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Targeting and Distribution of Post-Tsunami Aid in Sri Lanka: A Critical Appraisal

Asha Gunawardena
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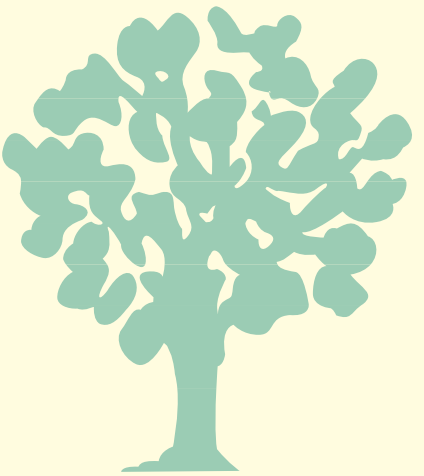

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Abstract

In this study, we examine two types of aid transfers - boats and houses - that were made to rehabilitate tsunami-affected fishery households in Sri Lanka. Our goal is to investigate the distributional impacts of these transfers and the effectiveness of targeting. The study also attempts to quantify the factors underlying the allocation of such asset transfers. Data for this study comes from the Census of Tsunami, conducted by the Department of Census and Statistics in 2005, and a follow-up survey undertaken by us in 2008 for a sub-sample of fishery households. Our findings suggest that that there was better targeting of households with regard to the allocation of houses than boats. The findings also show that housing transfers resulted in improved asset equality among fishery households compared to what existed in the pre-Tsunami period. The boat transfers on the other hand were not only poorly targeted but also increased asset inequality. The findings of the study also reveal that households who had access to social networks were more likely to receive aid transfers. Apart from household characteristics, regional disparities also played a role in the allocation of aid due to differences in access to infrastructure facilities, political preferences or the presence and absence of political turmoil. The findings of the study highlight the importance of making a special effort to identify certain sub-sets of people such as the very poor and marginalized groups, as well as households who lost human capital, when it comes to targeting aid in disaster situations.

Key words: Aid targeting and distribution, Government policies, Social transfers, Post-disaster development, Sri Lanka.

Targeting and Distribution of Post-Tsunami Aid in Sri Lanka: A Critical Appraisal

Asha Gunawardena and Kanchana Wickramasinghe

1. Introduction

Natural disasters are becoming an increasingly more prominent feature of the global landscape. In recent years, the world has witnessed massive destruction due to natural disasters. The frequency of occurrence and the economic impact of such disasters have been increasing from the 1970s (CRED, 2008). South Asia in particular is highly susceptible to such natural disasters due to high population density, high levels of poverty, and the heavy dependence on monsoonal rains. Floods, wind storms, earthquakes, droughts and wave/surges including Tsunamis were the main types of natural disasters that have created havoc in the region in the recent past. The number of recorded natural disasters in the region from 1990-2007 were about 680, which resulted in some 400,000 human deaths and large numbers of people injured and displaced, in addition to the massive losses economically (CRED 2008).

Development aid in terms of social transfers to the victims of the calamities plays a major role in post-disaster situations of South Asian countries given their high vulnerability to such risks as well as other factors such as their low-income levels. Recent studies have shown that the priority in such situations should not only be on increasing the aid effort by raising and transferring more money but on increasing aid effectiveness by targeting the right recipients (Mavrotas, 2009). Very few studies to date have investigated post-disaster development aid in order to determine how effective these interventions are in achieving the intended objectives.

Sri Lanka was one of the countries most affected by the Asian Tsunami that occurred on December 26, 2004, which resulted in more than 35,000 dead, over 20,000 injured, and several hundred thousand people displaced (GOSL 2005). This is also the largest natural disaster in the recorded history of Sri Lanka. The loss of or damage to property was equally high. About 89,000 houses were fully or partially damaged (DCS, 2005). The number of people who lost their livelihoods amounted to 150,000. The fisheries sector was the most seriously affected economic sector. The loss of lives among fishermen was estimated at 5000 with 71,500 households directly affected. Fishermen lost about 16,000 crafts while roughly 7000 crafts were damaged due to the Tsunami (Amarasinghe, 2006). The total property damage in the fisheries sector, including damage to fisheries infrastructure, was estimated at US $391 million (ICSFW, 2005). In addition, many coastal protection structures and coastal ecosystems were either disturbed or destroyed.

Following the Tsunami, Sri Lanka was fairly efficient and effective in providing immediate relief to the victims. However, rehabilitation proved to be more challenging due to a variety of reasons. The delivery of post-Tsunami interventions was not systematic and planned. Concerns have also been raised about poor targeting and distributional issues (MFAR, 2006) in a context where accurate pre-Tsunami information was not available. The situation was aggravated by poor coordination among government agencies and local and international donors as well as local level poor capacities with regard to receiving and distributing aid. This was compounded by the different interests and priorities of donors.

This study seeks to examine how well aid was transferred during the post-Tsunami period in Sri Lanka. It focuses on two main social transfers: the transfer of houses and boats, as part of efforts to rehabilitate Tsunami-affected fishery households in six districts of Sri Lanka. The study asks three sets of questions: a) were households who received aid in the post-Tsunami period better-off relative to the pre-Tsunami situation i.e. did aid improve the asset holdings of affected households? And, did aid transfers result in more equitable distribution of assets among households or did they result in households becoming more un-equal i.e. what was the distributional impact of such asset transfers on affected fishery households? b) how effective was aid targeting, i.e. did households who lost assets due to the Tsunami receive aid or did aid go to the wrong recipients? And c) what were the determinants of aid allocation at the household level.

The study draws its data from a census of Tsunami-affected households that was conducted just after the Tsunami and a follow-up survey of a sample of Tsunami-affected fisher households conducted in 2008. The study findings reveal that the targeting and allocation of housing aid was better compared to boat aid. In addition, the distribution of houses in the post-Tsunami period was also more equal when compared with the pre-Tsunami situation. On the other hand, the distribution of boats was less equal resulting in small boat owners losing benefits they had previously enjoyed while relatively big boat owners gained more expensive boats. However, it is interesting to note that total asset (houses and boats) distribution among households in the post-Tsunami period become more equal compared to the immediate pre-Tsunami situation.

We observe regional disparities in the allocation of aid. The findings of the study show that access to social networks plays a significant role in receiving aid by households. Further, households that experienced loss/death of, or injury to, a family member (members) were more likely to allocated cheaper houses and were less likely to own boats in the post-Tsunami period, i.e. they seem to be discriminated against in aid delivery. Thus, there is a need for donors to be alert to special sub-sets of people in disaster situations and to make a special effort to reach them in their aid transfers.

The rest of the paper is organized as follows. Section 2 reviews the available literature on the targeting of social of transfers. Section 3 describes the policies and programs on the distribution of houses and boats in the post-Tsunami period. Section 4 discusses the study area, the data and the data collection methods. Section 5 examines the distributional impact of asset transfers and Section 6 investigates the effectiveness of the targeting of these asset transfers. Section 7 attempts to examine the determinants of allocation of aid transfers. The final section concludes with policy recommendations.

2. Targeting of Social Transfers

Targeting is the means by which to identify the potential members of a society who will receive the particular benefits of a social transfer. There are two elements in targeting: setting the eligibility criteria and establishing a mechanism by which to identify those individuals or households who meet the eligibility criteria (Rachel *et al,* 2009).

The basic aim of any development aid within a country is improving the welfare of beneficiaries and ultimately improving social and economic distribution within the community and society. Targeting specific groups may be preferable to universal transfers for several reasons. Firstly, most such interventions are provided by the government which is constrained by a limited budget.

Thus, an efficient and effective use of the available budget while meeting the objectives of the intervention is important (Coady *et al*., 2004; Basely & Kanbur, 1990). Secondly, universal transfers can distort the local economy, for example, food-aid distribution can affect local food prices and labour allocation (Jayne *et al*., 2002).

Targeting is also associated with costs. Improved targeting will likely incur administration costs such as the costs of gathering information, conducting surveys and conducting means-testing of households. In addition, the time taken for precision targeting will also be comparatively high. Moreover, there will be private costs to the beneficiaries involved in receiving transfers. For instance, in cases of "cash-for-work" programs where targeting is done through self-selection, households have to bear the cost of foregone income opportunities, the opportunity cost of queuing, and the cost of providing necessary documents to prove their eligibility (Coady *et al*., 2004). Apart from private costs, there can be indirect costs as beneficiaries may change their behavior in order to meet the eligibility criteria. Social stigma associated with being a beneficiary is another fall-out that the beneficiaries may encounter within the community while there can be political costs due to a reduction in social cohesion because the targeting of a particular group may lead to resentment among non-targeted groups in the community against the recipients. These costs imply that there could be a trade-off between targeting specific group of people and reaching a high number of beneficiaries.

Researchers have come up with three main approaches to the targeting of social transfers: individual or household level assessment, categorical targeting and self-selection. Individual or household level assessment can be done in three different ways: mean testing, proxy mean testing, and community based targeting (Coady *et al.*, 2004). Mean testing compares the income or expenditure of an individual or household with some threshold level. Proxy mean testing uses a few indicators, such as certain household characteristics that are easy to observe, and develops a score for each household on that basis. In case of community-based targeting, donors delegate the authority to the community to select the beneficiaries. The second main approach, or categorical targeting, happens when only individuals or households in a specific category are eligible to receive intervention. Targeting based on region (geographical targeting) or demographic factors such as age and sex can be included under this category. The third approach, or self-targeting, provides universal eligibility with no administrative restrictions on participation but its design is such that it encourages the more needy to participate because it factors in the differences between the private cost of participation for the poor and wealthy households(Coady *et al.*, 2004). Examples are programs that involve low-quality subsidized food, queuing to obtain transfers, or cash-for-work where the opportunity cost of participation is costly for wealthy households.

