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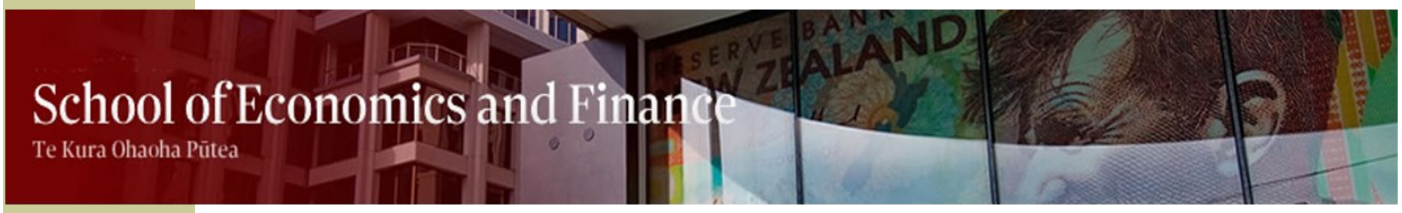

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Where is the Money? Post-Disaster Foreign Aid Flows

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Abstract: We describe the flows of aid after large catastrophic natural disasters by using the extensive record of bilateral aid flows, by aid sector, available through the OECD's Development Assistance Committee. For each large donor, we identify the extent of cross-sector re-allocation that is occurring in the aftermath of large disasters whereby humanitarian aid increases but other types of aid may decrease. Our evidence suggests that the expectation of large surges in post disaster aid flows is not warranted given the past diversity of experience of global foreign aid by donor and by event. We find no evidence, however, that donors reallocate aid between recipient countries (cross-recipient reallocation). These observations suggest that countries which are predicted to face increasing losses from natural disasters in the coming decades (and almost all are) should be devoting significant resources for prevention, insurance, and mitigation.

JEL Codes: Q54, F35
Keywords: Natural disasters, Foreign aid, Official Development Assistance (ODA), Development Assistance Committee (DAC)

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1. Introduction

The January 2010 earthquake in Haiti generated unprecedented promises of international aid from private charities, non-governmental organizations, governments, and multilateral organizations. These aid pledges and the promise of a new Port-au-Prince were widely seen as an opportunity for Haiti to 'turn a corner', 'build back better', and improve its development path in spite of the horrific destruction and tremendous loss of life. At the end of 2012, according to the UN Special Envoy to Haiti office, only 62% of the funding promised by official (bilateral and multilateral) sources in the NY donor conference held in March 2010 has been disbursed. According to most observers, a significant number of people in Port-au-Prince still reside in temporary tent-like structures in camps for the displaced, some of the rubble has not yet been cleared, the cholera epidemic that was introduced into Haiti by UN forces has wreaked havoc on the health and lives of many, and the outlook for the reconstruction of Haiti's capital city is clearly not as rosy as the initial descriptions of the Special Envoy's office seemed to predict.[1]

Here, we raise several questions regarding the inflows of post-disaster aid and their impacts. We want, primarily, to describe post-disaster aid flows in some detail, and within the context of total foreign aid flows. We quantify post-disaster aid, identify its nature and dynamics and examine its importance to the receiving countries as part of their overall reception of foreign assistance. We view this description as a first step in examining the efficacy of foreign aid.

As far as we could find, no one has ever looked at these issues systematically, in spite of their obvious importance. Even a tabulation of the extent of post-disaster aid that is typically forthcoming after catastrophic disasters is difficult given the possibilities that aid pledges are very different from amounts actually disbursed, and much of what is disbursed is re-labeled aid. Becerra et al. (2012) examine the importance of post-disaster aid surges in relation to the amount of incurred damages. Here, we only examine large catastrophic events, and describe the ways in which these events affect total aid flows, and the aid's components. We try to avoid

[1] See for example, the descriptions in Katz (2013).

some of the difficulties in identification by exploiting the detailed bilateral data available through the Development Assistance Committee (DAC), the OECD body responsible for tracking aid flows. We describe, separately for each of the largest donors, their disbursements of post disaster aid, and in particular the extent of cross-sector and cross-country re-allocation that is occurring in the aftermath of large disasters and their attendant promises of aid.

Our evidence suggests that the expectation of large surges in post disaster aid flows is not warranted given the current configuration of global foreign aid; especially for countries facing big losses from natural disasters. Moreover, we do not find evidence that in the aftermath of catastrophic natural disasters, donors reallocate aid between recipient countries (cross-recipient reallocation). These observations suggest that countries which are predicted to face increasing losses from natural disasters in the coming decades (and almost all are) should be devoting significant resources for prevention, insurance, and mitigation.[2] In terms of the humanitarian response to natural disasters, we find some evidence that donor countries provide humanitarian assistance by reallocating aid that was previously provided to other sectors (cross-sector reallocation). This observation leads us to conclude that research efforts that rely only on data for humanitarian assistance are mis-measuring the amount that affected countries receive in the aftermath of disasters.

The structure of the paper is as follows. First, we review the related literature in order to place our contribution in context. Next, in section 3, we discuss the data in some detail, and introduce some stylized facts on post-disaster aid flows by donor. In section 4, we provide panel VAR estimates of the magnitudes in question. Finally, we conclude with caveats, a policy discussion and topics for further research.

[2] See the general discussion in Noy (2012) and the estimates for the Haiti 2010 earthquake damages versus its aid inflows (Cavallo et al., 2010).

2. The Previous Literature

2.1 Aid

The academic literature examining foreign aid is very large, and hardly presents a unified consensus on almost any related issue. An extensive recent survey of this literature, Temple (2010), outlines many of the current debates regarding recent trends in aid flows, the importance of debt relief as aid, the theory behind aid flows and their impact on economic growth, the actual evidence about the efficacy of aid, problems associated with aid flows such as Dutch Disease (a deterioration in the terms-of-trade caused by foreign inflows), crowding-out of private and public sector investment, governance failures associated with aid (a variant of the resource curse), the problems connected to volatility and unpredictability of aid flows, and principal-agent problems (and the conditionality imposed to overcome them). All of these issues have their own research streams and all do not have any emerging consensus associated with them – see for example Clemens et al. (2012) for a recent description of the various views regarding aid effectiveness, the evolution of this literature, and the inherent difficulties in reaching any generalizable insights.

Remarkably, Temple's (2010) very extensive survey is silent about post-disaster aid, even though the visibility of post-disaster aid in public discussion is quite high, and much of the fund-raising of non-governmental organizations providing foreign aid is tied to funding requests in the aftermath of well-publicized catastrophes.

Much of the most recent development research involves the analysis of specific aid projects and the implementation of randomized control trials (RCT). A specific recent emphasis is the introduction of programs to strengthen institutions, and in particular institutions that enhance community involvement in the development process. For example, Casey et al. (2012) examine a program to increase community-driven development in Sierra Leone. Again, much of this recent research does not involve the specific context of disaster relief and reconstruction aid. Leaving aside questions about external and internal validity, we believe that more RCT

projects whose aim is to assess the effectiveness of aid in post-disaster rehabilitation and recovery environments are also required.[3]

2.2 Emergency Disaster Aid

Few papers examine post-natural-disasters aid flows. Yang (2008) uses hurricane intensity data and concludes that official foreign aid increases significantly after disasters; for the developing countries in his sample, 73 percent of disaster damages are ultimately covered by aid inflows.[4] David (2011), in contrast, examines a similar question but with a different empirical approach. He finds that aid does not seem to increase after climatic disasters, and their increase following geological ones is delayed and very small.[5] Becerra et al. (2012) also attempt to quantify the magnitude of the post-disaster aid surges using a broader sample and data from different sources, and conclude that these are typically much smaller than the estimated magnitude of the destruction.

Most of the papers that examine the determinants of aid flows focus on the supply side, and in particular on the hypothesis that foreign aid is affected by geo-strategic interests–mostly focusing on the United States—e.g., Drury, Olson and Van Belle (2005), Fleck and Kilby (2010) and Becerra et al. (2012).[6] In addition to the external geo-strategic considerations, Eisensee and Strömberg (2007) find that the amount of aid given after a disaster is influenced by domestic news coverage of the disaster in the donor country.

Beyond these supply factors guiding aid allocations, Olsen, Carstensen and Høyen (2003) note that demand factors (i.e., the receiving country's characteristics), and in particular its readiness to absorb new flows through NGOs, are important in determining aid inflows in general. On the other hand, they find little evidence that documented policy effectiveness by the receiving government and the presence of efficient institutional capacity to implement aid

[3] The only RCT trial on post-disaster aid that we are aware of is De Mel et al. (2012).
[4] Yang's sample is concentrated in a few island nations, the countries of Central America, and two big countries that frequently experience storm damage, Bangladesh and the Philippines.
[5] Both papers attempt to estimate the impact of disasters on financial flows more generally.
[6] Bearce and Tirone (2010) show that these differences in geo-strategic interests also lead to differences in the efficacy of aid.

projects matter for the magnitude of aid received (though this may vary by the nature of the donating source; see Easterly and Pfutze, 2008).

