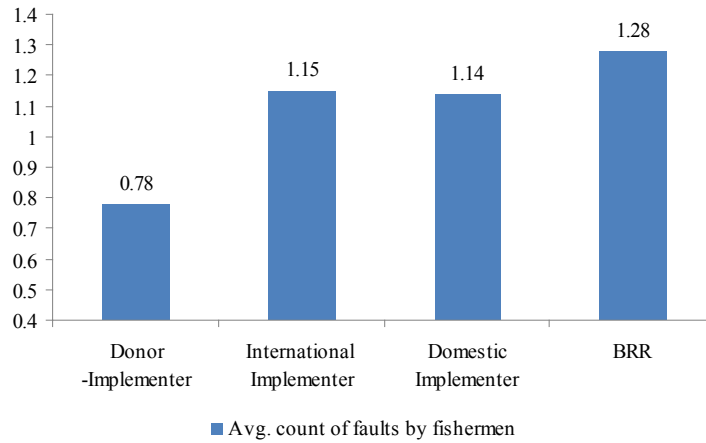
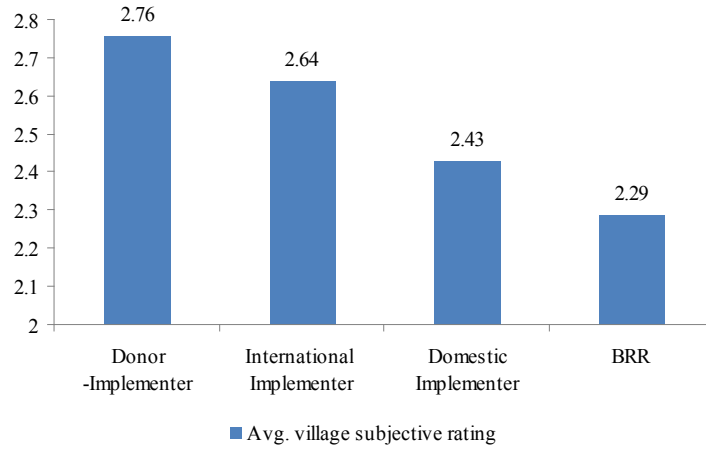


Figure 2. Boat aid: Shared ownership and boat failure, fishermen 2009

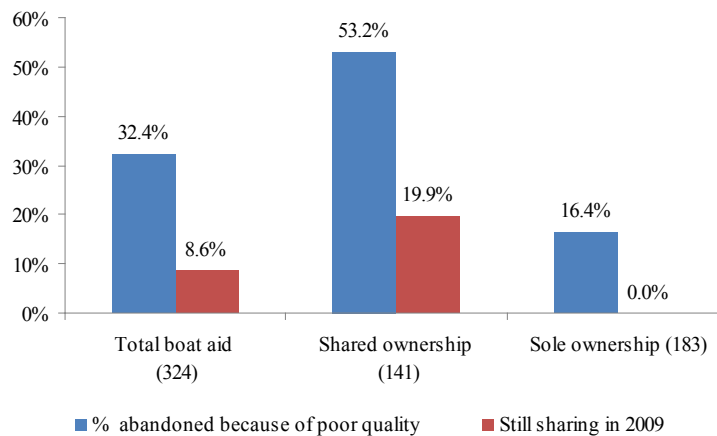


Table 1. Destruction of population and housing

Survival	
Pre-tsunami population ^a	171783 (official)
Survival rate of population ^b [original 05 villages, 104 covered]	65% [49%]
Post-tsunami households, official	32876
House aid	
Number of houses survive tsunami, survey	5399
Survival rate houses	9%
Number of temporary aid houses built ('07 survey)	6529
Number of permanent aid houses built ('07 survey)	32277
Replacement rate by late 2007 ^c	117%
Number of permanent aid houses built by late 2009	39899
Other aid	
Survival rate public buildings	6%
Replacement rate, public buildings by late 2007	80%
Replacement rate, public buildings by late 2009	96%
Survival rate of boats ['05 sample of villages]	[6%]
Replacement rate, boats [2007 survey for 96 villages surveyed in '05] ^d	[105%]

Note: Based on 190 villages where there is both 2007 and 2009 information

- Official population counts pre-tsunami are from the P4B, a 2004 government pre-election census.
- The official survival rate is the 2006 PODES count divided by the count in P4B. The PODES is a tri-annual government inventory of village populations and facilities. The 2006 PODES in Aceh was conducted in the Spring 2005. It has lower counts of population and households compared to our 2005 survey (Summer and Fall, 2005). This may be partly a "9/11 phenomenon"; as time goes on more missing families are discovered.
- The replacement rate is the number of houses given in aid divided by the number of surviving households less the number of surviving houses. Includes mosques, village halls, fishermen halls, public and Islamic elementary schools, health facilities.
- Defined as boats on water by late 2007/surviving captains 2005.

Table 2. Matching villages to types of agencies : Multinomial Logit

	(1) Donor-Imp.	(2) Int'l Imp.	(3) Domestic Imp.	(4) BRR
Ln (no. households post-tsunami)	0.0122 (0.0416)	0.000618 (0.0273)	0.0247 (0.0357)	-0.0375 (0.0417)
Survival rate population	0.00375 (0.0627)	0.00350 (0.0462)	-0.00324 (0.0655)	-0.00401 (0.0690)
Mullah survive	0.00590 (0.0553)	-0.0129 (0.0466)	-0.0493 (0.0504)	0.0563 (0.0534)
Pre-tsunami <i>arisan</i> group	0.179*** (0.0532)	-0.0942* (0.0543)	-0.0890 (0.0566)	0.00431 (0.0561)
Ln (distance to Banda Aceh)	0.0524** (0.0229)	0.0342* (0.0182)	-0.0441** (0.0213)	-0.0426* (0.0242)
Ln (no. houses destroyed)	-0.0107 (0.0293)	0.0200 (0.0235)	0.0248 (0.0267)	-0.0341 (0.0246)
Observations	349	349	349	349

Notes: Coefficients are marginal probabilities reported from a multinomial logit regression. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Housing aid agencies