The targeting of aid for the purpose of social transfers is a challenging task while measuring the performance of such programs is even more difficult. Barrett (2002) associates poor targeting with mainly two kinds of problems: errors of exclusion (i.e., missing intended beneficiaries) and errors of inclusion (i.e., providing benefits to the non-needy). For example, the *Samurdhi* Program, which is the main poverty-alleviation program in Sri Lanka, is based on means testing (where the beneficiaries are households that earn income below Rs.1500/= per month). But it misses 36% of deserving beneficiaries while it includes 40% from higher income brackets (Goonasekara & Gunatilake, 2005). Therefore, according to Barrett (2002), one approach to measuring the performance of targeting is to compare the percentage of households under coverage due to both errors of exclusion and leakage (that is, due to errors of inclusion). However, this approach using the above two indicators has limitations such as its failure to account for more distributional information and its focus on only the number of recipients but not the amount of transfers (Coady

et al., 2004). In this paper, we examine the effectiveness of targeting by looking at errors of exclusion in housing and boat transfers (see section 6 for further details).

It is useful to examine the factors influencing the targeting and allocation of aid to households. But only a few studies are available to date on a multivariate household level analysis of the targeting of social transfers. Galasso & Ravallion (2000) analyzed targeting and the distribution of food-for-school programs in Bangaladesh and found that decentralized social programmes are mildly pro–poor. They observed better targeting with in villages. In addition, they found that the presence of local institutions such as cooperatives of farmers and landless appear to be associated with pro-poor targeting while the presence of recreational clubs has opposite effect. Jayne *et al.* (2002) on the other hand have examined the factors underlying the allocation of food aid and the extent to which the food aid targets poor households and communities. They undertook a multivariate household analysis using a comprehensive set of panel data from Ethiopia and found that there was a spatial rigidity in food-aid distribution over time due to the fixed cost of setting up operations, political lobbying by the recipients, and/or other reasons. They concluded therefore that food aid had not reached the poorest households and communities in that region. In Section 7 of this paper, we build on these two papers to examine the determinants of boat and housing transfers in Sri Lanka.

The literature on targeting focuses largely on relief programs such as food aid, cash-for-work, and food-for-work. There are also studies on conditional programs such as cash for school enrollment and regular attendance at health care programs.[1] Our study, on the other hand, focuses on asset transfers: housing and boats, for the purpose of rehabilitating Tsunami-affected fishery households. These asset transfers aim at achieving long-term development among the affected households. To date, there has been very little development literature on the targeting of asset transfers, especially in post-disaster situations.

3. Policies and Programs on Housing and Boat Distribution in the Post-Tsunami Period

There was a high level of interest from the government, multilateral donors, international and local NGOs, and the local private sector in rehabilitating the affected people in the immediate aftermath of the 2004 Tsunami. However, the rehabilitation of affected households posed a challenge due to many reasons. First, there was little coordination and planning behind this interest and effort. Different donors had different interests, budgets and time-constraints. For example, when it came to replacing boats, providing small coastal boats was seen as an attractive quick fix as well as a way to publicize their work for many NGOs and other donors who were under pressure to distribute a large amount of funds within a short period of time (MFAR, 2006). The problem was compounded by the absence of accurate reliable pre-Tsunami data as some of the information available with village heads had also been washed away in the Tsunami waves. In case of the

[1] Conditional cash transfers are currently popular and extensively used in several countries. These programs provide money to poor families, conditional on certain behaviors, such as compulsory school enrollment of children and regular attendance at child-care services. Such programs are aimed at addressing not only short-term consumption needs but also long-term poverty reduction via human capital accumulation through improvements in education, health and nutrition. Evidence from many countries suggests that large efficiency gains (reducing leakages) can be achieved by improving targeting to poor households and better calibration of conditional transfers as opposed to the universal uniform cash transfers (Janvry and Sadoulet, 2006).

fisheries sector, the main problem had to do with the lack of information on the composition of the fishing fleet and of fishery households, especially in the case of small scale fishers, due to the informal nature of their vocation. Although the registration of boats was a legal requirement for fishing, a majority of small-scale fishers had not registered and obtained licenses. Furthermore, the lack of prior exposure to and thus experience of disasters of such magnitude and, hence, the lack of capacity at local levels to deal with the contingencies arising from them made development efforts more difficult.

Our field discussions with affected households revealed that a permanent house was the main priority of affected people as a majority of them were living in temporary shelters. In March 2005, the government declared a no-build zone (which was meant to be a buffer zone) of 100m in the southern and western provinces and 200m in the northern and eastern provinces. In addition, the government introduced two approaches to providing housing assistance: the owner-driven program for households that were located outside the buffer zone and the donor-driven program for those that were located within the government-declared buffer zone. The government agreed to provide grants and loans to those whose houses were fully (that is, more than 40% damage)[2] or partially damaged and lived outside the declared buffer zone in order to rebuild their houses in the same location. In order to qualify for the entitlement, the government required the households to provide proof of ownership to the land on which they lived.

This policy did not permit families who lived within the buffer zone limit to rebuild their damaged or destroyed houses. Thus they were to be provided with new houses built with donor assistance on government land while allowing them to retain ownership of the original land. Nor did the government require them to demonstrate ownership of the former land in order to qualify for housing assistance. Guidelines were set by the Urban Development Authority (UDA) on the floor size (a minimum 500 sqft) of the new houses and on the amenities that the houses would be provided with such as electricity, drinking water, sanitation, drainage and access roads, etc. The other feature of this policy was a "house for house", according to which even extended families were entitled to receive only one standard-sized house irrespective of how big their former house had been (GOSL, 2005)

Unfortunately, the progress of the house construction and resettlement program has been slow because of the unavailability of suitable lands close to the affected villages. This has forced households who lived within the buffer zone to continue in temporary shelters for years. The slow pace led the government to relax the buffer zone policy in 2006 along with a revised Tsunami housing policy. The revised housing policy refers to two zones[3] based on the Coastal Management Plan of 1997 of the Coast Conservation Department and aims at providing housing to all affected households irrespective of whether they owned land formerly or not. In addition, the government and other donors arrived at co-financing arrangements to build houses as the housing grant provided through the government was inadequate. The government also introduced a system of cash grants (IPS, 2006).

Most of the post-Tsunami livelihood programs focused on providing cash for work, the replacement of assets (that is, boats and fishing tools), grants and loans to start a small business,

[2] Housing grants given by the government were Rs 100,000 (USD 1000) for partially damaged houses and Rs 250,000 (USD 2500) for fully damaged houses.

[3] Zone 1 refers to state reservations within the Tsunami-affected coastal areas while Zone 2 refers to the other areas.

and alternative livelihood training programs. However, there were not many livelihood training programs focusing on the fishery sector. Hence, only some fishery households in Trincomalee received training on boat repairing. While the fishery sector lost a lot of physical assets, livelihood programs confined themselves mainly to the provision of boats and fishing tools and did not extend to the implementation of holistic livelihood restoration. Boat donations were mainly by NGOs and poor coordination between the government and NGOs as well as the absence of an accurate information system in the fishery sector made targeting more challenging (MFAR, 2006). Moreover, unlike in the case of house transfers, there was no policy when it came to the targeting and allocation of boats.

Two studies prior to the Tsunami have shown that the coastal fisheries sector in Sri Lanka has reached the optimum level of exploitation and further exploitation would lead to over-exploitation (Dayaratne, 1996; Wijeratne, 2001). These studies indicate therefore the necessity of controlling the fishing effort and introducing proper management strategies in order to avoid the depletion of stocks. However, the MFAR has not been successful in addressing these issues in a timely and effective manner. This situation has worsened after the Tsunami because of the unplanned supply of new coastal boats. MFAR suspects that the oversupply of boats/crafts through Tsunami rehabilitation programs may result in an over-exploitation of coastal fisheries due to increased fishing (MFAR, 2006). National-level data from the Boat Census conducted by MFAR in 2006/ 2007 reveals that the total fishing fleet has increased by 35% in the post-Tsunami period when compared with pre-Tsunami numbers (MFAR, 2008).

4. Study Area and Data

4.1 Data Collection

The 2004 Tsunami affected thirteen coastal districts in Sri Lanka (see Map 1). Of the thirteen districts, 8 were more severely affected in terms of the extent of the impact on livelihood activities, the extent of the damage to housing units, and the number of the injured and dead in households. We thus choose to focus on those 8 districts. However, we decided to leave out the two districts from the Northern Province because of difficulty in collecting data from these areas due to the uncertain security situation that prevailed in northern Sri Lanka at the time of data collection. We are thus left with 6 districts: Galle, Matara and Hambantota from the Southern Province and Batticaloa, Trincomalee and Ampara from the Eastern Province[4].

The study used the Tsunami Census conducted by the Department of Census and Statistics, Sri Lanka, in 2005 as its source for baseline data. The Census had based its identification of households for the survey on the housing damage that occurred due to the Tsunami. The Census covered pre-Tsunami socio-economic conditions, the extent of damage to household members (both deaths and injuries), and data on both the ownership of the pre-Tsunami house and other assets as well as the damage to the house and other assets due to the Tsunami. In addition, we used the Census of Fishing Boats conducted by the Ministry of Fisheries and Aquatic Resources in 2006/2007 for purposes of cross-checking current boat ownership of households.