This literature also hypothesizes that there is significant cross-country re-allocation (as total aid budgets are politically more difficult to increase than to change the identity of recipients), and that there is cross-sectoral re-allocation (as post disaster humanitarian aid is frequently re-labeled aid that was already previously promised in other guises). Here, we would like to examine all these possibilities using the most comprehensive and detailed available data on bilateral aid flows.

3. Data

3.1 CRS Aid data

Detailed data on aid flows are available from the Credit Report System (CRS) of the Development Assistance Committee (DAC) and from the United Nations' Financial Tracking Service (FTS). The CRS data on official development assistance cover annual bilateral aid extended from 27 donor countries to a large number of recipient countries. The FTS database does not aggregate aid flows annually but rather presents information for each international humanitarian aid appeal issued by the UN. Many of these appeals involve natural disasters.

The FTS data have two advantages: First, they provide data for each appeal separately, hence allowing direct one-to-one correspondence between aid flows and individual disasters. Second, while the CRS focuses only on OECD donor governments and multilateral organizations, the FTS also tracks aid flows from several large private/NGO donors. However, FTS data are based on donors' voluntary reporting and evidence suggests it mis-estimates the volume of actual new aid given (see Becerra et al., 2012). We use the CRS dataset because of its more comprehensive nature and because it is based on actual disbursements rather than pledges or commitments. Only the CRS data allows us to answer the questions we pose here on the nature of realized post-disaster aid flows.

The CRS dataset includes the aid originating from the 25 members of the development assistant committee (DAC), 29 multilateral institutions, and 2 Non-DAC countries (Kuwait and United Arab Emirates) between 1973 and 2011. CRS records comprehensive information about bilateral and multilateral donors' Official Development Assistance (ODA), including donor and recipient identification data, basic description of the amount, channel of delivery, purpose of the aid activity, and some supplementary data. The basic unit of observation in the CRS dataset is the aid activity, which according to the OECD definition, includes "projects and programs, cash transfers, deliveries of goods, training courses, research projects, debt relief operations and contributions to non-governmental organizations." To be classified as an aid activity, an activity must met the OECD definition for ODA, which is that the activity has as its aim "the promotion of the economic development and welfare of developing countries, and which are concessional in character with a grant element of at least 25 percent."[7] Each aid activity is reported by the donor agency, and includes detailed information about the amount committed and disbursed, characteristics and purposes.

One central issue in the analysis of the CRS data is their comprehensiveness. In the past, some aid activities were not reported in the CRS, and so the conclusions based on the CRS data may not be accurate describing the trends in the overall aid activity of DAC countries. It is therefore necessary to assess to what extent we can use the data recorded in the CRS. The completeness of CRS data is measured by the coverage ratio, which we compute by adding the appropriate flows recorded in the CRS dataset and comparing them to their aggregate counterparts recorded in the aggregate statistics' DAC dataset, which has the official figures of total aid activities by donor and recipient.

[7] In the CRS, there is additional information about other official flows – the Other Official Flows (OOF). These do not meet the ODA criteria, and represent a minor share of the total official assistance and we consequently will not include them in the rest of the analysis.

We compute the coverage ratio for the total commitments and disbursements of grants and loans, and humanitarian aid disbursements.[8] Figure 1 shows the computed coverage ratio for the period 1995 – 2011. Commitment information is highly comprehensive (i.e. it covers more than 90% of the whole commitment information) from 2000 onwards, whereas CRS disbursements and humanitarian aid information reached a high coverage only after 2002. In what follows, we focus on aid from DAC countries to developing countries between 2002 and 2011 (the high coverage period).[9]

The CRS dataset has five sections: identification data, basic data on the activity (description, destination, recipient, type, and channel), supplementary data (long narrative description and policy objective), volume data related to the activity (commitments, tying status, gross disbursements, and repayments of loans), and for loans, details on financial terms and amounts outstanding. The most relevant fields in the first three sections are discussed below.

3.1.1. Aid Commitment Data

The basic CRS data contain information about the recipient country, the aid flows' channel of delivery and information about the purpose of the project, such as the description and purpose of the aid activity.[10] Between 2002 and 2011, CRS identifies 160 developing countries as recipients of ODA aid activities. The main recipients are countries located in the Sub-Saharan Africa, South and Central Asia, Far East Asia, and Middle East with an average share of 31.1, 16.3, 10.2, and 9.1 percent of the total commitments between 2002 and 2011. When comparing commitments classified as humanitarian aid, the largest share of aid is focused on countries located South of the Sahara with 39.6 percent of the total, followed by South and Central Asian countries (18.5 percent), and the Middle-East (12.7 percent). One important

[8] Humanitarian aid is defined as the "assistance designed to save lives, alleviate suffering and maintain and protect human dignity during and in the aftermath of emergencies. To be classified as humanitarian, aid should be consistent with the humanitarian principles of humanity, impartiality, neutrality and independence." (See the Guidelines for Reporting In CRS++ Format)

[9] AidData (www.aiddata.org) includes data on other donors besides the CRS data on DAC donors. However, AidData focuses on commitments rather than on disbursements, and given the documented gap between the two, we prefer to use the CRS data directly (see Tierney et al. 2011).

[10] A summary of the main features of the commitment data is presented in Appendix Table 1.

feature of this disaggregation is the high share of the unspecified bilateral aid category: 14.7 percent of the total commitments are classified in this category (12.7 percent for humanitarian aid).

At the country level, aid commitments are concentrated in a few countries: between 2002 and 2011, one third of the total aid is concentrated on ten countries, and almost 50 percent of the humanitarian aid was directed to ten countries. The description of the purpose and sector of the aid activities is one of the most important fields for our purposes. The OECD asks donors to classify their aid activities according to the purpose that donors specify, using a broad sector classification and a particular subclass. The major part of the commitments is dedicated to social infrastructure and services (38.4 percent of the total between 2002 and 2011), followed by economic infrastructure and services (15.4 percent), and action relating to debt (9.7 percent).

For humanitarian aid, there are three main subsectors that in turn have their own purpose. Between 2002 and 2011, the average number of activities is 8,521 activities per year. Out of the total of humanitarian aid, Emergency Response is the sector that represents the most common activity, with around 83 percent of total commitments. Inside the emergency response sector, the main purpose is emergency relief, which accounts for 56 percent of the total humanitarian aid between 2002 and 2011, followed by emergency food aid (25 percent).[11]

The CRS dataset also includes information about the type of financing, with two main categories: grants and loans. Grants represent around 77 percent of the total commitments, whereas the remaining 23 percent is for loans. Not surprisingly, grants represent around 97 percent of the total humanitarian aid. The United States, Japan, Germany, France, United Kingdom and Netherlands are the most important donors, and together represent 75 percent

[11] While we do not use this information, the CRS dataset also includes information about the type of channel used to deliver the aid—there are five broad groups: the public sector, NGOs, public-private partnerships (PPPs), multilateral organizations, and others. Information about channel is only available for half of the total aid activities after 2004, with a higher coverage after 2007.

of the total commitments among the DAC countries. For humanitarian aid, the United States, United Kingdom, Japan, Netherlands, and Canada are the main donors.[12]

Finally, although commitments and disbursements are closely tied, actual disbursements tend to be lower than the original ODA commitments. Table 1 presents the average and standard deviation of the disbursement to commitment ratio for the largest six donor countries (France, Germany, Japan, Netherlands, United Kingdom, and United States) and the largest multilateral donor (European Union Institutions) between 2002 and 2011. For each country, disbursements represented roughly about 90 percent of the total commitments with a standard deviation of about 20 percentage points. The main differences between the disbursement and commitment data occurred in the United Kingdom and EU Institutions, mainly caused by large deviations in particular years.[13]

3.1.2. Aid Disbursement Data

In light of the significant discrepancies between aid commitment and disbursement data, we focus on the latter. We started with the CRS database, covering the period 2002 - 2011. The dataset includes information of 1,746,431 aid activities in this period, but only 1,567,379 records include information about disbursements. Almost all of the records come from the 25 DAC countries (1,193,057 records) and 29 multilateral institutions[14] (372,073). We focused only on the activities classified as ODA grants. They account for the main share of the total aid

[12] Since Iraq and Afghanistan are two of the main recipients of aid, however, the role of United States and United Kingdom may be overestimated. For non-DAC countries, CRS coverage is negligible: only two countries have information on aid activities for 2009 – 2011, and their commitments represent 1.1% of the total commitments. Amongst the multilateral institutions, the main donor is the category EU institutions, which accounts for 35 percent of the multilateral organizations' total commitments and the total humanitarian aid recorded in the CRS between 2002 and 2011. The other important multilateral donor reported in the CRS dataset is the International Development Association, which accounts for 33 percent of multilateral organizations' total commitments (mostly loans) in the same period.

[13] EU institutions showed a low coverage of disbursements prior to 2005, whereas United Kingdom showed disbursement to commitment data greater than one in 2010 and 2011.