Agency	No. of houses given	No. of projects [No. of villages]	Houses per project	Percent villages where present, where dominant provider	Percent villages where present, where almost "sole" provider (> 90%)	Percent projects where minimal provision (< 15%)
BRR	7541	117	66	34	17	34
All Donor-Implementers	18009	115 [107]	158	80	43	7
Canadian Red Cross	2358	11	214	100	91	0
Catholic Relief Service	2282	18	127	83	33	6
United Nations	2087	16	130	75	56	0
World Vision International	1977	12	165	75	42	0
British Red Cross	1247	7	178	100	57	0
All Domestic Implementers	10772	96 [85]	112	45	16	17
Uplink	1390	15	97	73	33	7
All International Implementers	4517	61 [56]	74	34	14	23
Habitat for Humanity (Indonesia)	1392	14	99	50	21	14

Table 4. House implementers

Name of housing agency	Type	No. of village projects	No. of houses	Village Head reports		Fishermen reports	
				Mean quality	Mean quality (weighted)	Mean count of faults	No. of fishermen
Canadian Red Cross	Donor-Imp.	10	1758	3.00	3.00	0.81	27
German Information Technology Executive Council(GITEC) ¹	Donor-Imp.	4	856	3.00	3.00	0.78	9
World Vision International	Donor-Imp.	11	1977	2.73	2.89	0.67	12
Spanish Red Cross	Donor-Imp.	2	250	2.75	2.84		
UN	Donor-Imp.	14	2087	2.82	2.83	0.50	6
Catholic Relief Service	Donor-Imp.	18	2282	2.89	2.83	0.00	12
British Red Cross	Donor-Imp.	8	1247	2.63	2.82	0.43	7
German Red Cross	Donor-Imp.	4	652	2.75	2.78		
Turkey ²	Donor-Imp.	8	842	2.50	2.58	0.83	23
Australian Red Cross	Donor-Imp.	6	493	2.58	2.49		
CARE	Donor-Imp.	3	544	2.17	2.40		
Samaritan's Purse	Donor-Imp.	5	1232	2.30	2.05		
Save the Children	Donor-Imp.	2	75	1.50	1.93		
Concern Worldwide	Donor-Imp.	2	9	1.00	1.00		
GenAssist/CRWRC [Tearfund UK, Mennonite Central Committee]	Int'l Imp.	10	398	2.60	2.93	0.33	3
International Organization for Migration [Various Governments]	Int'l Imp.	5	328	2.70	2.93		
CHF International [Direct Relief International, USAID]	Int'l Imp.	7	380	2.86	2.84	0.00	2
Emergency Architects [French Red Cross, French Government]	Int'l Imp.	3	325	2.83	2.69		
Oxfam [UK Disaster Emergency Committee]	Int'l Imp.	9	514	2.67	2.66	0.89	18
Habitat for Humanity Indonesia [Mercy Corps International]	Int'l Imp.	13	1392	2.62	2.57		
Church World Services [ACT Alliance]	Int'l Imp.	2	192	2.00	2.00		
Muslim Aid Indonesia [Oxfam]	Int'l Imp.	6	390	2.33	1.92		
KOMPAK ^s	Domestic Imp.	8	599	2.88	2.92		
Caritas ^d	Domestic Imp.	5	890	2.60	2.90		
Education and Information Center for Child Rights(KKSP) [Terre des Hommes]	Domestic Imp.	3	600	2.67	2.77		
Indonesian Government Agencies ^d	Domestic Imp.	5	842	2.30	2.64		
Diakonie Emergency Aid [Katahati Institute]	Domestic Imp.	3	97	2.67	2.53		
United Methodist Committee on Relief ^d	Domestic Imp.	3	31	2.67	2.52		
Uplink Indonesia [Canadian Government]	Domestic Imp.	8	1390	2.44	2.42	1.23	31
Asian Development Bank ^d	Domestic Imp.	5	388	2.40	2.37	0.40	5
SOS Desa Taruna Indonesia [SOS Kinderdorf International]	Domestic Imp.	3	520	2.33	2.23	1.13	32
Aceh Relief Fund [Compassion International]	Domestic Imp.	4	198	1.38	1.69	3.00	4
Salam Aceh ^s	Domestic Imp.	2	172	1.50	1.68	1.75	8
MAMAMIA [Caritas]	Domestic Imp.	6	1068	1.42	1.33	1.50	16
Serambi Kasih/Serasih Indonesia ^s	Domestic Imp.	2	177	1.50	1.25	1.50	2
Nor Link/North Link [World Relief]	Domestic Imp.	2	66	1.00	1.00	2.36	14
BRR	BRR	112	7241	2.33	2.32	1.45	86

Notes: For international and domestic implementers the main donor agencies are listed in brackets.

d. Agencies named by the village head that are primarily donor agencies. In this case, implementing agencies are domestic implementers unnamed by the village head.

s. Agencies named in the survey by the village head but that does not show up in the RAN database.

1. GITEC includes the German Technical Cooperation (GTZ) and the German Development Bank (KFW)

2. Turkey includes ABS Turkey, the Istanbul International Brotherhood and Solidarity Association (IBS), and the Turkish Red Crescent

Table 5. Boat NGOs

Name of boat agency	No. of village projects	No. of boats provided	Failure rate	Failure rate (weighted)
Mercy Corps (several)	8	177	0	0
Church World Services	5	82	0	0
Samaritan's Purse	3	55	0	0
CARDI/NRC(Norwegian Refugee Council)	5	43	0	0
CHF International	3	32	0	0
Asian Development Bank	9	25	0	0
TRIKONI	2	24	0	0
Yayasan Tanggul Bencana di Indonesia	2	22	0	0
Yayasan Panglima Laot	5	18	0	0
Austin International Rescue Operation	4	15	0	0
Padi Nusatra (California Origin)	2	11	0	0
Oman	3	8	0	0
GenAssist/CRWRC	2	3	0	0
International Red Cross	11	67	0.09	0.01
Triangle Generation Humanitaire	38	502	0.17	0.08
Salam Aceh - Greeting Aceh	10	131	0.12	0.12
Austrian Tourism Export Council	3	52	0.33	0.15
Government ¹	50	326	0.31	0.19
World Vision International	6	31	0.17	0.32
BRR	9	21	0.50	0.38
Rumah Zakat Indonesia	3	7	0.33	0.43
International Medical Corps	15	101	0.50	0.50
Japan International Cooperation Agency	2	9	0.50	0.56
Kuwait	5	42	0.62	0.57
Africa Islamic AL-AMIN	3	19	0.72	0.58
France	2	36	0.50	0.83
Oxfam	6	215	0.42	0.84
Yayasan PUGAR	3	19	0.67	0.95
Serambi Kasih/Serasih Indonesia	2	10	1	1

Notes: 1. Government includes various Indonesian government agencies including the Ministry of Fishing Affairs.