We also collected primary data using both quantitative and qualitative methods. We used data from the Tsunami Census as baseline information in order to draw a stratified random sample of

[4] Sri Lanka is divided into 9 provinces namely Southern, Northern, Eastern, Western, Central , North Western , North Central, Uva and Sabaragamuwa

fishery households which was 396 in number. We carried out a follow-up survey of the 396 fishery households in the selected 6 districts. As there are several Divisional Secretary's Divisions (DSDs) under each selected district, we decided on the number of DSDs to be surveyed based on the percentage of affected fishery households that lived in each district. We listed the number of DSDs from each district where more than 10% of the fishery households were affected. We randomly selected the number of DSDs required for each district from this list. For each selected DSD, we identified a list of *Grama Niladari* Divisions (GNDs) where there were more than 5% affected fishery households. We then selected three *Grama Niladhari* Divisions (GNDs) from each selected DSD. Table 2 shows the selected DSDs and GNDs from the 6 districts. The study selected 39 GNDs from the 13 DSDs. Once again, we randomly selected ten fishery households from each selected GND (see Table 1 for more details).

We collected data from the selected sample of fishery households with the use of a pre-tested structured questionnaire (see Annexure 2). The questionnaire obtained post-Tsunami information (that is, the situation that prevailed in 2008) on the fishery households such as their socio-economic status, family information, home ownership and ownership of livelihood-related and other assets, housing conditions, access to infrastructure, access to community-based organizations, and sources and amount of various assets received as aid.[5] In addition, we recalled data which were not available in the Tsunami Census such as pre-Tsunami data on livelihood-related assets.

Two qualitative methods were employed in order to obtain an in-depth understanding of the context and issues:

a) Key informant interviews**:** We conducted interviews with key informants such as relevant government officials, fishery inspectors, *Grama Niladhari*,[6] representatives of fishery cooperatives, and officials of other relevant organizations in order to get a better understanding of the issues related to the targeting of beneficiaries and problems related to post tsunami reconstruction. We conducted these interviews in each of the six districts during the first quarter of 2008.

b) Focus group discussions**:** We conducted nine focus group discussions in the selected communities in the six districts chosen (see Table 1). Each focus group consisted of different types of fishers (boat owners, crew members, etc.) and households who engaged in the fish trade and other related services. Participants of the focus group were selected with an eye to representativeness in terms of the major age groups (young, middle aged, old) and socio-economic status. We utilized the information collected and knowledge gained from in-depth interviews and focus group discussions in order to develop the structured questionnaire for the household survey.

4.2 Construction of Variables: Calculation of Current and Pre-Tsunami Asset Values

We used the guidelines of the Urban Development Authority (UDA) to calculate house values. First, we classified houses as temporary or permanent based on materials used for construction (i.e., wall, roof and floor materials). Then we calculated house values based on floor area, age of the house and house type with the use of UDA guidelines (for further details, see Annexure 1).

[5] However, we do not have information on the actual amount of housing aid received by each household.

[6] *Grama Niladhari* is the official designation of the officer in charge of the village

We calculated pre-Tsunami house values at current prices in order to adjust values against inflation. We collected the current value of boats and the current value of the pre-Tsunami boats from our household survey. In addition, we collected information on boat type and the year the household bought or received the boat. We checked the boat values given by households against values available from MFAR and private boat yards based on the boat type and the age of the boat. We assumed 5% boat depreciation for each year and the productive period of a boat as 15-20 years.[7] We value both pre-Tsunami and current boats at 2008 prices in order to adjust against inflation.

4.3 House Reconstruction and Boat Replacement in the Sample

The following two subsections provide a description about the data obtained from the follow- up survey of the tsunami affected households with reference to housing and boat assets.

4.3.1 Reconstruction of Houses

In our sample, 62 percent of the households had fully damaged houses while the rest of the households had partially damaged houses. The majority (67 percent) of the households had received housing aid through the government, followed by NGO-assisted households at 65 percent, with 7 percent of receiving assistance from the private sector and community-based organizations. It is important to note that most of the households had received housing aid from more than one source. For example 45 percent of the households had received housing aid from both the government and the NGOs. Among the 87 percent current house owners, 82 percent had been able to obtain housing aid either from one or more than one source of aid (see Table 2).

By the year 2008, 51 percent of the households had been able to rebuild their houses on their own land while 40 percent had relocated to new lands away from the sea. But around 6 percent of the households had neither been able to rebuild their houses in the same land nor able to relocate to another land. In contrast, around 3 percent of the households had not only been able to rebuild their houses but also to receive a house on new land. However, it is important to note that the percentage of households who live in permanent houses had increased from 65 percent in the pre-Tsunami period to 83 percent in the post-Tsunami period. We also compared the average value of their current house with the average value of their pre-Tsunami house (at current prices) and found that the current average house value was more than double (see Table 2).

4.3.2 Replacement of Boats

Forty six percent of households in our sample were boat owners in the pre-Tsunami period. Thirty-nine percent of total households had lost their boats totally destroyed) while there was partial damage to the boats of 6 percent due to the Tsunami wave. Only 1 percent of households had escaped any boat damage (see Table 2).

The households had received boat aid primarily from local and international NGOs/donor agencies. The percentage of households that received boat aid from the NGOs (local and international) was 25 percent while only 5 percent received boat aid through the government. Another 1 percent of households received boat aid from either private or community-based organizations. When we compared the average amount of boat aid received with the mean value of the destroyed

[7] We assumed that there is no salvage value for this type of boat.

boats, we found that the aid received was higher compared to the value of the destroyed boats (see Table 2).

5. Did Asset Distribution Change with Post Tsunami Aid?

In this section, we attempt to investigate whether post Tsunami aid changed asset ownership (houses and boats and both assets) with the use of cumulative distribution functions (CDF). The CDF describes the probability that a real-valued random variable x with a given probability distribution will be found at a value less than or equal to *x*. Then, we use Lorenz curves (LC) to examine whether asset distribution has become more equal or vice versa. Lorenz curves are normally used to measure income / wealth distribution. LC plots the percentage of total income earned by various portions of the population when the population is ordered by the size of their income (Gastwirth, 1971). In our paper we use the asset value instead of income. We also estimate Gini-coefficients, another measure of income distribution.

5.1 Distribution of Houses

Two cumulative distribution curves on pre-Tsunami house values[8] and current house values show that except for a few households, a majority of the households now possess more expensive houses[9] compared to the pre-Tsunami situation (see Figure 1). For example, in the pre-tsunami case, about 75% houses had a value of Rs 400000 or less, and after the reconstruction/ relocation, the value of the houses went up so that only 30% houses have houses worth Rs 400000 or less.

Lorenz curves for pre-Tsunami and current house values show that the distribution of housing assets in the post-Tsunami period has improved compared to the pre-Tsunami period. In Figure 5, the Lorenz curve for current house distribution is closer to the perfect distribution line (the 45 degree line) in comparison with the curve for pre-Tsunami house distribution. Another way to look at asset distribution is by estimating the Gini-coefficient, which is the area between any given LC and a LC for an economy in which everyone has equal income, as expressed as the proportion of the area under the curve for equal income distribution (Dorfman ,1979)[10]. In this paper, we use asset values instead of income to calculate Gini coefficients. The Gini coefficients of the pre-Tsunami and current house distribution are 0.5 and 0.43 respectively. Therefore, the distribution of houses has become more equal after post tsunami aid.

5.2 Distribution of Boats

Figure 2 shows cumulative distribution curves plotted using the amount of boat aid received and the current value of the destroyed boat. Figure 3 shows the current boat values and pre-Tsunami boat values.[11] Boat owners who owned less expensive boats before the Tsunami have lost out,

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8 We calculate pre-Tsunami house values at current prices to adjust for inflation.

9 Due to limitations in the available data, we do not have details on the amount of housing aid received or the damage value of the houses. However, we attempt to compare current value of the pre-Tsunami house and current house value as the majority of the current house owners have received housing aid (see Table 2).

10 Gini coeeficient of income is usually calculated using the following equation $Gini = \frac{1}{2n^2\bar{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} |y_i - y_j|$ where, n is the total units in the population and y is income. y_i and y_j are income of individuals

11 We calculate pre-Tsunami boat values at current prices to adjust for inflation.

while boat owners who owned more expensive boats had actually benefited due to post-Tsunami boat aid.

The Lorenz curves that we plotted using the current value of the destroyed boat and the value of boat aid received reveal that current boat distribution does not compare favorably with the pre-Tsunami situation. The curve for boat aid received is placed well away from the perfect distribution line (see Figure 6). The second Lorenz curve that we plotted for current boat value and pre-Tsunami boat value show that these curves also follow a similar pattern [12](see Figure 7). The Gini coefficients for the distribution of pre-Tsunami and current boats were 0.81 and 0.86 respectively. The Lorenz curves further illustrate that current boat distribution is more unequal compared to pre-tsunami boat distribution.

It is also interesting to note that total asset[13] distribution among households has also improved compared to the immediate pre-Tsunami situation (see figure 4) The Lorenz curves of current value of pre-tsunami total assets and current total assets value shows that there is a more equitable distribution of total assets (houses and boats) after post-Tsunami aid transfers (see figure 9).

6. How effective was Aid Targeting?

In general, development-related aid transfers at the individual or household levels basically target the neediest. However, aid transfers in post-disaster Sri Lanka focused on wealthy and less wealthy households, i.e. whoever owned their own houses and boats lost them either fully or partially due to the disaster. Due to practical reasons aid programmes used pre-tsunami asset ownership as a reference point in targeting. In this section, we attempt to investigate the effectiveness of post-tsunami asset transfers with regard to targeting and allocation.

6.1 Housing Aid

In the case of housing, donors used two methods to replace damaged or destroyed houses. Firstly, they based housing aid given for rebuilding on the severity of damage (whether fully or partially damaged) and not on the amount or value of the damage. Second, they did not base housing aid provided for relocated households on their previous house value or the damage value. Instead, the government (GOSL) set guidelines on the minimum requirements for a standard house for relocated households. Most of the relocated households were able to receive standard-size permanent houses irrespective of whether the household concerned had occupied temporary or semi-temporary houses in the immediate pre-Tsunami period

The reference point for targeting of house transfers was initially based on all pre-Tsunami house owners affected by the Tsunami (that is, the policy of "house for house") as mentioned in Section 3. However, this resulted in the exclusion of needy, poor and vulnerable household who did not own houses pre-tsunami. Therefore, the government later changed the reference point for house transfers to all Tsunami-affected households that did not own a house after the Tsunami devastation, irrespective of whether they had owned a house during the immediate pre-Tsunami period or not.