[14] We grouped the multilateral donors in three categories: (i) European Institutions; (ii) UN Institutions and Development Banks with complete information (AfDB, AfDF, IBRD, IDA, IMF Concessional Trust Funds, UNAIDS, UNDP, UNFPA, UNICEF, and UNRWA), and (iii) Other multilateral donors without complete information (OSCE, GAVI, GEF, Global Fund, WFP, WHO, Arab Fund-AFESD, AsDB Special Funds, BADEA, EBRD, IDB Special Fund, IFAD, Islamic Development Bank, Nordic Development Fund, OFID, UNECE, UNHCR, and UNPBF).

activities. After dropping the ODA loan-related activities, there were 1,393,542 observations with information about disbursements.[15]

Preliminary analysis suggested that different donors react differently to the need for disaster-related emergency aid, and we therefore focus on all the largest donors and examine them separately. We kept the data for the largest six donors from the DAC countries (France, Germany, Japan, Netherlands, United Kingdom, and United States) and two multilateral donor groups (EU Institutions, and Development Banks and UN Institutions). Overall, these six countries and two groups account for 766,613 records, whose disbursement activity sum about 75 percent of the total ODA disbursements. Details about the breakdown of these disbursements by the eight donors (six countries and two multilateral groupings) are provided in Figure 2.[16]

Next, we kept information based on the recipient countries record. Out of the 748,778 records with non-zero information about disbursements, 104,541 records (13.6 percent) were related to regional or unspecified recipients. We dropped those records.[17] The next step was to collapse the events by donor-recipient-year-sector category. The collapsed dataset has 46,199 observations, with information about 159 recipient countries.[18] The number of recipient countries varies by donor: Japan is the donor with the most recipients (it is linked to 133 countries), whereas the United Kingdom is the one with the lowest number (47 recipient countries).

We dropped eight countries that are of particular interest for the large donors and show very different patterns in aid trends. These are: Afghanistan, Iraq, Nigeria, Pakistan, Republic of

[15] Loans – even with a large grant component in the form of concessionary interest rate – are not equivalent to grants, and measuring the concessionary part will potentially insert biases into our data. Accounting for the timing and maturities of the loans inserts an additional dimension into our analysis.

[16] Figure 2 also includes this data without the debt relief component; we describe this in more detail below.

[17] We drop additional records for France in 2004 and 2005, since they seem as double counting disbursements of the sector 930 (refugees in donor countries). This problem occurs in 2005, where humanitarian aid sector and development aid sectors showed abnormal changes with respect to their historical behavior. After comparing the dataset with the aggregates reported in the Table DAC 2A, we found regularities in the abnormal increases in humanitarian aid and development food aid disbursements for those years that led us to modify 31 activities for the development food aid sector and drop 160 records for the humanitarian aid sector.

[18] There were some countries with very few observations (e.g. Malta only has three records in the dataset). We dropped any donor-recipient combination with less than 30 observations (an ad-hoc low threshold). The resulting dataset includes 40,735 observations for 144 recipient countries.

Congo, Democratic Republic of Congo, Ethiopia, and the Ex-Yugoslavian States. As Figure 3A shows, most of the upward trend observed in the largest donors is explained by the activities of donor countries in those countries. In addition to those countries, we dropped some ODA sectors: Administrative Costs of Donors (910) and Unallocated/Unspecified (998). Except for Netherlands aid activities, these sectors represent a small share of total disbursements.[19] We also dropped the Action Relating to Debt (600), since in 2006 the Heavily indebted poor countries (HIPC) initiative represents an abnormal jump in the aid flows from the multilateral organizations – see Figure 3B.[20] The number of non-zero observations in this dataset is 31,369.[21] Figure 3C shows the resulting trends for total disbursements by donor.[22]

3.2 Disaster Data

Almost all the empirical work on natural disasters relies on the publicly available Emergency Events Database (EM-DAT) maintained by the Center for Research on the Epidemiology of Disasters (CRED) at the Catholic University of Louvain, Belgium (http://www.emdat.be/). EM-DAT defines a disaster as a natural situation or event that overwhelms local capacity and/or necessitates a request for external assistance. For a disaster to be entered into the EM-DAT database, at least one of the following criteria must be met: i) 10 or more people are reported killed; ii) 100 people are reported affected; iii) a state of emergency is declared; or iv) a call for international assistance is issued. Disasters can be hydro-meteorological**,** including floods, wave

[19] In order to avoid time scale effects, when we use measures that depend on ODA in levels (e.g. total aid or aid as percentage of GDP), we split the 910/998 disbursements between the remaining sectors proportional to their original shares (this is only of empirical importance for the Netherlands).
[20] We dropped Refugees in Donor Countries (930) sector; it is only reported for France in 2005.
[21] We also dropped a few very small island-states for which we had no population data (Cook Islands, Montserrat, Nauru, St. Helena, Wallis & Futuna).
[22] To verify the integrity of our data construction process, we also compared CRS disbursements with the aggregate disbursements reported in the Table 2A by the DAC, which represents the aggregate official reports of bilateral disbursements from countries and institutions included in CRS. A figure comparing the aggregate disbursements by donor reported in both CRS and DAC 2A datasets is available upon request. The aggregate disbursements from EU Institutions show a systematic underreporting between 2002 and 2004, and since our final objective is to identify aid surges, we restrict the sample for EU Institutions to the period 2005–2011. Similarly, we set the sample for Japan disbursements to the period 2003–2011.

surges, storms, droughts, landslides and avalanches; geophysical, including earthquakes, tsunamis and volcanic eruptions; and biological, covering epidemics and insect infestations (the latter are very infrequent).

The disaster impact data reported in the EM-DAT database consists of direct damages (e.g., value of damage to infrastructure, crops, and housing in current dollars), the number of people killed, and the number of people affected. As Cavallo and Noy (2011) observe, many of the events reported in this database are quite small and are unlikely to have any significant impact on aid disbursements and on the economy more generally. We therefore limit our investigation only to very large disasters and identify the largest using the algorithm described below.

We started with the EM-DAT dataset by event between 2002 and 2011, including only hydro-meteorological and geophysical events (sudden-onset natural hazards).[23] The total number of events was 3,055.[24] Using the information on damages and mortality, we only kept events with more than 10 killed people and damages greater than 2011 US$ 10 MM: 1,485 events. Next, we created the first list of the large catastrophic events, defined as the events for which the number of either total killed or killed to population ratio was greater than the respective sample average (611 killed and 24.14 killed per million inhabitants). This list of large catastrophic disasters has 72 events.[25] For this list of large events, we created a new variable measuring media coverage, based on the AP archive website.

We next collapsed the dataset from an event level to a country-year level,[26] and aggregated the intensity variables over all the events occurring in the same country during the same year. The collapsed dataset had 66 year-country observations. Finally, from the 66 country-year disaster observations, we chose the final list of large catastrophic event. First, we

[23] Slowly evolving events are much more difficult to date (both their beginning and end) and to quantify their costs. They are also less clearly caused by natural hazards, and more related to government policy. While some of these issues are relevant to the analysis of sudden-onset events, the data problems are less severe in the latter case.
[24] Only 2,232 events had information about mortality and the number of affected people. We converted the monetary damage data into comparable 2011 US$ using US CPI data.
[25] We dropped one event in Taiwan because it did not have the other required information.
[26] If the event occurred in the last quarter of the year, we used the next year as the year of the disaster.

generated a ranking for each intensity variable: number of killed, killed to population ratio, and media coverage. Second, we generated an aggregate score that is the sum of the three mentioned rankings. Third, we defined a large catastrophic event as the top 25 events based on the composite score. After we merged this list with the available aid data, the list of usable large events includes 19 large disasters.[27] The final list of catastrophic disasters, and their descriptive statistics, is available in Table 2. The table includes data on the number of people killed in each event, the number of killed as percentage of the population, and the media coverage (measured by the number of AP reports on the event).

4. Empirical Results

4.1. Aid after Catastrophic Disasters – Some Possibilities

Several research projects have examined aid data from the donors' perspective (e.g. Drury et al., 2005). Here, however, we are more interested in the recipients, their experience with obtaining aid after catastrophic events, and what these patterns imply for their incentives.[28] For several of the disaster events in our sample (Bangladesh, Indonesia, Myanmar, and Sri Lanka) there are remarkable surges related to the catastrophic events we identified, and in some cases (e.g. Haiti) those increases are large enough to suggest that there may be cross-country reallocation in donor accounts – see Appendix Table 3. On the other hand, there are some catastrophic events that did not record an aid surge and that in general, received little aid that can be directly associated with the catastrophic event. Examples include the flood in the Dominican Republic in 2004, cyclone Sidr in Bangladesh (November 2007), and the China earthquake in 2010.

The 2004 tsunami demanded the attention of all donors. In particular, there are two effects that are remarkable with the events related to the 2004 Indian Ocean tsunami: first, most of the donors reported increases in humanitarian aid to the most affected countries –

[27] We dropped three events because they do not correspond with the CRS data (Japan 2011, United States 2005 and American Samoa 2009) and three events that occurred in countries with abnormal levels of aid inflows – aid that is likely not motivated mostly because of humanitarian concerns (Afghanistan 2002 and Pakistan 2006 and 2010).

[28] We later also examine the biggest donors' patterns, but only given the importance of understanding their behavior from the recipients' perspective.