Table 6. Agency typing in the model and outcomes

	BRR	Donor-implementer	International implementer	Domestic Implementer
	$B=8.94, z=1, \theta=A=0$	$B=12, \theta=.9$	$B=12, \theta=.2$	$B=10, \theta=.6$
	Low house value, no social agenda	High house value, high social value to dominance	High house value, low social value to dominance	Low house value, medium social value to dominance
House quality ($q = Be_2^\alpha$)	40	66.7	68.2	46.4
$\Delta(\max, \text{ or corner at } 20)$	n.a.	19.5	14.4	19.2
Per house effort (e_2)	20	30.9	32.2	21.5
Total social effort (e_1)	n.a.	58.2	57.4	58.1

Table 7. Quality of housing

Dependent Variable:	Subjective Quality					
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(no. households post-tsunami)	0.00822 (0.0648)	0.00713 (0.0608)	0.00430 (0.0582)	0.0140 (0.0592)	0.0609 (0.0852)	
Survival rate population	-0.0790 (0.0933)	-0.0913 (0.0920)	-0.103 (0.0871)	-0.110 (0.0875)	-0.0906 (0.0843)	
Mullah survive	0.117 (0.0996)	0.130 (0.0942)	0.157 (0.0962)	0.154 (0.0956)	0.107 (0.110)	
Pre-tsunami arisan group	0.124 (0.107)	0.109 (0.101)	0.0928 (0.0994)	0.0930 (0.0981)	0.106 (0.0949)	
Ln(distance to Banda Aceh)	0.0983 (0.106)	0.0915 (0.103)	0.0743 (0.102)	0.0783 (0.0995)	0.0711 (0.260)	
Ln(no. houses destroyed)	-0.0265 (0.0381)	-0.0261 (0.0347)	-0.0300 (0.0322)	-0.0328 (0.0327)	-0.0495 (0.0380)	
Provider: Donor-Implementer		0.300*** (0.0951)				
x 1st project			0.444*** (0.138)	0.443*** (0.137)	0.482*** (0.152)	0.496*** (0.129)
x 2nd project			-0.0732 (0.186)			
x 3rd project			0.295 (0.314)			
x 2nd or 3rd project				0.0240 (0.181)	0.00445 (0.193)	0.100 (0.188)
Provider: International Implementer		0.312*** (0.101)				
x 1st project			0.330* (0.182)	0.330* (0.180)	0.412** (0.204)	0.349** (0.176)
x 2nd project			0.364** (0.168)			
x 3rd project			0.335* (0.173)			
x 2nd or 3rd project				0.352** (0.147)	0.313* (0.162)	0.361** (0.142)
Provider: Domestic Implementer		-0.0331 (0.120)				
x 1st project			-0.187 (0.188)	-0.188 (0.186)	-0.206 (0.186)	-0.199 (0.186)
x 2nd project			0.102 (0.186)			
x 3rd project			0.332* (0.171)			
x 2nd or 3rd project				0.166 (0.162)	0.135 (0.169)	0.162 (0.155)
Provider: BRR x 2nd project			0.0819 (0.155)			
x 3rd project			-0.0728 (0.197)			
x 2nd or 3rd project				0.0433 (0.147)	0.105 (0.154)	0.0631 (0.144)
Kabupaten fixed effects	Yes	Yes	Yes	Yes		
Kecamatan fixed effects					Yes	
Observations	322	322	322	322	322	341
R-squared	0.064	0.116	0.163	0.153	0.237	0.109

Notes: Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8. Donor-implementer quality shading, robustness to composition of NGOs

Dependent Variable:	Subjective Quality		
	(1)	(2)	(3)
Provider: Donor-Imp. x 1st project	0.601*** (0.139)	0.536*** (0.154)	0.802* (0.421)
x ratio of others	-0.972*** (0.331)	-0.740** (0.365)	-0.801* (0.425)
x 2nd or 3rd project	0.0199 (0.181)	0.0181 (0.183)	0.675* (0.379)
Provider: Int'l Imp. x 1st project	0.340* (0.181)	0.341* (0.182)	0.925** (0.426)
x 2nd or 3rd project	0.347** (0.148)	0.343** (0.150)	0.684 (0.458)
Provider: Dom Imp x 1st project	-0.196 (0.186)	-0.199 (0.185)	0.454 (0.474)
x 2nd or 3rd project	0.148 (0.162)	0.144 (0.162)	0.711* (0.405)
Provider: BRR x 2nd or 3rd proj	0.0344 (0.147)	-0.0376 (0.149)	0.272 (0.473)
Kabupaten fixed effects	Yes	Yes	Yes
Observations	322	299	106
R-squared	0.169	0.165	0.273

Notes: All specifications include village characteristics variables as in Table 7. Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9. Housing quality from fishermen data

Dependent variable:	Count of faults			Leaky roof (2)	Cracked Walls (3)	Poor foundation (4)	Faulty plumbing (5)
	(1a)	(1b)	(1c)				
Provider: Donor-Implementer	-0.417 (0.257)	-0.596** (0.271)	-0.673** (0.276)	-0.192*** (0.0695)	-0.168* (0.0919)	-0.111 (0.0681)	-0.139** (0.0698)
Provider: International Implementer	-0.171 (0.370)	-0.812 (0.526)	-0.908 (0.582)	-0.265*** (0.0346)	-0.170 (0.133)	-0.123* (0.0666)	-0.0981 (0.0905)
Provider: Domestic Implementer	0.0606 (0.170)	0.0602 (0.207)	-0.0826 (0.204)	-0.0927 (0.0690)	0.0176 (0.0888)	0.0623 (0.0889)	0.0702 (0.0878)
Household controls	Yes	Yes		Yes	Yes	Yes	Yes
Village controls	Yes	Yes		Yes	Yes	Yes	Yes
Kabupaten fixed effects	Yes	Yes		Yes	Yes	Yes	Yes
Observations	529	371	371	371	371	371	371

Notes: In addition to the same village level controls in Table 7, household size, age, and household head education level are included. For columns (2)-(5), reported coefficients are marginal probabilities from a probit regression. Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 10. Other elements of quality