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[12] We also plotted a Lorenz curve using the current boat value and the pre-Tsunami boat value (that is, without taking into account the depreciation of boat values) in order to test whether boat distribution follows the same pattern and to ensure that such distribution is not due to the provision of new and high value boats (see Figure 8).

[13] We calculated total asset value by adding house value and boat value.

First, we cross tabulate the pre-Tsunami house ownership with current house ownership (see table 3) to examine how house ownership has changed. Then, we cross tabulate the pre-Tsunami house ownership against the recipients of the post Tsunami housing aid (see table 4) to examine to what extent the government and donors have targeted the right households.

All the households in our sample experienced either fully or partially damage of their houses. Ninety three per cent owned houses immediately before the Tsunami[14]. This percentage is lower now with 87% of households currently owning houses. Out of current house owners, 82% of the households received housing aid[15]. According to the first reference point set by the government, the error of exclusion is about 11% (93% to 82%). According to the second reference point, the error of exclusion is about 18% (100% to 82%). However, it is important to note that about 5% of the total sample who built or repaired houses themselves are not actual needy. Therefore the actual error of error of exclusion is about 13%.[16]

Among 13% of total households who do not own a house now, half were landless before the Tsunami and have not been able to get housing aid. This situation would have arisen from the two initial housing-related policies of "no-build zone" and "house for house" as well as the relaxation later of the same no-build zone policy which would have resulted in some poor landless households losing potential ownership of a new house in a new location. The rest had built temporary houses on government lands or other lands which do not belong to them.

6.2 Boat Aid

We cross tabulate the pre-Tsunami boat ownership with the current boat ownership to examine the changes of boat ownership. We also cross tabulate the pre-Tsunami boat ownership with the recipients of post - Tsunami boat aid.

Boat ownership has changed from the pre-Tsunami period to the present. The percentage of households who owned a boat (or boats) decreased from 46 percent (in the pre-Tsunami period) to 38 percent. Only 59 percent of the pre-Tsunami boat owners own boats at present (see Table 5). Of the pre-Tsunami boat owners who lost boats, 48 percent received boat aid transfers. Since boat transfers were said to target those who lost their boats, the exclusion rate (that is, the proportion of households who should have received but have not received benefits) is 52 percent (see Table 6 for more details). This also confirms claims by fishery households that among those who received boats were households that a) did not have boats, b) that had boats which were either not damaged or only partially damaged and c) in some cases, those that were not related to the fishery sector at all. Some of the pre-Tsunami boat owners who did not receive boats have in fact had to change their occupations to become crew members of boats, laborers, fish traders or masonry workers. Out of the number who did not own boats prior to the Tsunami, 20 percent currently own boats.[17] These figures constitute evidence of poor targeting of boat aid.

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[14] Seven percent of the households did not own houses before the Tsunami. They lived with either relatives or friends or in temporary shelters on government reservations such as marine reserves.

[15] Other 5% has built or repaired houses on their own

[16] We are not in a position to calculate the error of inclusion as our sample has only affected households in terms of housing assets.

[17] However, we cannot calculate the rate of inclusion as our sample includes only fishery households. According to our field investigations, the beneficiaries of boat aid are not only fishery households but also many other households.

7 What are the Determinants of Aid Transfers at Household level?

We examine the factors underlying the targeting and allocation of asset transfers (i.e., houses and boats) at the household level. We use household level data to understand which household-related characteristics made them eligible to receive post-Tsunami housing and boat aid.

7.1 Empirical models

We employ two models: Probit model to examine the determinants of allocation of aid (and ownership of post-Tsunami assets)_among households and a Tobit model to explain the amount of aid received (i.e., the money value of the house/boat) by each household and the determinants of the allocation of such amounts. We carry out similar analysis for house and boat transfers.

7.1.1 Explaining Whether or Not Aid was Received Using Probit Models

Households either received aid or not and we seek to explain why some households received aid and others did not. Given the nature of the dependant variable (which takes the value 1 if the household got aid and 0 otherwise) we choose a Probit model[18] to examine the probability of households receiving aid transfers.

In this study we use two Probit models. First, we examine the *probability of households receiving aid transfers* (houses or boats). In a second Probit estimation, we look at the *probability of households currently owning assets* (houses and boats). We use the same dependent variables as explanatory variables in both Probit estimations. The descriptive statistics on these variables are presented in Table 2.

Pre-Tsunami asset ownership and the extent of damage to such assets were the main concerns when it came to replacing assets as a means of rehabilitating affected households. Therefore, we use pre-Tsunami asset ownership (that is, owning a house or owning a boat just before the Tsunami) as an independent variable in order to examine whether aid transfers targeted the right beneficiaries. In addition, we take certain characteristics of the household head such as gender (male), ethnicity[19], age and education levels (less than primary[20], primary, secondary, etc.) as independent variables in the analysis as they could have an impact on receiving assets or owning them. For example, donors provided a considerable proportion of housing grants through the government, which was, in turn, disbursed via the government banks. Thus, households who had secondary level and above education would have found it easy to obtain these grants compared to those without such education. Similarly, we hypothesize that the gender of the household head matters. Men were more likely to have access to social networks than females. We also took into account the age of the household as young households might have had more access to aid through various social networks than older ones.

In addition, we hypothesize that the extent of damage to the family (that is, the death and/or injury of family members due to the Tsunami) might also have influenced the receiving of aid. Our field observations revealed that the families that experienced deaths, disappearances or disablement

[18] Our results hold with other model specifications such as logit.

[19] We had to drop the ethnicity variable as it is strongly correlated with districts/regions.

[20] We take households with less than primary level education as the reference category.

of members due to the Tsunami had focused less on obtaining aid and more on mourning for the dead and the missing, organizing funeral rites for the dead and religious rituals on behalf of the missing, or treating the injured members of the family. Since selecting genuine beneficiaries was a challenge because of the lack of reliable information at the local level, some donor agencies approached community-based organizations in order to identify beneficiaries. Therefore, we had to consider the household's access to social networks (that is, pre-Tsunami membership in a community-based organization/s) as an independent variable. We also use regional dummies for districts[21] (Ampara, Batticaloa, Trincomalee, Hambantota and Matara) in order to capture the effects due to spatial variation.

7.1.2 Explaining the Amount of Aid Allocation using Tobit Models

We examine to what extent the values of destroyed/lost assets are compensated by aid transfers.[22] Here we use a Tobit model with *aid value received* as the dependant variable. This model is used to explain the amount of aid received as dependent variable. Tobit is used because the value of the asset transfer is censored at 0 and negative values are not observable. As the minimum value that can be observed is zero, we use several left-censored Tobit models to estimate the determinants of the value of housing aid (re-built and re-located) and the value of boat aid (amount of aid received and value of current boats owned).

We estimate a second left-censored Tobit model in order to examine to what extent households recover in monetary terms the pre-Tsunami assets via the new assets. The independent variables used are the same as the independent variables used in the previous section. We use the pre-Tsunami asset value (that is, the current value of the destroyed asset) as an independent variable. We use characteristics of the household head, the extent of damage to the family, the access to social networks, and regional dummies as other independent variables.

7.2 Results

7.2.1 Houses

With the use of a Probit model, we first examine the factors that affect the households' *probability of receiving housing aid*. Being a pre-Tsunami house owner increases the probability of receiving housing aid by 0.77 while pre-Tsunami membership in a community-based organization increases the probability of receiving housing aid by 0.09. In addition, we observe regional disparities in aid allocation. For instance, compared to Galle, all other districts except Hambantota have a lower probability of receiving housing aid (see model 1 in Table 7).

Next, we examine the *probability of house ownership at present* (in the year 2008) by using another Probit model (see model 2 in Table 7). Owning a house before the Tsunami increases the probability of owning a house at present by 0.79. Being a pre-Tsunami member of a community-based organization increases the probability of owning a house at present by 0.09. But being a resident in Batticaloa reduces the probability of owning a house compared to Galle.

We next attempt to examine, with the use of a Tobit model, to what extent *the value of housing*

[21] We consider households from the Galle district as the reference category.

[22] We calculate the aid value received as the current value of the assets received in aid transfer.

aid compensated for the damaged/destroyed house values.[23] Calculating the marginal effects, conditional on being censored, the results show that a one rupee increase in pre-Tsunami house value resulted in a 0.21 rupee increase in the current house value (see model 3 of Table 7). As mentioned in Section 3, donors provided housing aid in two ways: to rebuild houses on previously owned land or to relocate to new land. Among rebuilt households, we observed a significant positive relationship between their pre-Tsunami house value and their current *re-built house value* (see model 4 in Table 7). A one rupee increase in the pre-Tsunami house value resulted in an increase in current house value by 0.26 rupees. However, it is interesting to note that there is no significant relationship between the *current house value (re-located)* and the pre-Tsunami house value of relocated households (see model 5 of table 7). This was mainly due to the guidelines set by the government for houses build in new locations (irrespective of the size/value of the pre-tsunami damaged/destroyed house) to relocate households from their original land to another land (see section 3 for further details) But being a member of a CBO in the pre-Tsunami period was likely to increase the current house value for relocated households.

Households that experienced death, disappearance or injury of a family member (or family members) were more likely to own less expensive houses at present. Compared to Galle, households from Hambantota were more likely to own expensive houses. This is true for separate analyses of both rebuilt and relocated households as well (see model 3 in Table 7).