Indonesia and Sri Lanka. Second, the duration of the associated aid surges for these countries is longer than the typical post-disaster aid surge; a review of the narrative description of aid projects reveals that there are additional aid-funded activities up to 2009, especially reconstruction expenditures.[29]

Because of the richness of information of CRS and EM-DAT datasets, there are different ways to analyze the effect of a catastrophic event on bilateral aid. The first thing we should discuss is how different effects in aid should look like, and in the next section, look for those patterns in the data. The response of bilateral aid after a catastrophic event depends on the interaction of two different effects: (1) Complementarities between donors; donors coordinate the necessary actions to meet the aid requirements of a particular recipient country. (2) Reallocation between recipients and sectors. Becerra et al. (2013), conclude that the overall aid inflows in the aftermath of a disaster event are fairly limited (relative to disaster magnitude), so the evidence of the complementarity effect is fairly limited. We therefore focus on the second type of dynamics.

Let us assume that a catastrophic event occurred in the country r^* at period t^*, and assume further that donor d decides to increase the bilateral aid to r^*. Then, at the recipient country level, the response of total aid from donor d must be one of the following three cases: (1) The aggregate ODA from that donor does not increase because of cross-recipient reallocation. After the catastrophic event, the donor reallocates the current ODA resources from other recipients to r^*;[30] (2) aggregate ODA increases in the same amount than the increase in ODA for recipient r^*; i.e., no cross-recipient reallocation; and (3) neither aggregate ODA nor ODA for the recipient country increases; we call this possibility cross-sector reallocation. The donor country does not reallocate resources across recipients, but instead it provides humanitarian aid by reallocating ODA from recipient r^*'s aid previously provided for other sectors. These three possibilities are presented diagrammatically in Figure 4.

[29] The 2004 South-East Asia tsunami was also the first event, apparently, in which private donations were larger than the sum of official aid flows (from both bi-lateral and multi-lateral sources) – see Athukorala (2012).

[30] This type of response may be explained, for example, because aid response after catastrophic events tends to be immediate, and so it may be administratively/institutionally easier to reallocate resources across recipients than get additional funding approved for emergency relief.

4.2. Post-Disaster Aid Data: Cross-Country Reallocation

We next consider all the aid surges for all the donor-recipient pairs, and specifically in conjunction with the occurrence of a large catastrophic event.[31] We define an aid surge as the difference between the aid flows for the year the disaster occurred and the average aid flows in the two years preceding the event. The full data is presented in Appendix Table 3, with shaded rows denote the cases in which the aid surge ranks in the top 5 percent of aid surges (either the same year or one year after the event). We summarize this data in Figure 5, which plots the distribution of all the aid surges in the dataset, and specifically highlight the aid surges that are associated with catastrophic natural disasters. Even in the aftermath of the largest catastrophic events, not all the donors react with large (abnormal) increases in aid to the disaster-hit country recipient. Not surprisingly, the most remarkable aid surges are related to the largest four catastrophic events (in terms of absolute mortality levels): the 2010 Haiti earthquake, the 2004 Indian Ocean tsunami in Sri Lanka and Indonesia, and Cyclone Nargis in Myanmar. The US response to the aftermath of the 2010 Haiti earthquake is the highest surge in absolute value (2010 US$ 815 Million, 3.8 times higher than the previous two years average).

Even though we observe large increases in ODA for some of the large disasters, most of them are not large compared with the level of the total ODA activities of a donor country. We identified, in Figure 5 (and Appendix Table 3), 25 recipient-donor pairs as large aid surges out of a possible 118. We also find that the increases in total ODA to the recipient tend to be low when compared to the increase in the aggregate ODA from that donor in most cases. This pattern, of course, suggests that the cross-country reallocation is typically not an observed pattern, but it also suggests that donor countries do not seem to mobilize all available resources even in the aftermath of quite catastrophic events (for the affected countries). Table 3 below shows the largest aid surges highlighted in Figure 5, and compares them to the change in the total ODA by donor (relative to the previous two year average) for the same year. After a large surge, the median increase in ODA by recipient was 2010 US$ 39.5 MM, whereas the median increase in total ODA by donor was 2010 US$ 308.4 MM. As a proportion of the change

[31] Our selection of catastrophic events was explained in section 3.2.

in total ODA, the median change in ODA by recipient represented 5.5 percent of the total change by donor country.

In summary, after the occurrence of a catastrophic event, not all the donors increase ODA in an abnormal way; moreover, the increase in ODA is typically smaller than the one observed for the aggregate ODA – except for the cases of Haiti-EU Institutions (2010), Haiti-United States (2010), Sri Lanka-United States (2005) and Maldives – Japan (2005). In addition, the evidence suggests that the donor cross-country reallocation of foreign aid to channel more aid to an affected country is low.

4.3. Post-Disaster Aid Data: Humanitarian Aid

The CRS dataset classifies the bilateral aid flows according to their intended sector (social, infrastructure, etc.). We would like to describe the sectoral composition of post-disaster aid surges; i.e., we ask what are the sectoral characteristics of this aid. We considered only the sectors with the largest share in total aid activities from the largest donors we already identified. The relative importance of the sectors varies between the donors, but for consistency we examine the same five biggest sectors for all donors. These sectors are: social infrastructure and services, economic infrastructure and services, production sectors, humanitarian aid, and multi-sector.[32] [33]

We separate the analysis by donor country, having a two dimensional panel dataset for each donor country (recipient/year, whereas aid in each sector becomes the variable of interest). Implicitly, we are assuming in this analysis that the aid decision is donor-driven and

[32] The three sectors we do not include are: budget support/other commodity aid, development food aid/food security assistance, and actions relating to debt.

[33] For the United States, 2002 and 2010 were abnormal years. Even after we removed Pakistan from our sample (because of its role in the war in Afghanistan), US disbursements in 2002 had a large share of "unspecified" humanitarian aid for Indonesia (7 percent of total). Second, there was a large amount of resources focused on the relief of Haiti's earthquake (45 percent of the total of 2010). Because of these dramatic deviations from status-quo for the sector shares, the main conclusions regarding sectorial allocations are related to the period 2003-2009. In order to keep homogeneity in the results, we used the time-frame for the other countries as well.

that donors do not coordinate their aid disbursements. In what follows, the analysis is carried out by group of recipients given a donor.

We start by examining the impact of an event (a catastrophic disaster in a recipient) on humanitarian aid. This examination is both interesting in and of itself, and important since a lot of the empirical research on disaster aid cited earlier only uses humanitarian aid flows, implicitly assuming that only these flows are related to post-disaster assistance. Using a similar approach than the one used in the previous section, we analyze the aid surges for the humanitarian aid sector in the aftermath of a catastrophic event. The full results of these tabulations are presented in Appendix Table 4 below. In Figure 6, we again plot the distribution of humanitarian aid surges, while highlighting all the recipient-donor pairs for the large catastrophic events previously identified. For these, we compute the humanitarian aid surges, and compare them to the overall change in ODA for the same period.

The data suggests there is an occasional shift of the donors, in the aftermath of catastrophic events in recipient countries, towards humanitarian aid; and this increase is more frequently done accompanied both by an overall increase in aid but with some cross-sector reallocation. On one hand, while there are few cases considered as large aid surges in aggregate ODA, humanitarian aid tends to show large aid surges in many of the countries with large catastrophic events. Out of the total 118 pairs listed in Figure 6 (and Appendix Table 4), 20 humanitarian aid surges are greater than the percentile 95 of the humanitarian aid surge distribution by donor, and for 25 events the recipient countries were not receiving any humanitarian aid before the catastrophic event.[34] Second, many of the cases in which an overall aid surge is identified as large do not coincide with a large aid surge in humanitarian aid. Out of the 25 events we previously classified as a large aid surge, 12 are in the top 5 percent of the humanitarian aid surge distribution.

Third, for the largest catastrophic events, the changes in humanitarian aid are more than half the change in total ODA; in general, this percentage tends to increase with the

[34] This is the particular case of the response of the 2010 earthquake in Chile, where the four donors included in the analysis disbursed US$ 19.5 millions as humanitarian aid, which represented large aid surges for each recipient-donor pair.

intensity of the event. For Japan's foreign aid provision, the change in humanitarian aid is larger than the change in the total ODA, providing suggestive evidence of cross-sector reallocation. For the first four large catastrophic events, the change in the Japanese humanitarian aid is at least of the same magnitude than the change in total ODA. Similarly, the change in humanitarian aid accounts for almost 60 percent of the change in total ODA from other donors, but the importance of the change in humanitarian aid over the total change in ODA is smaller as the intensity of the event falls. The exception to this trend is the Chilean case, for which the ranking of the event is relatively low, but the change in humanitarian aid accounts for the main part of the total change in ODA.

To summarize this section, while humanitarian aid is on some occasions the main driver for a post-disaster aid surge, in many cases it is not. There are many cases in which a donor country did increase its post-disaster aid without a surge in humanitarian aid being observed, and equally instances in which humanitarian aid surged but total bilateral aid did not as the donor country cross-allocated funds from other sectors to humanitarian assistance. As such, using humanitarian aid in an investigation of post-disaster aid patterns is at best incomplete, and at worse misleading.