Dependent Variable:	Percent piped water	Count of rooms	Ln(Count of houses in aid in 2009)	
	(1)	(2)	(3)	(4)
Family size		0.00402 (0.00722)		
Age of household head		-0.000140 (0.00158)		
Education of HH head (levels 1-8)		-0.00232 (0.0101)		
Ln(no. households post-tsunami)	-5.162 (5.260)	0.0349 (0.0223)	0.576*** (0.0892)	0.568*** (0.0894)
Survival rate population	-0.896 (9.172)	0.00199 (0.0425)	-0.190*** (0.0727)	-0.185*** (0.0694)
Mullah survive	11.28 (7.233)	0.0560* (0.0340)	0.00180 (0.0720)	0.000658 (0.0697)
Pre-tsunami arisan group	1.393 (8.342)	-0.0153 (0.0303)	0.0504 (0.0676)	0.0570 (0.0721)
Ln(distance to Banda Aceh)	-15.23* (8.244)	0.0285 (0.0239)	-0.0895 (0.0667)	-0.0768 (0.0706)
Ln(no. houses destroyed)	1.065 (3.087)	0.00294 (0.00961)	0.239*** (0.0715)	0.234*** (0.0708)
Two or more housing provider	-11.90 (7.945)			0.107* (0.0646)
Agency type: Donor-Implementer	16.19* (9.794)	-0.00975 (0.0366)		0.0179 (0.0924)
Agency type: International Implementer	-5.686 (12.62)	-0.0262 (0.0476)		-0.0304 (0.112)
Agency type: Domestic Implementer	-9.357 (10.54)	-0.0881** (0.0376)		0.0384 (0.105)
Kabupaten fixed effects	Yes	Yes	Yes	Yes
Observations	169	486	179	179

Notes: Implementer types in column (1), (2), and (4) are for the major housing provider in the village. Coefficients are reported from Poisson regression in column (2) and OLS in the others. Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 11. Other physical capital and village traditions

	Count public bldgs	Count co-op bldgs	Percent roads paved	Plant pines or grasses	Evening pray count per week in 09	Occupational choice to stay a fisherman in 09
	(1)	(2)	(3)	(4)	(5)	(6)
Major housing provider: Donor-implementer	0.256** (0.102)	1.083 (0.817)	16.07** (7.509)	0.241* (0.133)	0.0608 (0.0753)	-0.0701 (0.0750)
Major housing provider: Int'l implementer	0.175 (0.122)	-0.183 (1.003)	22.89** (10.10)	0.296* (0.171)	-0.115 (0.0948)	-0.169* (0.0990)
Major housing provider: Domestic Implementer	0.198* (0.120)	1.532* (0.868)	20.64*** (7.765)	0.351*** (0.135)	0.159** (0.0744)	0.0591 (0.0716)
Additional village controls	Public bldgs destroyed	Buildings destroyed	Houses destroyed		No. of mosques & dusans	
Family controls					Yes	Yes
Kabupaten fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	184	184	174	147	586	571

Notes: Columns (1), (2), and (5) are Poisson, Column (3) is OLS, and Columns (4) and (6) are probit regressions. All specifications include the first five village variables in Table 7. Column (4) is based on coastal villages only. Column (6) additionally includes the number of aid boats and fishing family in 07, and whether one was a pre-tsunami boat owner or a succeeding fishing household. Robust standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

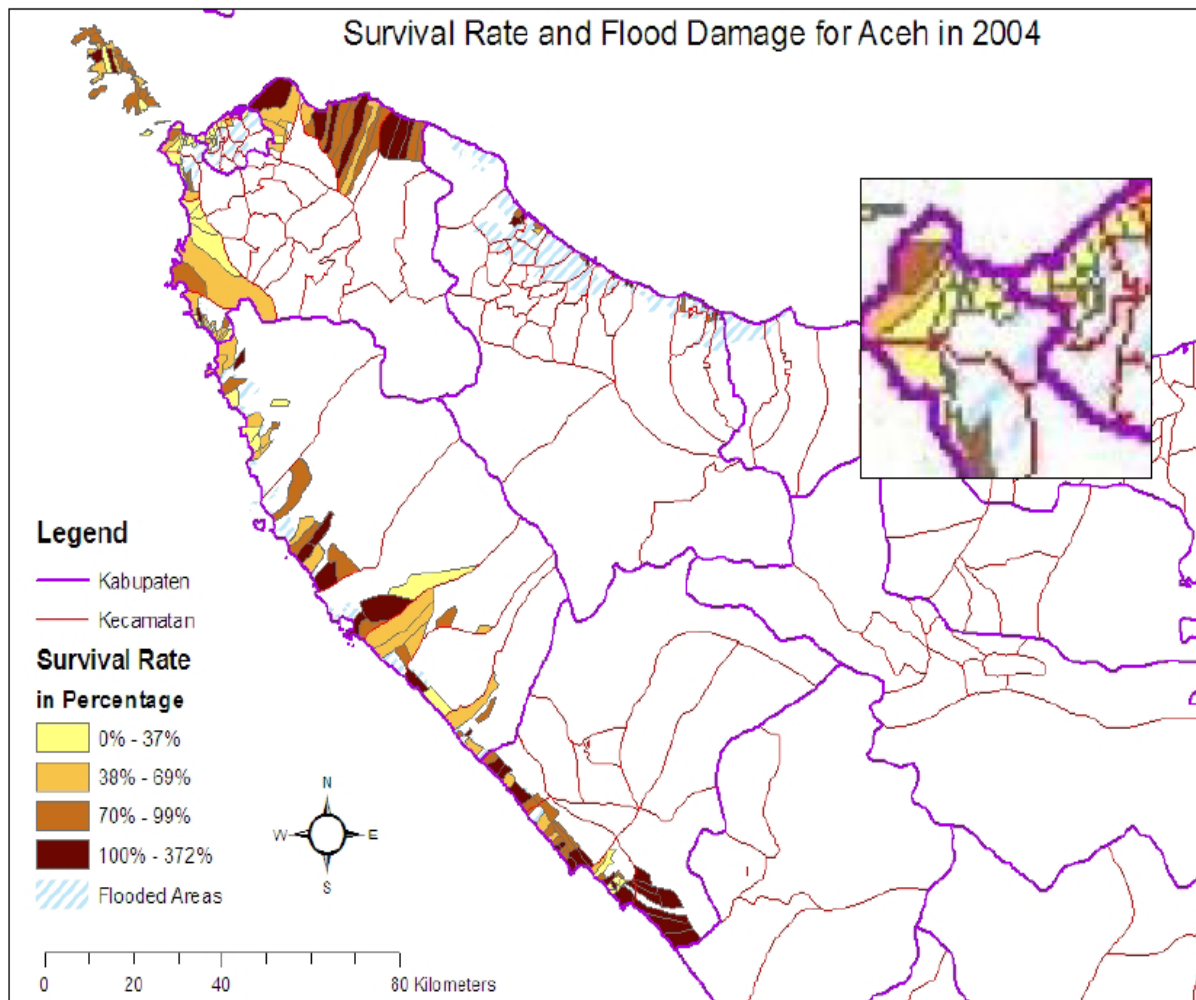
Table 12. Sharing and boat failure in fishermen data