7.2.2 Boats

We use a Probit model to first examine the *probability of receiving boat aid* by pre-Tsunami boat owners who had lost their boats (model 1 of Table 8). The results of the model show that having a boat before the Tsunami increased the probability of receiving a new boat by only 0.26. Being a member of a fishery cooperative (before the Tsunami) increases the probability of receiving boat aid by 0.11. When compared with the Galle district, being a household from Batticaloa increases the probability of receiving a boat by 0.16.

With the use of another Probit model, we examine the *probability of current boat ownership* and pre-Tsunami boat ownership, controlling for other variables (see model 2 of Table 8 for further details). Being a pre-Tsunami boat owner increases the probability of owning a boat at present by 0.38. Being a member of a fishery cooperative and being a household from Batticaloa district increase the probability of owning a boat at present by 0.11 and 0.16 respectively.

Using a Tobit model, we examine the relationship between the *amount of boat aid* received and the value of the destroyed boat in order to understand to what extent the destroyed boats were compensated by the boat aid received. A one rupee increase in the value of the destroyed boat increases the amount of the boat aid received by 0.42, rupees. Being a member of a fishery cooperative before the Tsunami also increases the likelihood of receiving a more expensive boat (see model 3 of Table 8).

Using another Tobit model (see model 4 of Table 8), we examine how pre-Tsunami assets affected the *value of current boats owned.* A one rupee increase in the pre-Tsunami boat value resulted in an increase of 0.48 rupees in the current boat value. Being a member of a fishery cooperative before the Tsunami increased the likelihood of owning a more expensive boat in the post-Tsunami period.

[23] However, we do not have actual amounts of housing aid received by each household. Therefore, we could compare the pre-Tsunami house values with current house values.

8. Conclusions and Policy Recommendations

The study attempts to investigate the distributional impacts of house and boat transfers on Tsunami-affected households. The study also examines the effectiveness of targeting of these asset transfers. Further, the study attempts to examine the determinants of the allocation of aid at the household level.

Our results reveal that the targeting and allocation of housing aid was better compared to boat aid. In addition, the distribution of houses was also more equal when compared with the pre-Tsunami situation despite a slight bias towards the homeless and the landless. On the other hand, the distribution of boats was less equal resulting in small boat owners losing benefits they had previously enjoyed in the process while relatively big boat owners gained more expensive boats.

The differences between the two aid transfers may be due to differences in the nature of the two asset transfers, the availability of specific government policies, the availability of systematic information, and the dominant mode of aid delivery. The nature of the two assets under study was without doubt different: house transfers demand more planning and coordinated effort, putting in place infrastructure and other facilities, and ensuring the long-time duration of the asset whereas boat transfers do not demand as much. Moreover, it is comparatively easy to prove damages to houses compared with boats. Furthermore, while there was a government policy on the rebuilding and relocation of houses, there was no specific and clear policy for boats. Local-level information on fishermen and especially boat owners were not available, which made the selection of beneficiaries for boat transfers more difficult compared to the selection of beneficiaries for house transfers. In the case of house transfers, the government mainly administered the aid, followed by local and international NGOs and other private or community-based organizations. In the case of boat transfers, however, the main donors were NGOs.

The poor targeting of boat aid may have aggravated the rapid increase in the fishing fleet in Sri Lanka. According to secondary data from the Boat Census conducted in 2006/2007, there was already an oversupply of coastal boats in the pre-Tsunami period. Thus, cash transfers to enable households to buy boats, or to invest in some other industry, may have prevented adding to the oversupply, which has negative implications for ecosystems and the environment.

It is interesting to note that total asset[24] distribution among households improved compared to the immediate pre-Tsunami situation[25]. Therefore, we can conclude that there is a more equitable distribution of total assets (houses and boats) after post-Tsunami aid transfers.

However, we observe regional disparities in the allocation of aid. In the case of housing aid, southern districts such as Hambantota and Gallle have received more houses than other districts. One explanation for this disparity might be their relative proximity to the center of power, that is, the capital city of Colombo, compared to other districts and the better infrastructure facilities such as roads which make access to the affected communities easier. Moreover, the districts from the East were located closer to the centers of the ethnic conflict in the north and east, which may have led to some donors steering away from these areas in their aid-distribution efforts. This highlights the importance of the government making more coordinated efforts to target and

[24] We calculated total asset value by adding house value and boat value.

[25] See figures 4 and 9 for further details.

allocate aid in less served areas as opposed to other areas that are less vulnerable to political instability and where infrastructure and other facilities are available.

In both house and boat transfers, the aid was biased towards those who had access to social networks such as community-based organizations. Most donors approached local community-based organizations in order to identify potential beneficiaries due to a lack of local-level systematic information about pre-Tsunami asset ownership. There could be both positive as well as negative impacts arising from this approach. Our field visits reveal that in places where community-based organizations were strong, the aid went to the right beneficiaries. In other areas, those who had access to or link with officials of such community-based organizations were able to receive more aid than those without such links. The findings of the study show that access to social networks plays a significant role especially in the absence of local-level information. Therefore, donors and the government should make a special effort to reach the marginalized and/or poor households which usually do not have access to social networks.

Households that had experienced loss/death of, or injury to, a family member (members) were more likely to own cheaper houses and were less likely to own boats. It is possible that they concentrated more on looking for missing members or mourning their loss and/or treating the injured, leaving them less time therefore to pay attention to requesting or receiving aid. In addition, those who were very poor and/or marginalized were also less likely to receive housing aid although this number was comparatively low. All this makes evident the importance of/need for donors to be alert to these special sub-sets of people in disaster situations and to make a special effort to reach them in their aid transfers.

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LIST OF TABLES

Table 1: Sample Selection for the Household Survey and Focus Group Discussions

District	No of DS Divisions	No of GNDs	No of Households Selected	No of Focus group Discussions
Galle	2	6	60	2
Matara	1	3	30	1
Hambantota	1	3	30	1
Batticaloa	4	12	120	2
Ampara	2	6	60	1
Trincomalee	3	9	90	2
Total	13	39	390	9

Table 2: Descriptive Statistics of the Household Survey Data (n=396)

Variable Name	Mean	Std. Dev.
Housing Damage		
Fully damaged	0.71	0.45
Partially damaged	0.29	0.45
Sources of Housing Aid [26]		
Through the government	0.64	0.48
NGOs/ Donors	0.63	0.48
Local private sector	0.03	0.16
Community-based organizations	0.03	0.16
Households' own contribution	0.05	0.32
Current Housing Situation		
Rebuilt	0.51	0.50
Relocated	0.40	0.49
Rebuilt and relocated	0.03	0.17
Neither rebuilt or relocated	0.06	0.23
Pre-Tsunami Housing Quality		
Permanent	0.65	0.48
Temporary	0.28	0.45
Current Housing Quality		
Permanent	0.83	0.38
Temporary	0.04	0.18
House Ownership		
Current house owner	0.87	0.34
Pre-Tsunami house owner	0.93	0.25
Recipient of housing aid	0.82	0.38
House Values		
Current house value	570088.2	487089.0
Pre-Tsunami house value	265555.1	250297.8

[26] Most of the households had received housing aid from two sources, for example, from the government and NGOs.

Boats		
Boat Damage		
Fully damaged	0.39	0.49
Partially damaged	0.06	0.25
Not damaged	0.01	0.10
Did not own a boat	0.53	0.50
Sources of Boat Aid		
Through the government	0.05	
NGOs/ Donor agencies	0.25	
Private or community-based organizations	0.01	
Boat Ownership		
Current boat owner	0.38	0.49
Pre-Tsunami boat owner	0.46	0.50
Recipient of boat aid	0.31	0.46
Pre-Tsunami boat owner if boat was destroyed	0.39	0.49
Boat Values		
Current boat value	122444.20	381358.50
Pre-Tsunami boat value (at current prices)	82595.96	197159.10
Amount of boat aid received	99703.03	362778.90
Current value of the destroyed boat	63498.33	168395.70
Household Characteristics		
Gender of the Household Head (Male)	0.96	0.20
Age of the household head	45.42	12.24
Square of age	2212.6	1181.7
Level of Education of the Household Head [27]		
= 1 if the household head has completed primary level of education but not secondary level	0.19	0.39
= 1 if the household head has secondary or more than a secondary level education	0.51	0.50
Damage to Household Members		
=1 if the household experienced death of a family member due to Tsunami	0.12	0.33
=1 if a family member injured due to Tsunami	0.11	0.31
Households Access to Social Networks		
=1 if head of the household was a member of a community-based organization before Tsunami	0.64	0.48
=1 if head of the household was a member of a fishery cooperative before Tsunami	0.53	0.50

[27] We considered household heads with less than primary level education as the base.