4.4. Cross-Sector Post Disaster Aid Patterns

If examining humanitarian aid by itself is not sufficient in order to understand post-disaster aid patterns, the next step is to more fully describe the sectoral allocation of aid in post-disaster environments, by donor. Some sectors have a consistent large share across the donor countries we observe. Though the shares varied between donor countries, four sectors were the most prominent across these donors: Social infrastructure and services, economic infrastructure and services, production sectors, and multi-sector/cross-cutting activities. Given our interests in the role of post-disaster aid in total aid flows, we also included in the analysis the humanitarian aid sector, which had a share larger than ten percent for EU Institutions, Netherlands, and United States.

In order to analyze the donor's choice of how to allocate aid after a catastrophic event, an appealing approach is to study a version of Balassa's relative comparative advantage index, that we will call the Relative Importance (RI) index. For each pair of donor-recipient (i, j), the RI index is defined as the ratio between the disbursements' share for a specific sector in a recipient country, and the total share of aid of the donor country in the same sector. Formally, our RI index is defined as:

$$RI^{i}_{j,s,t} = \frac{\frac{Aid_{i,j,s,t}}{\sum_{s\prime} Aid_{i,j,s\prime,t}}}{\frac{\sum_{j\prime} Aid_{i,j\prime,s,t}}{\sum_{j\prime}\sum_{s\prime} Aid_{i,j\prime,s\prime,t}}}$$

where s and t stand for the sector and time indexes.

The RI index is suitable for our analysis because it summarizes in one number two different dimensions of our data: on one hand, it quantifies the importance of a specific sector in the total aid of a recipient country. On the other hand, it compares this share relative to the same share for a reference group of countries. Moreover, the RI index has a clear reference point: a value of RI greater than one implies that compared with the other countries in our sample, country *j* is receiving more aid in that specific sector, and so the countries with a $RI^{i}_{j,s,t} \geq 1$ are the countries in which the donor focuses their aid for that sector.

Consider, for example, the humanitarian aid sector in a particular country after the occurrence of a catastrophic event. In this case, an increase in the RI index implies that the change in humanitarian aid for a given country is larger than the variation in the total share that the donor country disbursed as humanitarian aid for all the reference countries.[35] This is particularly useful in cases in which there was more than one catastrophic event per year, for example, the 2004 Indian Ocean tsunami, in which Indonesia and Sri Lanka received more humanitarian aid than India and Thailand.

4.4.1 Dynamics of aid across sectors

[35] Essentially, this can be read as the donor country 'revealing' what recipient countries it prefers to support.

The basic bivariate cross correlation coefficient provides an alternative way of analyzing the patterns of post-disaster aid flows. We compute the cross correlation coefficient as

$$Corr\left(RI^{i}_{j,s,t}, RI^{i}_{j,s,t-k}\right) = \frac{1}{|j|}\sum_{j'} Corr\left(RI^{i}_{j',s,t}, RI^{i}_{j',s',t-k}\right),$$

where $|j|$ stands for the number of countries with a non zero correlation coefficient (i.e. countries which have a non constant value of $RI^{i}_{j,s,t}$ across the sample). The set of correlation coefficients for each donor country, allows us to identify some patterns in the cross-sectoral allocation; we focus on the main five aid sectors: Social infrastructure (100), Economic infrastructure (200), production sectors (300), multi-sector/cross-cutting (400), and humanitarian aid (700).

Figure 7 shows a summary of the estimated correlation coefficients for all donors. We display the range between the largest and smallest correlation coefficient obtained for each pair of sectors, pooling all the donor countries. The panel located at the first row and fifth column, for example, displays the correlation coefficients between the RI index for social infrastructure and lags of the RI index for humanitarian aid. In the first range (at lag 0), the graph displays the range of the maximum and minimum correlation coefficient estimated by donor for between those two sectors (-0.25 for Netherlands and -0.59 for United States). Figure 7 makes evident some patterns in the data. Humanitarian aid flows tend to be uncorrelated with their past: the range of the autocorrelation coefficients for all countries is roughly centered around zero for all lags, and show the smallest dispersion among the autocorrelation of all sectors (graphs located at the main diagonal of Figure 7). Thus, a shock in the humanitarian aid sector tends to be short lived, lasting about one year. Even though this may be the case for other sectors (for example the economic infrastructure (200) sector), the range of the correlation is wider for them, suggesting that at least for some donors, there is persistence in the level of aid focused on these particular sectors. This is not surprising, as many ODA projects may be investment projects lasting more than one year, whereas the humanitarian aid is designed for short-run response. If any, the RI for humanitarian aid showed a negative contemporaneous correlation (between -0.6 and -0.25) with the social infrastructure sector, and does not show a definite pattern with changes in the other considered sectors.

Finally, correlation between humanitarian aid and changes in the other sectors was low in the subsequent observations.

A more formal approach to examine the dynamic relationship between the different flows (by sectors) is the use of a panel VAR with exogenous variables (PVAR) model, defined as:

$$\begin{bmatrix} RI^i_{j,100,t} \\ RI^i_{j,200,t} \\ RI^i_{j,300,t} \\ RI^i_{j,400,t} \\ RI^i_{j,700,t} \end{bmatrix} = \sum_{k=0}^{p} \begin{bmatrix} a^{i,k}_{1,1} & a^{i,k}_{1,2} & a^{i,k}_{1,3} & a^{i,k}_{1,4} & a^{i,k}_{1,7} \\ a^{i,k}_{2,1} & a^{i,k}_{2,2} & a^{i,k}_{2,3} & a^{i,k}_{2,4} & a^{i,k}_{2,7} \\ a^{i,k}_{3,1} & a^{i,k}_{3,2} & a^{i,k}_{3,3} & a^{i,k}_{3,4} & a^{i,k}_{3,7} \\ a^{i,k}_{4,1} & a^{i,k}_{4,2} & a^{i,k}_{4,3} & a^{i,k}_{4,4} & a^{i,k}_{4,7} \\ a^{i,k}_{7,1} & a^{i,k}_{7,2} & a^{i,k}_{7,3} & a^{i,k}_{7,4} & a^{i,k}_{7,7} \end{bmatrix} \begin{bmatrix} RI^i_{j,100,t-k} \\ RI^i_{j,200,t-k} \\ RI^i_{j,300,t-k} \\ RI^i_{j,400,t-k} \\ RI^i_{j,700,t-k} \end{bmatrix} + \begin{bmatrix} b^i_1 \\ b^i_2 \\ b^i_3 \\ b^i_4 \\ b^i_7 \end{bmatrix} X_{j,t} + \begin{bmatrix} u^i_{j,100,t} \\ u^i_{j,200,t} \\ u^i_{j,300,t} \\ u^i_{j,400,t} \\ u^i_{j,700,t} \end{bmatrix} \quad (1)$$

where $X_{j,t}$ is a dummy variable indicating whether a catastrophic event occurred, and $u^i_{j,s,t} = \alpha^i_{j,s} + v^i_{j,s,t}$ is the composite error term, the sum of the individual unobserved term $\alpha^i_{j,s}$ and the error term $v^i_{j,s,t}$. Because the previous analysis suggests a low level of persistence, and the time series is short (10 years), we include only one lag (p=1). [36]

We investigate the impulse response functions; the response of the system given a shock in the catastrophic event variable $\left(X_{j,t}\right)$. This examination enables us to identify if there was contemporaneous effect in the other sectors, and how it is typically transmitted to other sectors. Given a shock in the catastrophic event indicator, the average response of the RI index of the humanitarian sector is positive and significant only for United States and EU Institutions – the two largest donors in our sample. For these two donors, the contemporaneous response of the RI index of the social infrastructure and sectors is negative and significant, and for the US, the contemporaneous response of the RI index for the production-sectors sector is also negative and significant. Although not significant, the negative contemporaneous response of the RI index for the social infrastructure sector is observed in other four cases (Germany, Japan, Netherlands, and United Kingdom), which suggests that, to the extent that there is some cross sectorial reallocation, the reallocation seems to be stronger between the infrastructure to humanitarian aid sectors (Appendix Figure 1).

[36] We estimate the reduced form of equation by using the Dynamic Panel GMM estimator equation by equation (Arellano and Bond, 1991), and compute the impulse response functions for a shock in the exogenous variable $X_{j,t}$ as in Lütkepohl (2005) for the VAR case.

4.6. Panel VAR for aid across sectors in a response to a disaster event

In the previous section, we examined the impact of a change (shock) in one type of aid flow on other sectorial aid flows originating from the same donor country (and aggregated across disaster events). In this next step, we use similar panel VARs to investigate the impact of a disaster event on all types of aid flows (from the same donor). Before we present the PVAR results, however, it is worth noting from a before-after comparison that even though there is significant heterogeneity within each sector and donor, some observed patterns are noteworthy: Humanitarian aid increases in the year of the disaster for almost all donors, social infrastructure investment consistently falls for US in the year of the disaster, the humanitarian aid surge appears to last only one period, and there is no clear pattern for the other sectors and donors.[37]

The response to a shock in the catastrophic event indicator variable is presented in the Figure 8 panels. We present the PVAR results for the five biggest aid flow sectors previously mentioned and separately for the largest eight donors in our sample. These five sectors satisfy three conditions: (1) They are important for the donor (the aggregate share by donor is large); (2) They are important for the recipients (the average share per recipient is large); and (3) They are important for the majority of recipients (the share is non-zero for the major part of the country-year observations).