Dependent variable:	Shared boat ownership in 07		Discard boat because of poor quality in 09			
	(1)	(2)	(3)	(4)	(5)	(6)
Family size	-0.0205 (0.0188)	0.000334 (0.0180)	-0.0179 (0.0222)	-0.0362 (0.0273)	-0.0143 (0.0233)	-0.0273 (0.0310)
Age of household head	-0.00111 (0.00244)	-0.00238 (0.00263)	0.00140 (0.00343)	0.00384 (0.00335)	4.86e-05 (0.00379)	0.00382 (0.00392)
Education of HH head (levels 1-8)	-0.0326 (0.0238)	-0.0466* (0.0251)	0.0102 (0.0224)	0.0239 (0.0255)	0.0319 (0.0221)	0.0477* (0.0263)
Pre-tsunami boat owner	-0.0929 (0.0623)	-0.137** (0.0613)	-0.0396 (0.0656)	-0.113 (0.0718)	-0.0216 (0.0745)	-0.0924 (0.0903)
Ln (boat aid 07)	-0.151*** (0.0446)	-0.122*** (0.0419)	-0.0335 (0.0339)	-0.0272 (0.0396)	-0.0264 (0.0420)	-0.0256 (0.0479)
Ln (no. fish families 07)	0.0345 (0.0256)	0.0422 (0.0265)	0.0123 (0.0171)	0.0224 (0.0174)	0.0332 (0.0266)	0.0485* (0.0290)
Ln(no. households post- tsunami)	-0.0607 (0.0743)	-0.188** (0.0762)	0.0379 (0.0564)	0.0494 (0.0625)	-0.0236 (0.0600)	-0.0233 (0.0695)
Survival rate population	-0.139 (0.0967)	-0.0475 (0.115)	-0.430** (0.189)	-0.303* (0.176)	-0.432** (0.202)	-0.222 (0.192)
Mullah survive	0.0520 (0.0921)	0.0513 fishing	0.0511 (0.0929)	0.0581 (0.0958)	0.0821 (0.0987)	0.116 (0.100)
Pre-tsunami arisan group	0.196** (0.0762)	0.166** (0.0727)	-0.0739 (0.0801)	-0.0716 (0.0836)	-0.135 (0.0985)	-0.161 (0.0985)
Ln(distance to Banda Aceh)	0.206*** (0.0647)	0.0811 (0.0773)	0.122** (0.0542)	0.115 (0.0714)	0.163*** (0.0574)	0.133 (0.0876)
			Shared ownership 0.292*** (0.0892)		0.295*** (0.0954)	
Boat NGO : TGH		-0.183** (0.0901)		TGH*Share 0.425*** (0.151)		0.381* (0.212)
Boat NGO : IMC		0.482** (0.193)		IMC*Share 0.370** (0.154)		0.457*** (0.162)
Boat NGO: Boat D-I		0.150 (0.221)		Boat D-I*Share 0.151 (0.233)		0.0971 (0.205)
Boat NGO: BRR		0.0946 (0.137)		Rest*Share 0.107 (0.132)		0.180 (0.166)
				TGH*Not share -0.137 (0.107)		0.0121 (0.150)
				IMC*Not share n.a.		n.a.
				Boat D-I*Not share -0.312*** (0.0629)		-0.298*** (0.0648)
				Hours per fishing trip	0.00724 (0.0150)	-0.00567 (0.0160)
				Number of trips per week	0.0492 (0.0506)	0.0785 (0.0551)
Observations	389	389	281	257	212	192

Notes: Robust standard errors clustered by village are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix 1. Map and survey area

The figure shows a map of the survey area, with a blow-up (right side in figure) of the Banda Aceh area (upper-left part of coastal area).¹ We cover all villages in three contiguous districts (Banda Aceh, Aceh Jaya, and Aceh Besar) going south and north-east of the capital Banda Aceh. In addition we covered the fishing villages in two other districts, up to a defined geographic limit moving east from Banda Aceh into Pidie (the last sub-district surveyed is Meurah Dua) and moving south into Aceh Barat (the last sub-district surveyed is Meuruebo). These include villages on islands offshore. The map shows household survival rates by village (yellow being the worst). Unfortunately, the map is based on the post-tsunami government rendering of village boundaries which is grossly inaccurate. We took GPS readings of the center (the mosque) of the living area of each village. In only 6% of the cases is the GPS reading within the supposed village boundaries. In 15% of the cases, it is over 10 kilometers away. Coastal villages are drawn as non-coastal and vice-versa which explains why, in parts of the map, a yellow (low survival) village may be shown next to a supposed coastal village which is dark (high survival). Nevertheless the map depicts the general survey area.