Table 3: Pre-Tsunami and Current House Ownership

		Current House Owner		
		Yes	No	Total
Pre-Tsunami House Owner	Yes	339	30	369
		(92%	(8%)	93%
	No	4	23	27
		(15%)	85%	7%
	Total	343 87%	53 13%	396

Pearson chi2(1) = 128.8600 Pr = 0.000 Fisher's exact = 0

Table 4: Pre-Tsunami house ownership and Housing Aid Received

		Housing Aid Received		
		Yes	No	Total
Pre-Tsunami House Owner	Yes	322	47	369
		(87%)	(13%)	93%
	No	3	24	27
		(11%)	(89%)	7%
	Total	325 82%	71 18%	396

Pearson chi2(1) = 99.15 Pr = 0.000 Fisher's exact = 0

Table 5: Changes in Boat Ownership (pre-Tsunami and Current)

		Current Boat Owner		
		Yes	No	Total
Pre-Tsunami Boat Owner	Yes	109	75	184
		59%	41%	46%
	No	42	170	212
		20%	80.2%	54%
	Total	151 38%	243 62%	396

Pearson chi2(1) = 64.9099 P value = 0.000

Table 6: Boat Destroyed and Aid Received

		Aid Received		
		Yes	No	Total
Boat Destroyed	Yes	74	80	154
		48%	52%	39%
	No	49	193	242
		20%	80%	61%
	Total	123 31%	273 69%	396

Pearson chi2(1) = 33.9765 Pr = 0.000

Table 7: Results of the Empirical Models – Housing (n=396)

	Probit Model		Tobit Model		
Dependant Variable	Recipient of Housing Aid	Current House Ownership	Current House Value [28]	Current House Value (Rebuilt Households) [29] n=202	Current House Value (Relocated Households) [30] n=160
Model	1	2	3	4	5
	Marginal Effects		Marginal Effects at Observed Censoring Rate		
Pre- house Ownership	0.77*** (0.080)	0.79*** (0.080)			
Pre-Tsunami Land Ownership	0.046 (0.049)	0.054 (0.041)			
Pre-Tsunami House Value			0.21***	0.26**	-0.06
Male	0.023 (0.096)	0.007 (0.073)	-62092.18	-13626.41	-38389.61
Age	0.0003 (0.0087)	-0.003 (0.066)	6407.87	11412.90	8936.73
Primary Education	-0.1078 (0.073)	-0.012 (0.047)	7361.09	46899.37	-115707.33
Secondary & Above Education	-0.017 (0.047)	0.026 (0.046)	21843.36	43608.76	-80151.37
Dead	-0.044 (0.064)	-0.036 (0.056)	-91763.65*	-63951.13	-48927.59
Injured	-0.009 (0.07)	-0.027 (0.062)	-106732.57*	-79131.96	-116795.73
Membership of a CBO	0.087** (0.041)	0.094** (0.035)	42885.23	-19401.88	125790.72**
Matara	-0.348* (0.203)	-0.286 (0.19)	-160249.56	-215179.84**	-115711.10
Hambantota	-0.217 (0.222)	-0.016 (0.146)	506936.60***	572209.40***	391730.37***
Trincomalee	-0.48** (0.155)	-0.21 (0.135)	-96125.44	-73841.76	-27244.44
Batticaloa	-0.327** (0.137)	-0.247** (0.115)	33050.4	17335.66	41055.65
Ampara	-0.484*** (0.169)	-0.26 (0.152)	28260.5	13306.14	-7554.69

***,**,* denote significance at the 1, 5, and 10 percent levels respectively

[28] 53 left-censored observations at current house value<=0 and 343 uncensored observations
[29] 14 left-censored observations at current house value <=0 and 188 uncensored observations
[30] 21 left-censored observations at current house value <=0 and 139 uncensored observations

Table 8: Results of the Empirical Models – Boats (n=396)

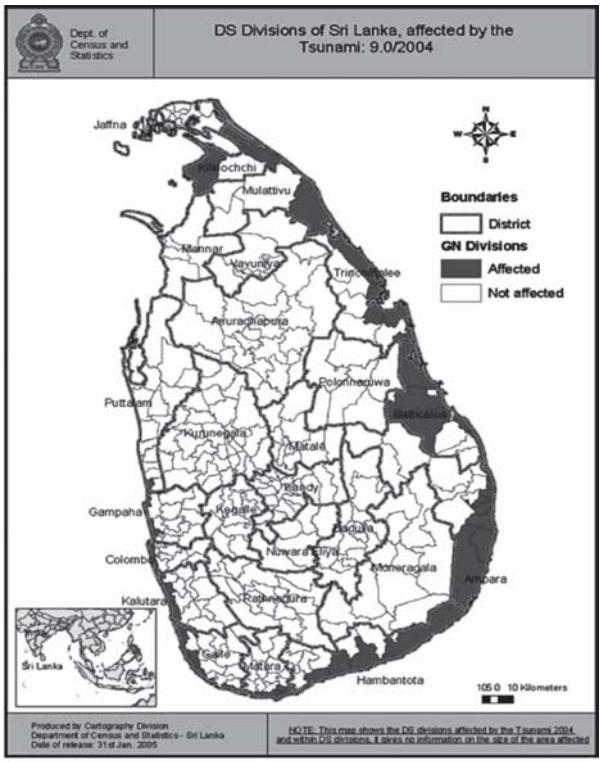
	Marginal Effects		Marginal Effects	
	Probit		Tobit	
Model	1	2	3	4
Dependant Variable	Recipient of Boat Aid	Current Boat Ownership	Boat Aid Received (Conditional on Being Censored)	Current Boat Value [31] (Conditional on Being Censored)
Pre-Tsunami Boat Owner who lost Boat	0.26*** (0.05)			
Pre-Tsunami Boat Owner		0.38*** (0.05)		
Current Value of the Destroyed Boat			0.42***	
Current Value of the pre-Tsunami Boat				0.48***
Male	0.03 (0.13)	-0.06 (0.145)	33634.29	-27552.83
Age	0.00 (0.01)	-0.002 (0.014)	-2945.09	-21.49
Primary	0.04 (0.08)	0.04 (0.086)	23575.58	31859.76
Secondary & Above	-0.12* (0.06)	-0.09 (0.069)	-58066.79	-43892.62
Dead	-0.08 (0.07)	-0.14** 0.06908	-41500.45	-39144.62
Injured	0.01 (0.08)	0.07 (0.088)	16377.38	34096.46
Member of a Fishery Cooperative	0.11** (0.05)	0.11* (0.055)	55270.59*	48451.10*
Matara	0.03 (0.12)	0.08 (0.129)	47704.20	77188.18
Hambantota	-0.07 (0.10)	0.039 (0.1257)	-5607.81	28382.76
Trincomalee	-0.08 (0.08)	0.05 (0.01)	-38881.56	7943.31
Batticaloa	0.16* (0.09)	0.16* (0.092)	56355.24	47148.27
Ampara	-0.06 (0.09)	-0.025 (0.1055)	-42123.13	-43819.98

***,**,* denote significance at the 1, 5, and 10 percent levels respectively

[31] 245 left-censored observations at current house value <=0 and 151 uncensored observations.

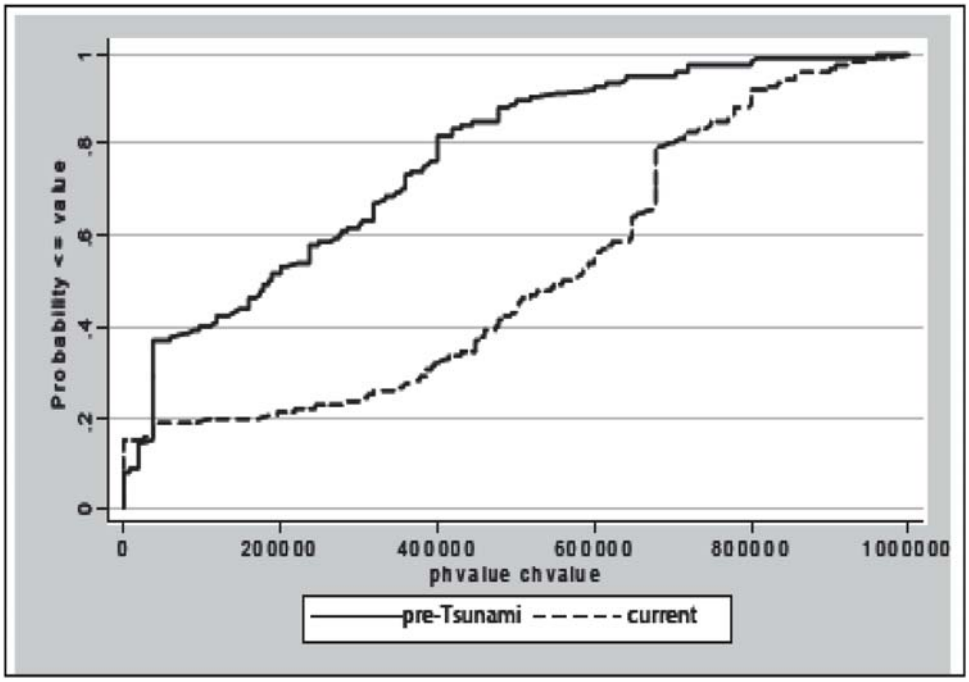
LIST OF FIGURES

Figure1: Tsunami affected Districts in Sri Lanka



Source : The Department of Census and Statistics 2005

Figure 2: Cumulative Distribution Curves for Pre-Tsunami[32] and Current House Values



[32] We calculate pre-Tsunami house value at current prices to adjust for inflation.