We find some evidence of partial re-allocation across sectors, but the data is fairly noisy, and this reallocation effect is statistically indistinguishable from the null of 'no effect' for most of the donor countries – see Figure 8 panels A-H. This re-allocation effect, however, does seem to be notable in the US data; i.e., from the five biggest donors, the US is the likeliest to reduce flows in other sectors once a disaster has an impact and humanitarian aid has increased.

5. Conclusions, caveats and some comments on policy

After examining the most detailed bilateral aid data available, we find three dominant patterns for aid in the aftermath of catastrophic disasters: First, the magnitudes and patterns of post

[37] Figures presenting these patterns are available from the authors upon request.

disaster aid are not consistent, and are very different across donors and across disaster events. Second, there is little evidence that donors reduce their aid to other countries when they boost aid to a country that suffers a catastrophic event. Third, donors do sometime engage in cross-sectoral substitution in the aftermath of an event, reducing their aid in other sectors (particularly infrastructure) while increasing it for humanitarian aid. This observation leads us to conclude that research efforts that rely only on data for humanitarian assistance are mis-measuring the amount that affected countries receive in the aftermath of disasters.

Potentially most importantly, an issue we have not explored sufficiently here is the dramatic difference between aid promises and actual disbursements; an example is the Haitian post-quake aid with only 62% disbursement rate.[38] Equally important is Becerra et al. (2013) finding that generally the aid surges that follow disasters are not sufficient to cover the disasters' costs.

Another important question, of course, is not how much aid arrives in a disaster-stricken country, but rather what does the aid that does arrive accomplish. Generally, it is not well documented that aid reaches its intended recipients, and supports the projects that are most worthy of support (in the sense of generating the most desirable outcomes). Ultimately, the desire is to place affected communities on a long-term sustainable path of prosperity. Whether aid assists in that process, if it indeed occurs, is not really known. The copious research on aid and growth more generally allows one to be skeptical, but the circumstances of post-disaster aid are quite different, and we believe that that conclusion would be unwarranted. Overall, however, it seems that in any case the aid that does arrive is not sufficient, and successful reconstructions cannot depend on aid alone.

The fact that post-disaster aid is unpredictable, and countries suffering disasters have quite a heterogeneous experience with post-disaster aid receipts, imposes its own costs. Aid becomes both uncertain and volatile. As Agénor and Aizenman (2010) have shown, this uncertainty and volatility leads in itself to inefficient policy choices among recipient countries.

[38] Data that can permit us to reach definite conclusions regarding the difference between disbursements and commitments is not easily available (since the data on disbursement is not directly comparable to the commitment data – see Tierney et al., 2011).

We view this paper as the “opening shot” in a larger research effort to understand post-disaster reconstruction. In this paper we have not yet directly addressed any of the important normative issues that are connected to post-disaster aid. For example, we have not asked what is the optimal size or composition of foreign aid for recovery/reconstruction purposes in post-disaster situations, or more broadly what is the best mix of pre-disaster risk prevention and mitigation, risk acceptance, and post-disaster efforts in reconstruction in case a disaster does hit.

A different set of questions, and one that has not really been tackled in any comparative way, focuses on identifying the most productive ways in which post-disaster aid should be disbursed (quickly as a lump-sum or sequenced over time? in-kind or in-cash?). Observers have pointed out that large aid surges lead to higher prices and may therefore be less effective. Is this indeed the case? Should aid nevertheless concentrate on reconstructing as quickly as possible, in spite of the higher costs? What about the trade-off between quickly rebuilding what was there before and a slower ‘build back better’ process that also accounts for newly exposed hazards and vulnerabilities and attempts to develop more resilient communities? We expect to see more research along these themes in the near future as the prominence of these events is only predicted to increase.

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Table 1: ODA disbursements to commitment ratio for large donors, 2002 – 2011

Donor	Mean	Standard deviation
France	0.94	0.08
Germany	0.90	0.05
Japan	0.92	0.11
Netherlands	0.96	0.25
United Kingdom	1.06	0.51
United States	0.87	0.11
EU Institutions	0.65	0.28

Table 2: Catastrophic Natural Disasters

Overall rank	Event	Total killed	Killed per million inhabitants	Media coverage (reports)	Rank killed	Rank killed to population	Rank media coverage
1	Haiti (2010)	222,570	22,563.3	1,035	1	1	1
2	Indonesia (2005)	166,623	741.8	615	2	5	5
3	Myanmar (2008)	138,366	2,949.2	439	3	2	9
4	Sri Lanka (2005)	35,399	1,827.5	452	6	3	8
5	China P Rep (2008)	87,476	66.4	623	4	20	4
6	Thailand (2005)	8,345	127.7	500	10	14	6
7	Iran Islam Rep (2004)	26,796	398.7	130	7	10	18
8	Haiti (2004)	5,419	597.1	80	12	6	27
9	Indonesia (2006)	6,580	28.9	152	11	42	15
10	India (2005)	17,589	15.9	307	9	48	12
11	Samoa (2009)	143	786.5	102	47	4	22
12	Guatemala (2006)	1,513	122.0	27	19	15	41
13	Algeria (2003)	2,266	72.1	25	15	19	43
14	Maldives (2005)	102	355.8	110	49	12	20
15	Bangladesh (2008)	4,234	29.7	74	14	39	28
16	China P Rep (2010)	4,659	3.5	373	13	59	11
17	Haiti (2008)	529	55.1	127	41	24	19
18	Dominican Rep (2004)	688	76.5	37	35	18	33
19	Chile (2010)	562	33.1	214	40	37	13

Table 3: Post-Disaster Aid Surges

Rank	Event	Donor	Aid surge (2010 USD, MM)	ODA change by donor (2010 USD, MM)	Aid surge as percentage of total ODA change
1	Haiti (2010)	Development Banks-UN	75.9	172.7	43.9
	Haiti (2010)	EU Institutions	180.3	-49.8	-361.9
	Haiti (2010)	France	104.6	213.4	49.0
	Haiti (2010)	Germany	32.8	99.3	33.1
	Haiti (2010)	Japan	52.3	851.7	6.1
	Haiti (2010)	United States	815.1	689.9	118.1
2	Indonesia (2005)	Germany	53.3	308.4	17.3
3	Myanmar (2008)	EU Institutions	35.0	640.5	5.5
	Myanmar (2008)	France	3.9	-446.7	-0.9
	Myanmar (2008)	Germany	8.1	319.3	2.5
	Myanmar (2008)	United Kingdom	59.5	402.7	14.8
	Myanmar (2008)	United States	59.3	2720.0	2.2
4	Sri Lanka (2005)	Development Banks-UN	41.0	795.4	5.2
	Sri Lanka (2005)	Germany	43.6	308.4	14.1
	Sri Lanka (2005)	Netherlands	39.5	263.1	15.0
	Sri Lanka (2005)	United States	37.8	-346.1	-10.9
6	Thailand (2005)	France/a	74.7	939.9	7.9
	Thailand (2005)	Netherlands/a	3.5	-234.6	-1.5
8	Haiti (2004)	Germany	4.4	282.5	1.6
9	Indonesia (2006)	Germany	91.6	183.9	49.8
11	Samoa (2009)	Development Banks-UN	3.4	310.9	1.1
13	Algeria (2003)	Germany	11.7	714.9	1.6
14	Maldives (2005)	Japan	22.1	20.4	108.3
17	Haiti (2008)	Germany/a	12.2	296.4	4.1
19	Chile (2010)	United States	11.2	689.9	1.6
MEDIAN			**39.5**	**308.4**	**5.5**

Notes:
a. Figures are the reported for year after the catastrophic event occurred.
b. Aid surge is the difference between the aid flows in the year the disaster occurred and the average aid flows in the two years preceding the catastrophic event.