Appendix 2. House and boat NGOs operating in one village

a. House NGOs operating in one village

Name of housing agency	Type	No. of village projects	No. of houses	Village Head reports		Fishermen reports	
				Mean quality	Mean quality (weighted)	Mean count of faults	No. of fishermen
Yayasan Budha Tzu Chi	Donor-Imp.	1	850	3.00	3.00	1.33	3
Islamic Relief	Donor-Imp.	1	668	3.00	3.00	0.00	4
Indonesia Red Cross	Donor-Imp.	1	401	3.00	3.00	1.00	2
Yayasan Budha Suci	Donor-Imp.	1	241	3.00	3.00		
The Salvation Army	Donor-Imp.	1	109	3.00	3.00		
Brunei Darussalam	Donor-Imp.	1	70	3.00	3.00		
Terre des Hommes	Donor-Imp.	1	48	3.00	3.00	3.00	5
World Relief	Donor-Imp.	1	42	3.00	3.00	0.00	3
Qatar	Donor-Imp.	1	170	2.50	2.50	2.00	1
Bakrie Group	Donor-Imp.	1	204	2.00	2.00	1.33	3
CARDI/NRC(Norwegian Refugee Council)	Donor-Imp.	1	202	2.00	2.00		
Chamber of Commerce and Industry of Indonesia(KADIN)	Donor-Imp.	1	100	1.00	1.00	0.00	3
Atlas Logistique	Int'l Imp.	1	274	3.00	3.00	0.00	6
Islamic Development Bank	Int'l Imp.	1	167	3.00	3.00		
Jesuit Refugee Services	Int'l Imp.	1	106	3.00	3.00		
Sara Henderson	Int'l Imp.	1	51	2.00	2.00		
Sinohidro China	Domestic Imp.	1	606	3.00	3.00	0.00	2
P2KP (Program Penanggulangan Kemiskinan di Perkotaan)	Domestic Imp.	1	400	3.00	3.00		
Lion's Club	Domestic Imp.	1	250	3.00	3.00		
GAA and Hivos funds	Domestic Imp.	1	184	3.00	3.00		
Welthungerhilfe	Domestic Imp.	1	174	3.00	3.00		
Yayasan Sosial Kreasi	Domestic Imp.	1	118	3.00	3.00		
YAKKUM Emergency Unit	Domestic Imp.	1	118	3.00	3.00		
Plan International	Domestic Imp.	1	96	3.00	3.00		
Yayasan Tanggul Bencana di Indonesia	Domestic Imp.	1	38	3.00	3.00		
Yayasan SHEEP	Domestic Imp.	1	31	3.00	3.00		
World Bank	Domestic Imp.	1	309	2.50	2.50		
Chinese Red Cross	Domestic Imp.	1	300	2.50	2.50	0.00	1
Kuwait	Domestic Imp.	1	2	2.50	2.50		
The Saudi Charity Campaign	Domestic Imp.	1	256	2.00	2.00	0.60	10
Yayasan Berkati Indonesia	Domestic Imp.	1	90	2.00	2.00	2.00	4
CORDIA Medan	Domestic Imp.	1	72	2.00	2.00		
Soroptimist International of Jakarta	Domestic Imp.	1	220	1.00	1.00	1.00	3
Mercy Corps (several)	Domestic Imp.	1	200	1.00	1.00	2.00	1

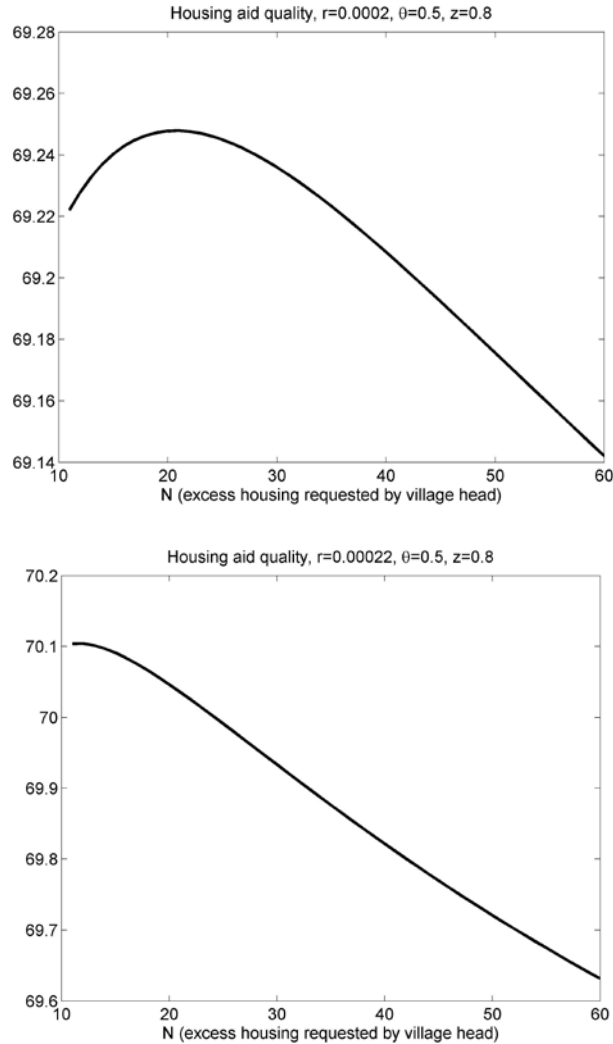
b. Boat NGOs operating in one village

Name of boat agency	No. of village projects	No. of boats provided	Failure rate	Failure rate (weighted)
German Information Technology Executive Council(GITEC) ¹	1	50	0	0
Catholic Relief Service	1	35	0	0
Saragih (rich person)	1	34	0	0
Tearfund	1	17	0	0
Yayasan Sosial Kreasi	1	10	0	0
CARE	1	8	0	0
Yayasan Berkati Indonesia	1	7	0	0
Aceh Relief Fund	1	6	0	0
AUSTCARE	1	6	0	0
ACTED - Agency for Technical Cooperation	1	5	0	0
YPK	1	5	0	0
Personal Aid	1	3	0	0
Save the Children	1	2	0	0
British Red Cross	1	1	0	0
Obor Berkat Indonesia	1	1	0	0
YJK	1	1	0	0
Diantama (Rich Person)	1	5	0.20	0.20
World Relief	1	25	0.40	0.40
UN	1	50	0.50	0.50
Food and Agricultural Organization	1	9	0.89	0.89

Notes: 1. GITEC includes the German Technical Cooperation (GTZ) and the German Development Bank (KFW)

Appendix 3. Relation between housing quality and excess housing

The top figure illustrates the case where $r=0.0002$. As the excess housing requested by the village head increases from 20, via reduction in γ , the quality of housing aid declines. However, note that this relationship is positive when excess housing requested is less than 20. This relationship between housing quality and excess housing is sensitive to r as can be seen in the bottom figure. Raising r to 0.00022 makes the relationship monotonic over the whole domain.