Figure 3: Cumulative Distribution Curves for Value of Destroyed Boats and Boat Aid Received

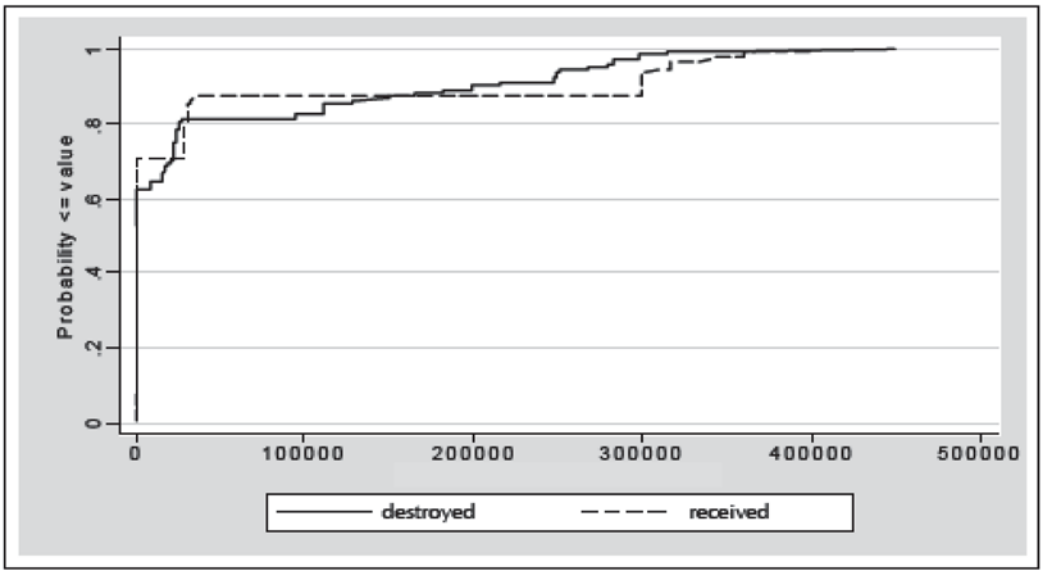
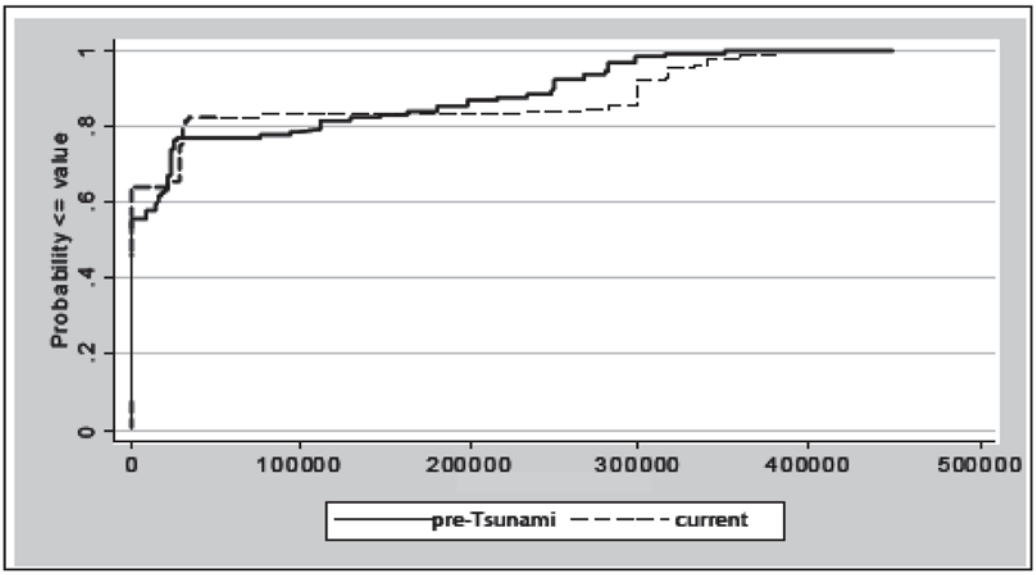


Figure 4: Cumulative Distribution Curves for Current and Pre-Tsunami Boat Values[33]



[33] We calculate pre-Tsunami boat value at current prices to adjust for inflation.

Figure 5: Cumulative Distribution Curves for Pre-Tsunami Total Asset Value[34] and Current Total Asset Value[35]

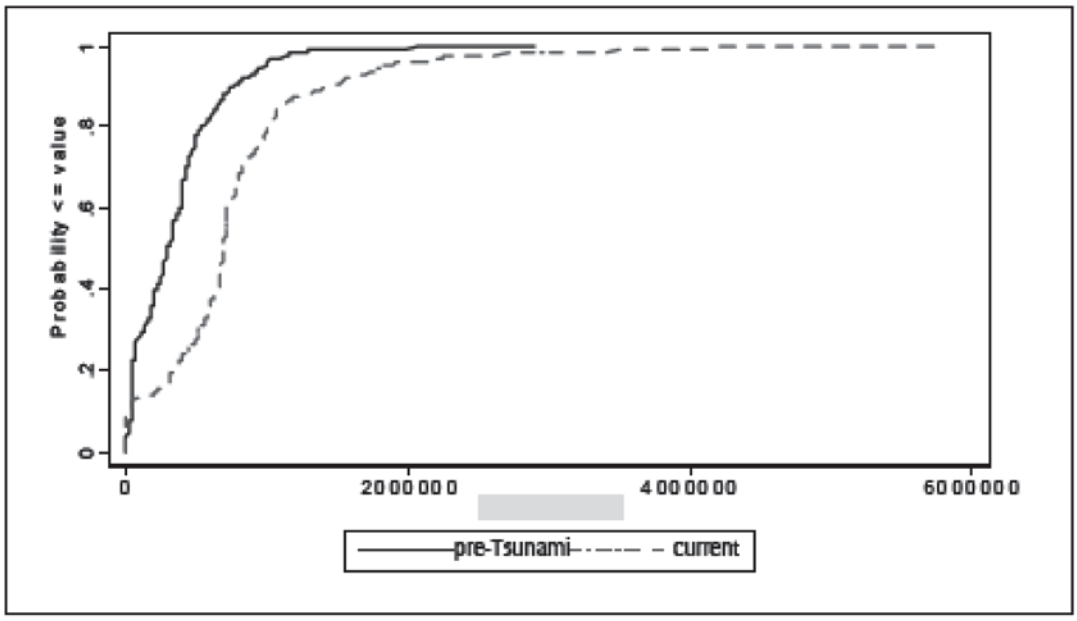
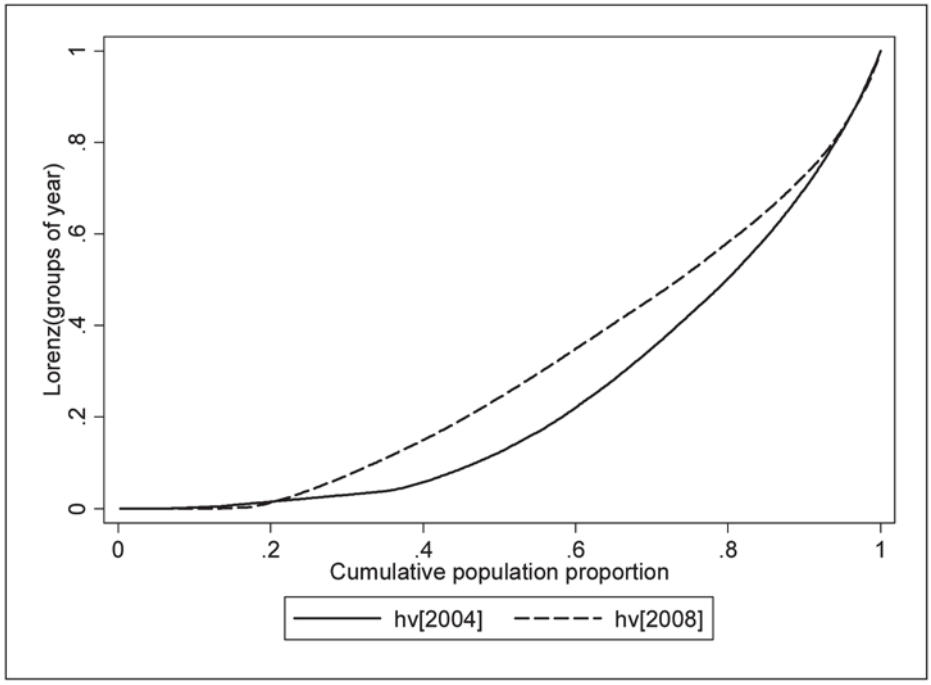


Figure 6: Lorenz Curves for Pre-Tsunami (hv[2004]) and Current House Values (hv[2008]



[34] We add up the value of the pre-Tsunami house and the value of the pre-Tsunami boat to calculate the total pre-Tsunami asset value in pre-Tsunami period and at present.

[35] We add up the value of the current house and the value of the current boat to calculate the total current asset value in the pre-Tsunami period and at present.

Figure 7: Lorenz Curves for Current Value of Destroyed Boat (bvd[2004]) and Boat Aid Received (bvd[2008])

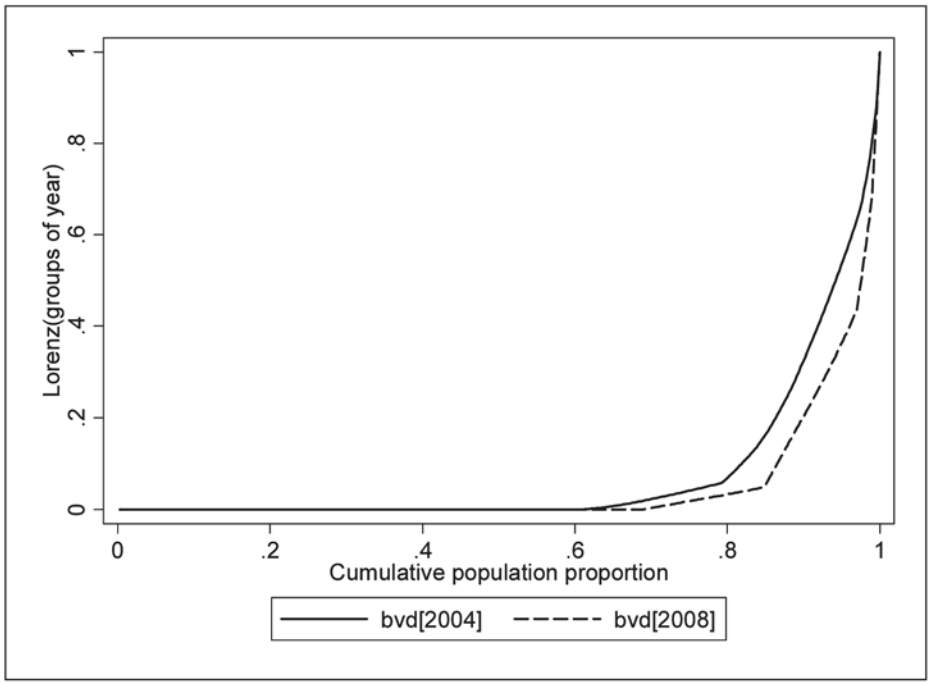


Figure 8: Lorenz Curves for Pre-Tsunami (bv[2004]) and Current Boat Values(bv[2008])