Figure 1: CRS coverage ratio

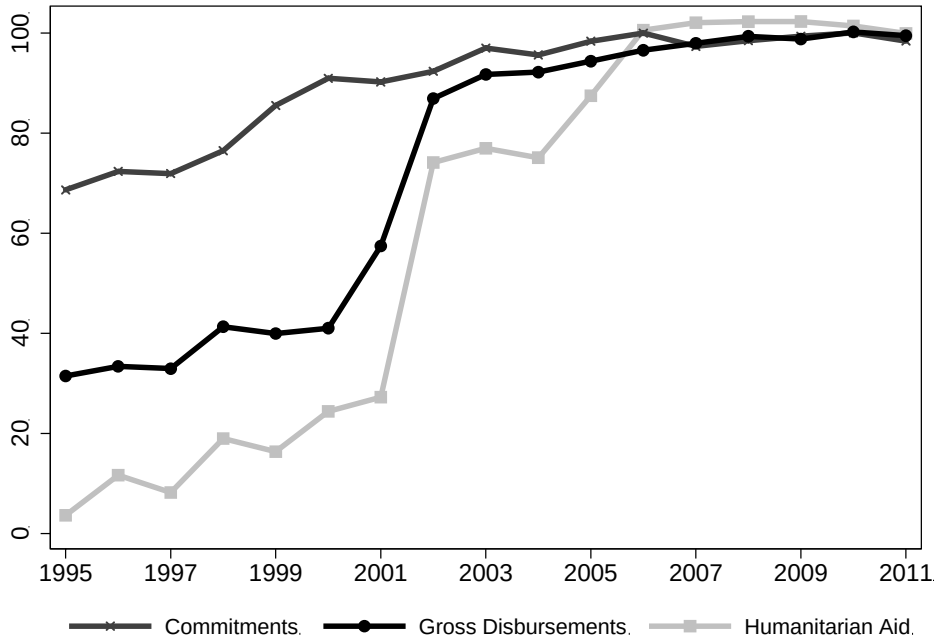


Figure 2: Share of disbursements in total by donor. Average 2002-2011

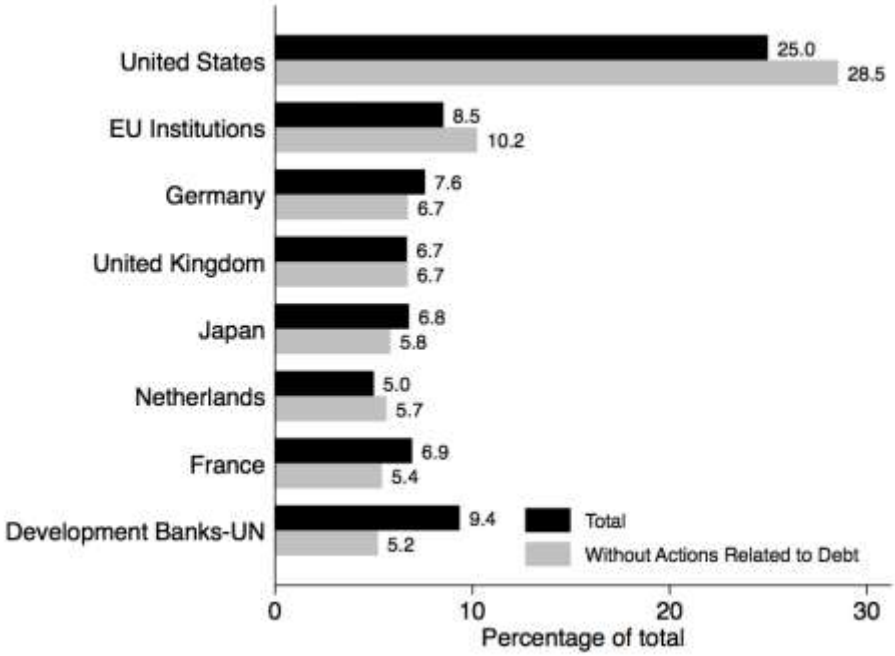
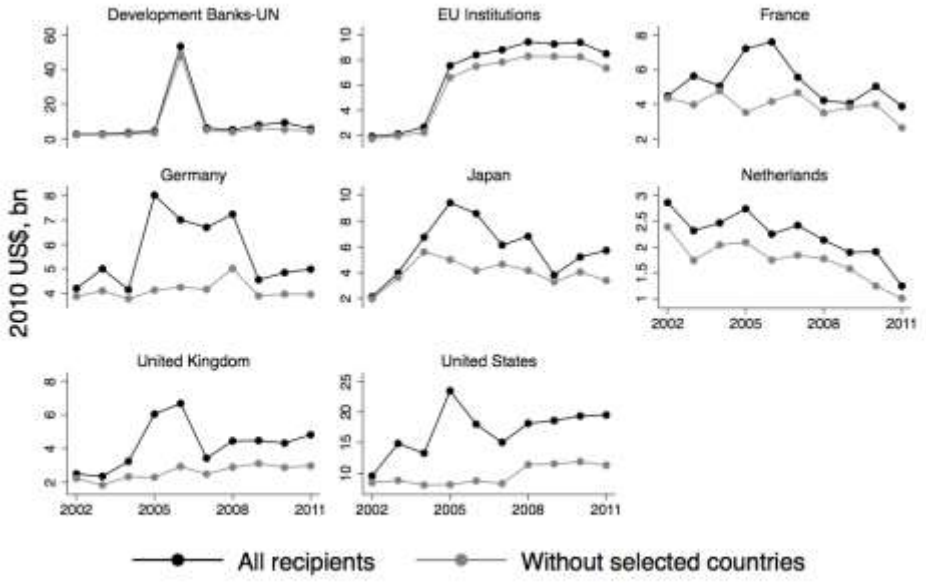
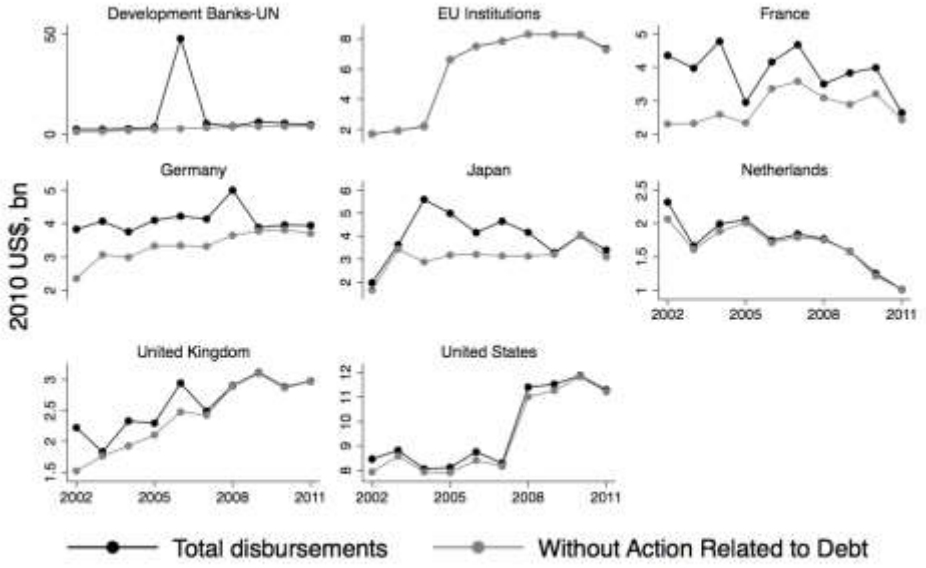


Figure 3A: Total disbursements by donor, with/out selected countries



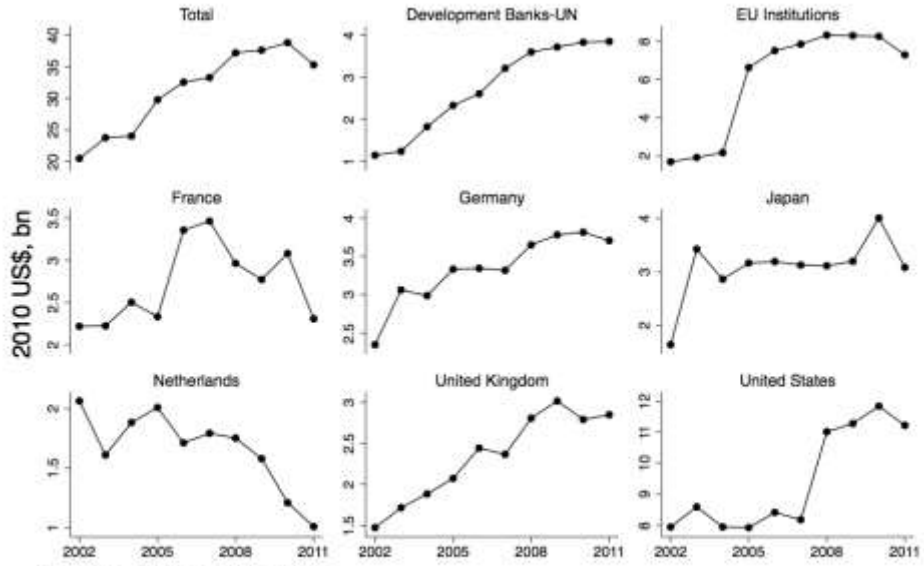
Source: Authors' calculations based on CRS, EM-DAT and WDI datasets.

Figure 3B: Total disbursements by donor, with/out debt relief



Note: Some countries excluded, see text.
Source: Authors' calculations based on CRS, EM-DAT and WDI datasets.

Figure 3C: Total disbursements by donor, 2002-2011

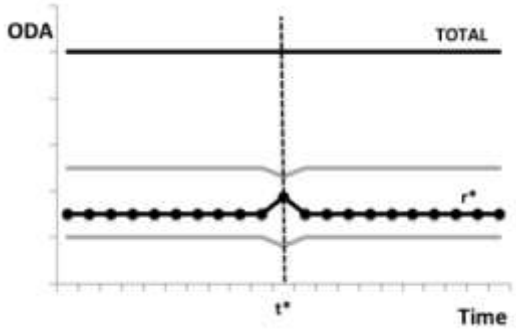


(1) Sectors 910 and 998 included.
(2) Action related to debt already excluded.