Appendix 4. Guarantees and housing quality reported by village heads and fishermen

In column 1 of the table to this Appendix, the offering of guarantees is only significantly correlated with one village characteristic, whether the mullah survived the tsunami or not. This might suggest that there is some modest room for negotiation about whether guarantees are offered. Donor-implementers are more likely to offer guarantees than other types of agencies, and all types are more likely than BRR. In terms of possible impacts, in column 2, with the exception of BRR, interacting implementer type with the count of guarantees offered (0, 1, 2) suggests overall that the offer of guarantees is correlated with higher house quality. A breakdown (not shown) into each type of guarantee shows both types matter, with the cement composition test being much more widespread and having stronger associations. The fact that guarantees by BRR, a big provider, are not associated with quality improvements suggests the guarantees do not always have real value. Columns 3 and 4 concern other matters discussed in the text.

Appendix 4 table

Dependent Variable:	Guarantees ⁺	Subjective quality		Count of faults
	(1)	(2)	(3)	(4)
Ln(no. households post-tsunami)	0.0494 (0.0777)	0.00262 (0.0539)	0.0486 (0.0847)	0.0953 (0.198)
Survival rate population	0.120 (0.0918)	-0.129* (0.0773)	-0.201 (0.180)	0.0370 (0.313)
Mullah survive	0.215** (0.0992)	0.130 (0.0922)	0.0633 (0.113)	0.166 (0.228)
Pre-tsunami arisan group	-0.0352 (0.107)	0.0831 (0.0974)	0.230* (0.123)	-0.109 (0.170)
Ln(distance to Banda Aceh)	-0.0115 (0.0944)	0.0720 (0.0964)	0.161 (0.109)	0.119 (0.143)
Ln(no. houses destroyed)	-0.0460 (0.0383)	-0.0262 (0.0307)	-0.105* (0.0600)	0.0113 (0.0567)
Provider: Donor-Implementer x 1st project	0.806*** (0.137)	0.303 (0.199)	0.470** (0.205)	-0.696** (0.340)
x 2nd or 3rd project	0.366*** (0.128)	-0.438* (0.255)	-0.113 (0.282)	-1.192** (0.566)
Provider: Int'l Implementer x 1st project	0.246 (0.197)	0.192 (0.237)	0.298 (0.303)	-0.717 (0.540)
x 2nd or 3rd project	0.367** (0.147)	0.364** (0.180)	0.548** (0.213)	-2.688*** (0.965)
Provider: Dom. Implementer x 1st project	0.269** (0.134)	-0.367 (0.241)	-0.619*** (0.232)	-0.148 (0.292)
x 2nd or 3rd project	0.221* (0.114)	0.0211 (0.210)	0.111 (0.262)	-0.0827 (0.361)
Provider: BRR x 2nd or 3rd proj	0.163 (0.117)	0.0228 (0.176)	0.124 (0.212)	-0.369 (0.383)
Guarantee x Donor-Implementer x 1st project		0.166* (0.0897)		
Guarantee x Donor-Implementer x 2nd or 3rd proj.		0.677*** (0.150)		
Guarantee x Int'l Implementer x 1st project		0.295** (0.125)		
Guarantee x Int'l Implementer x 2nd or 3rd proj.		0.0448 (0.128)		
Guarantee x Dom. Implementer x 1st project		0.329* (0.169)		
Guarantee x Dom. Implementer x 2nd or 3rd proj.		0.323** (0.131)		
Guarantee x BRR x 1st project		0.0983 (0.197)		
Guarantee x BRR x 2nd or 3rd proj.		0.109 (0.144)		
Fishermen level covariates				Yes
Kabupaten dummies	Yes	Yes	Yes	Yes
Observations	349	322	157	371

Notes: The sample for Column (3) is village projects where fishermen are interviewed and for column (4) is the fishermen where agency levels are known. Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

⁺ Guarantees are whether the NGO offered to test cement quality used in construction or offered a six month to one year guarantee to repair defects. If the project has both types of guarantee a two is assigned, and if the project has only one type of guarantee a one is assigned.

Appendix 5. Religious practices and traditional occupations

Dependent variable:	Poisson: Evening pray count per week, 09		Probit: Occupational choice to stay a fisherman in 09	
	(1)	(2)	(3)	(4)
Family size	0.00612 (0.0140)	0.0112 (0.0137)	0.0352*** (0.0131)	0.0375*** (0.0132)
Age of household head	0.00626*** (0.00205)	0.00577*** (0.00211)	-0.0108*** (0.00242)	-0.0112*** (0.00240)
Education of HH head (levels 1-8)	0.0218 (0.0177)	0.0160 (0.0180)	-0.0995*** (0.0191)	-0.102*** (0.0187)
Ln(distance to Banda Aceh)	-0.0370 (0.0556)	-0.0439 (0.0571)	-0.205*** (0.0480)	-0.181*** (0.0442)
No. of mosques	0.0659 (0.0435)	0.0613 (0.0401)		
No. of dusan (sub-villages)	-0.0187 (0.0209)	-0.0341 (0.0224)		
Pre-tsunami boat owner			0.0941** (0.0457)	0.109** (0.0456)
Successor fishing family			0.127* (0.0669)	0.132* (0.0681)
Major housing provider: Donor-implementor	0.0608 (0.0753)		-0.0701 (0.0750)	
Major housing provider: Int'l implementor	-0.115 (0.0948)		-0.169* (0.0990)	
Major housing provider: Domestic Implementor	0.159** (0.0744)		0.0591 (0.0716)	
Fraction houses by Christian agency		-0.123 (0.118)		-0.226** (0.0937)
Village controls	Yes	Yes	Yes + no. of aid boats and fishing family in 07	
Kabupaten dummies	Yes	Yes	Yes	Yes
Observations	586	586	571	571

Notes: Robust standard errors clustered at the village level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Data Appendix

The village surveys in summer and fall 2005, fall 2007 and fall 2009 ask questions about education, experience, and survival of village and religious leaders; population composition by sex and age both before and after the tsunami; migration; occupational structure; destruction of village lands, seawalls, aquaculture areas, docking areas and mangroves; pre- and post-tsunami data on political, legal, and social institutions; pre and post tsunami information on physical capital (houses, boats, public buildings); detailed information on initial and ongoing operations of NGOs, local governments, and relief agencies providing housing, boats, public buildings and restoration of the coast line; and detailed information on the village fishing industry pre- and post-tsunami, including questions on marketing, fishing fleet composition, catch composition and boat replacement. The 2005 survey of 111 villages focused on benchmarking destruction and village conditions. The 2007 and 2009 surveys of 199 villages (including the original 111) focused on aspects of the aid effort and institutional transformation of villages, such as the democratic evolution and quality of aid as related to different types of aid agencies.