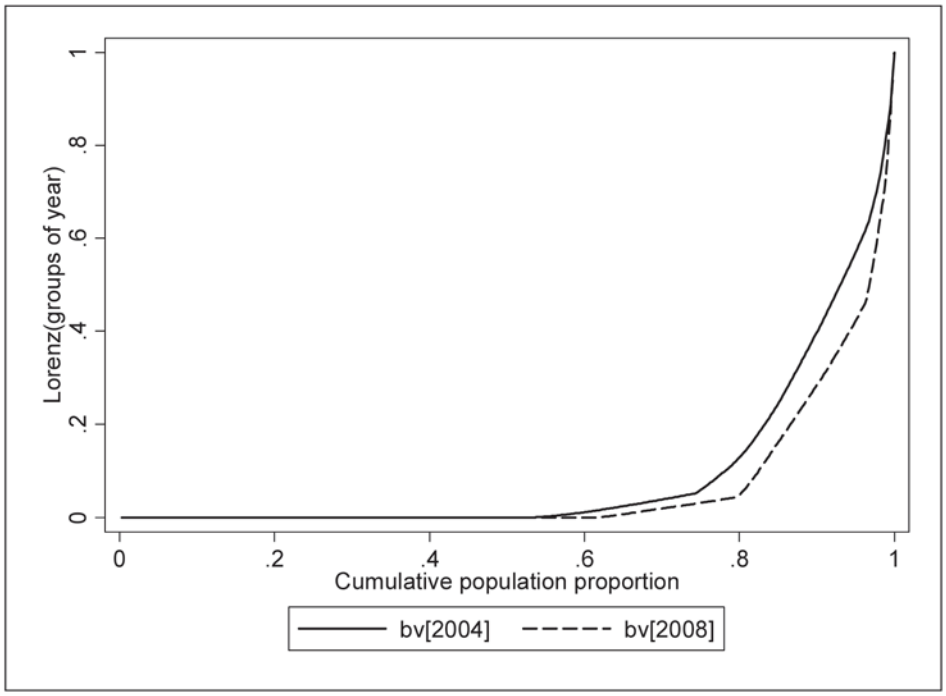


Figure 9: Lorenz Curves for Pre-Tsunami[36] (bv[2004]) and Current Boat Values (bv[2008])

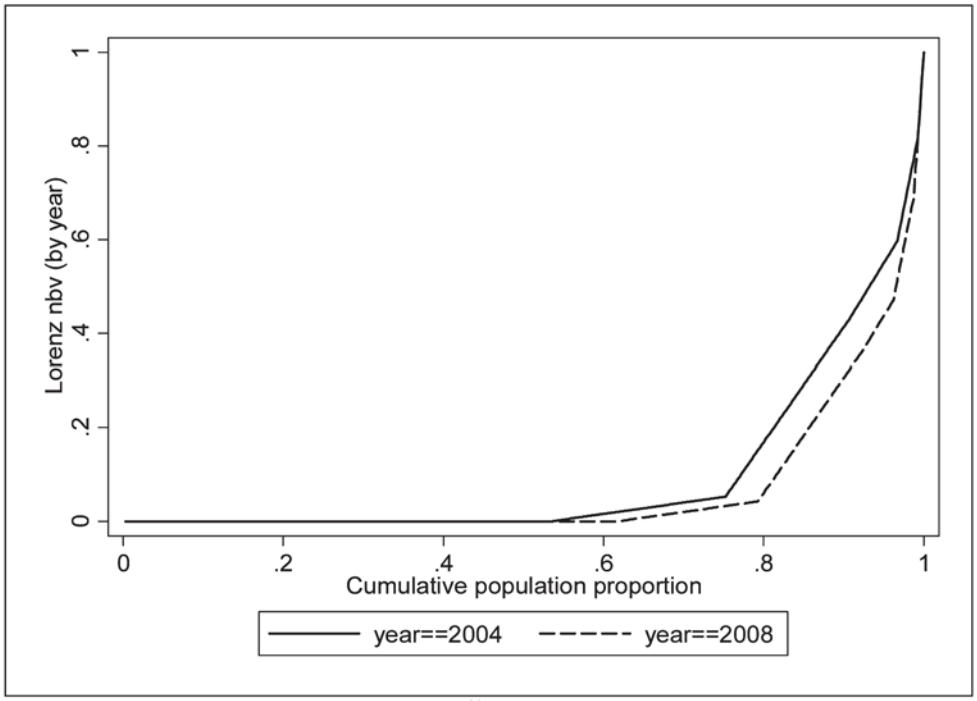
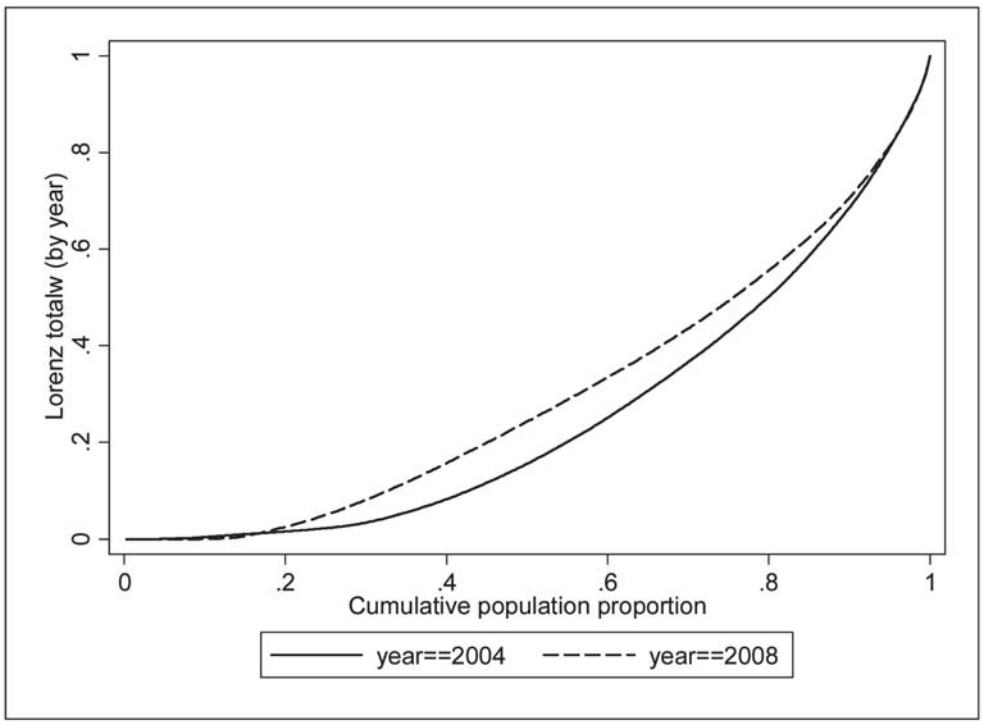


Figure 10: Lorenz Curves for Pre-Tsunami (2004) Total Asset Value and Current (2008) Total Asset Value



[36] Boat prices are not depreciated according to age of boats.

APPENDICES

APPENDIX 1

Valuation of Houses

The following section describes how the study valued houses. However, these values may not be the market prices of such houses. The study calculates the total cost of building a house based on indicators (data) from the baseline and follow-up survey. The actual price of such houses may be different according to location, access to infrastructure, the distance to sea and many other factors which the study has not taken into consideration. We value both pre-Tsunami and current houses at 2008 prices.

We valued the houses under two categories: pre-Tsunami houses and current houses. We performed the valuation of pre-Tsunami houses using secondary data that we obtained from the Tsunami Census (i.e., the baseline survey) of the Department of Census and Statistics. We performed the valuation of the current houses with the same set of data from the follow-up sample survey.

Pre-Tsunami	**Current**
Materials (Roof, floor, wall)	Materials (Roof, floor, wall)
Floor area	Floor area
Number of rooms	Number of rooms
Age of the houses	Year that house was rebuilt or relocated

We classified houses as permanent or temporary based on the materials used for the construction.

a, Valuation of Current Permanent Houses

We used different price rates (Rs/ft^2) based on the year that the households rebuilt or relocated their houses.

Year	Rate(Rs/ft^2)
2005	1000
2006	1100
2007	1300
2008	1500

(Source: Urban Development Authority)

b. Valuation of Current Temporary Houses

We performed the valuation of the temporary houses based on the floor area. We estimated temporary houses with a floor area between 250-500 ft^2 at SLRs. 40,000. Houses with less than 250 ft^2 were valued at SLRs 20,000. We valued houses with more than 500 ft^2 floor area at SLRs. 60,000.

c. Valuation of Pre-Tsunami Permanent Houses

Since the Department of Census carried out their survey in 2005, they used Rs1000 /ft^2 for the valuation of permanent houses. They also took into consideration the age of the houses in order to get the depreciated values.

Age Category	Depreciation
<10	20%
10-25	40%
25-50	60%
50-100	80%
>100	80%

d. Valuation of Pre-Tsunami Temporary Houses

We performed the valuation of temporary houses based on the age of the house. Since 99% of the houses were less than 500 ft^2, we did not take the floor area into consideration.

Age Category	Value(Rs)
<10	40,000
10-25	20,000
25-50	10,000

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