The fishermen surveys ask about family structure, occupations, social status, income and aspect of debt and wealth, housing and boat destruction and aid, fishing productivity, and family participation in village activities. The 2005 survey focused on 475 original boat owners and captains in 77 villages (about 40% of surviving captains and owners in those villages), benchmarking family destruction of people, housing and boats, as well as pre-tsunami productivity. The 2007 and 2009 surveys follow these families, marking their rebuilding of families, new occupational choices, aid received, re-establishment or not of fishing activities, and evolving family participation in village life. In the second wave as followed in the third, besides the original families we extended village coverage and added a module for new boat owners—villagers given an aid boat who had never owned a boat. In the second wave (2007) we have about 700 families in 96 villages and in the third wave (2009) after some sorting and attrition we drop coverage to about 635 fishing families in 90 villages. Here our focus is on the quality of aid received and response to low quality boat aid.

We need to empirically classify the aid agencies in Aceh. The agencies we focus on are those reported by the village head in 2009 as having delivered aid in their villages. We classify each agency that shows up in the survey as whether it is international or local, government or private, and its religious affiliation if it has any. However, we are unable to classify each agency's principal or agent, i.e., donor or implementer status in Aceh simply based on agency names. For this we utilize an additional source of data. The Indonesian government, working with the UN, has also recorded aid delivery aspects in the "RAN" [Recovery Aceh-Nias] database [<http://rand.brr.go.id/RAND/reference>]. We use the RAN database to classify agency types, particularly whether it was an implementing agency or a funding agency or both in Aceh. In RAN, for each project in a village a first level implementer is named as well as the underlying donors, often many in number. A first level implementer is the leading agency that either directly hires the labor to be used in construction or monitors any sub-contractors.

We classify an agency named by the village head as a donor-implementer if it appears as both a donor and implementer in at least 30% of the villages it provides housing in RAN.³⁶ Although we drew a 30% cutoff, almost all agencies we classify as donor-implementers are *always* both donor and implementer in our villages. Donor-implementers typically have on the ground operations with central offices in Banda Aceh (capital of Aceh), and large teams of trained people in the field. All agencies in this category are considered international agencies as well³⁷.

We define an international implementer, if the agency named by the village head is an international first level implementer representing a different, usually international donor in RAN. While their donors face the agency problem of monitoring the quality of aid delivered by the implementer, these implementers have international reputations at stake.

The domestic implementer category occurs when a village in our survey names an aid agency that is a domestic implementer or an agency which according to RAN is just a donor and not an implementer. As such, the underlying domestic or international donors must hire a domestic implementer. As the visible aid agency, sometimes the village head names the international donor rather than the domestic implementer—perhaps a function of greater visibility. For example, some international donors (such as religious NGOs) sent delegations for short visits to villages where their money was being spent. Some international donors and their domestic implementers are

³⁶ In some cases an NGO has multiple projects in the same village. We require for at least one of those they are both the donor and implementer

³⁷ One organization, the Bakrie Group, is actually a domestic agency. However, unlike the many temporary local NGOs, the Bakrie Group is one of the largest Indonesian business conglomerates and is not short lived and has a reputation to take care for. Hence, we classify it into the donor-implementer category rather than including it in the domestic implementer category.

intertwined by village heads. Either their names are explicitly linked, or in one year one agency is named and in another the other is named. Common examples include NORLINK/Salam Aceh and Caritas/Mammamia. Appendix Table 1 summarizes the agency classification based on RAN.

Variables	Obs	Mean	Variable	Obs	Mean
A. Village level variables			C. Fishermen level variables		
Total housing aid in 09	190	199.211	Count of faults in house	643	1.036
No. of households post-tsunami	190	177.105	Count of additions in house	643	2.300
Survival rate population	188	0.749	Count of rooms	577	1.920
Mullah survive	189	0.651	Family size in 09	643	4.005
Pre-tsunami arisan group	190	0.684	Household head age in 09	640	42.923
Distance to Banda Aceh	188	67.659	Household education in 09	637	3.551
No. of houses destroyed	185	210.984	Agency is D-I	587	0.317
Dominant provider is BRR	190	0.200	Agency is BRR	587	0.104
Dominant provider is D-I	190	0.432	Agency is Int'l Imp.	587	0.210
Dominant provider is Int'l Imp.	190	0.116	Agency is Dom Imp.	587	0.370
Dominant provider is Dom Imp.	190	0.247	1st level D-I	289	0.208
Number of housing projects	190	1.947	2nd or 3rd level D-I	289	0.014
Percent centrally piped water	180	40.706	1st level Int'l Imp.	289	0.028
Number of public buildings	190	3.679	2nd or 3rd level Int'l Imp.	289	0.014
Number of Co-op buildings	190	0.516	1st level BRR	289	0.135
Percent roads paved	185	53.319	2nd or 3rd level BRR	289	0.166
Plant pines, grasses	160	0.450	1st level Dom Imp.	289	0.370
			2nd or 3rd level Dom Imp.	289	0.066
B. Project level variables			Have leakyroof	643	0.260
Subjective quality	341	2.4619	Have cracked wall	643	0.328
Objective quality	370	0.7351	Have poor foundation	643	0.207
Agency is D-I	570	0.1912	Have faulty plumbing	643	0.241
Agency is BRR	570	0.1930	Have kitchen	643	0.628
Agency is Int'l Imp.	570	0.1070	Have bathroom	643	0.890
Agency is Dom Imp.	570	0.1579	Have plumbing	643	0.782
1st level D-I	570	0.1439	Evening pray count	632	4.220
2nd level D-I	570	0.0351	Household size in 09	643	4.005
3rd level D-I	570	0.0123	Fishermen in 09	643	0.664
1st level BRR	570	0.0667	Previous boat owner	643	0.499
2nd level BRR	570	0.0982	Fishing family succession	645	0.081
3rd level BRR	570	0.0281			
1st level Int'l Imp.	570	0.0386			
2nd level Int'l Imp.	570	0.0421			
3rd level Int'l Imp.	570	0.0263			
1st level Dom Imp.	570	0.0825			
2nd level Dom Imp.	570	0.0526			
3rd level Dom Imp.	570	0.0228			