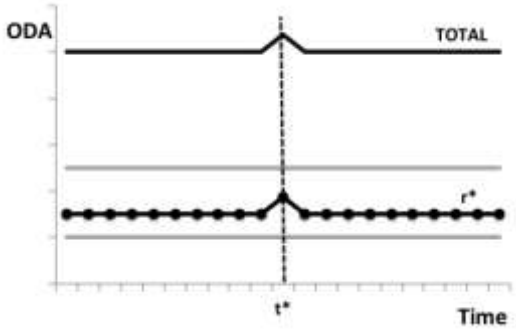
Source: Authors' calculations based on CRS, EM-DAT and WDI datasets.

Figure 4: Alternative Post-Disaster Aid Scenarios

1. Cross-recipient reallocation



2. No cross-recipient reallocation



3. Cross-sector reallocation

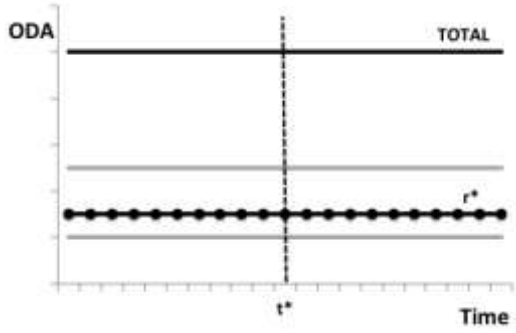


Figure 5: The Distribution of Aid Surges

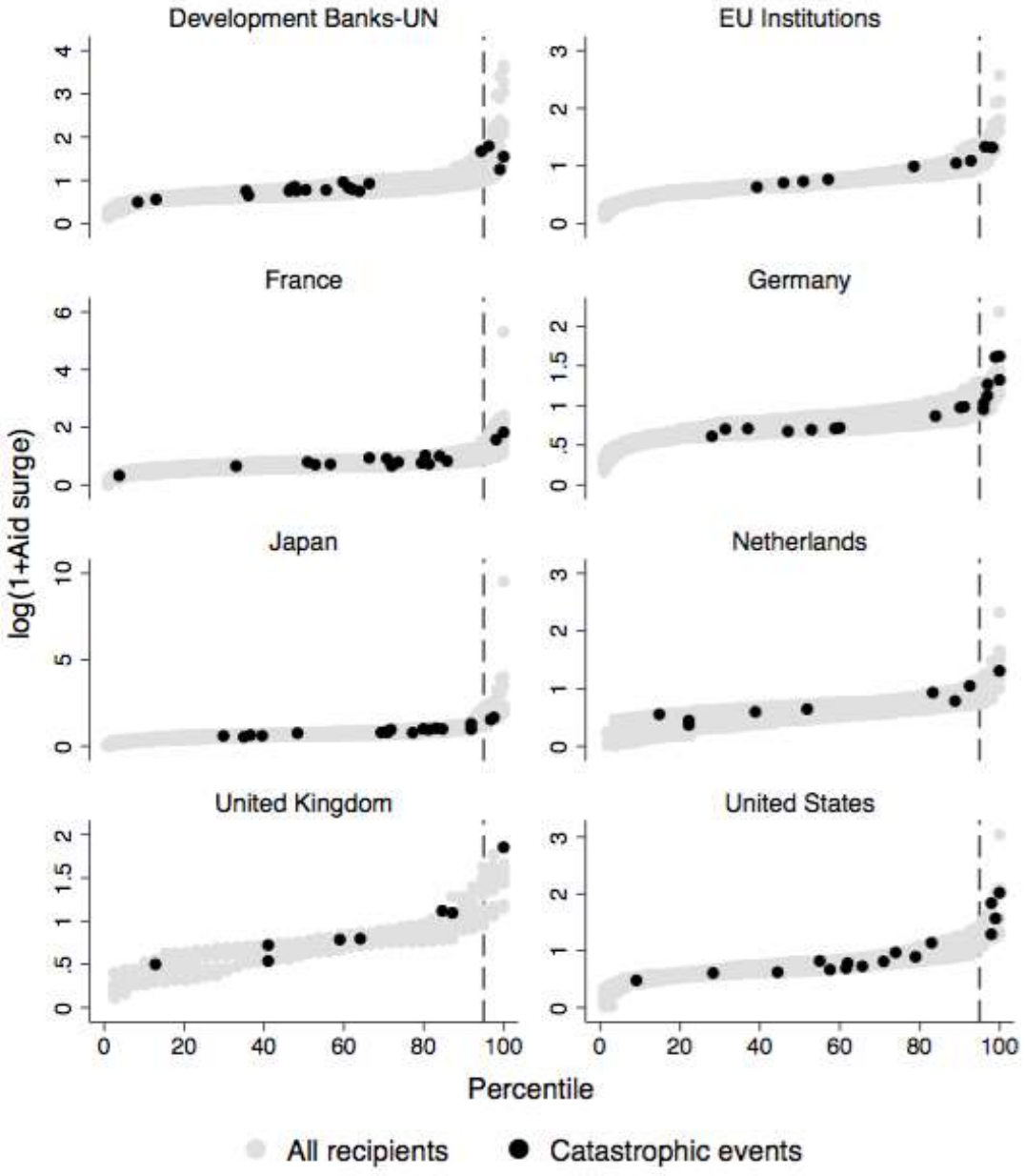


Figure 6: The Distribution of Humanitarian Aid Surges

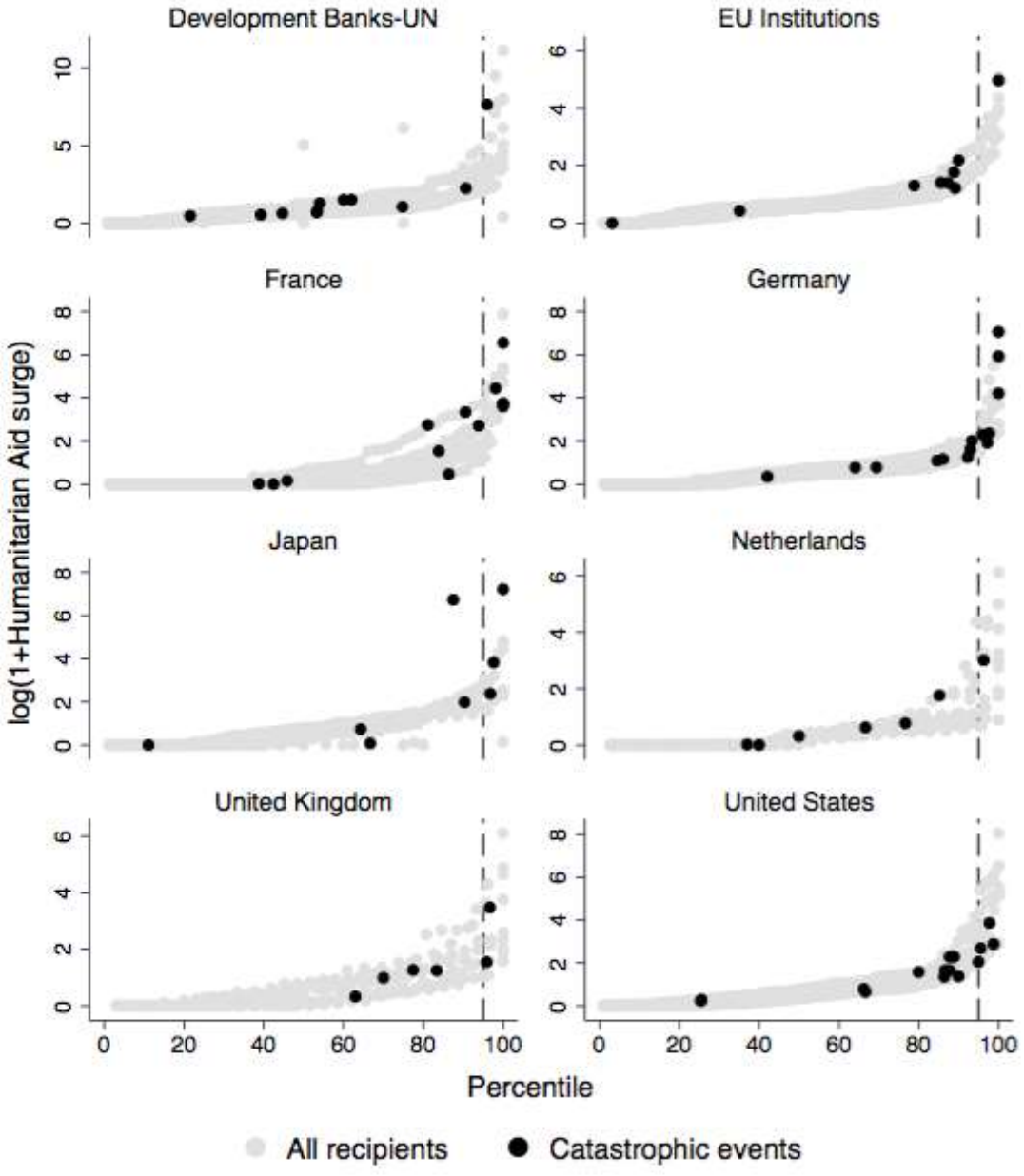


Figure 7: Cross correlation coefficients between RI indices for Social infrastructure (100), Economic infrastructure (200), production sectors (300), multi-sector/cross-cutting (400), and humanitarian aid (700).

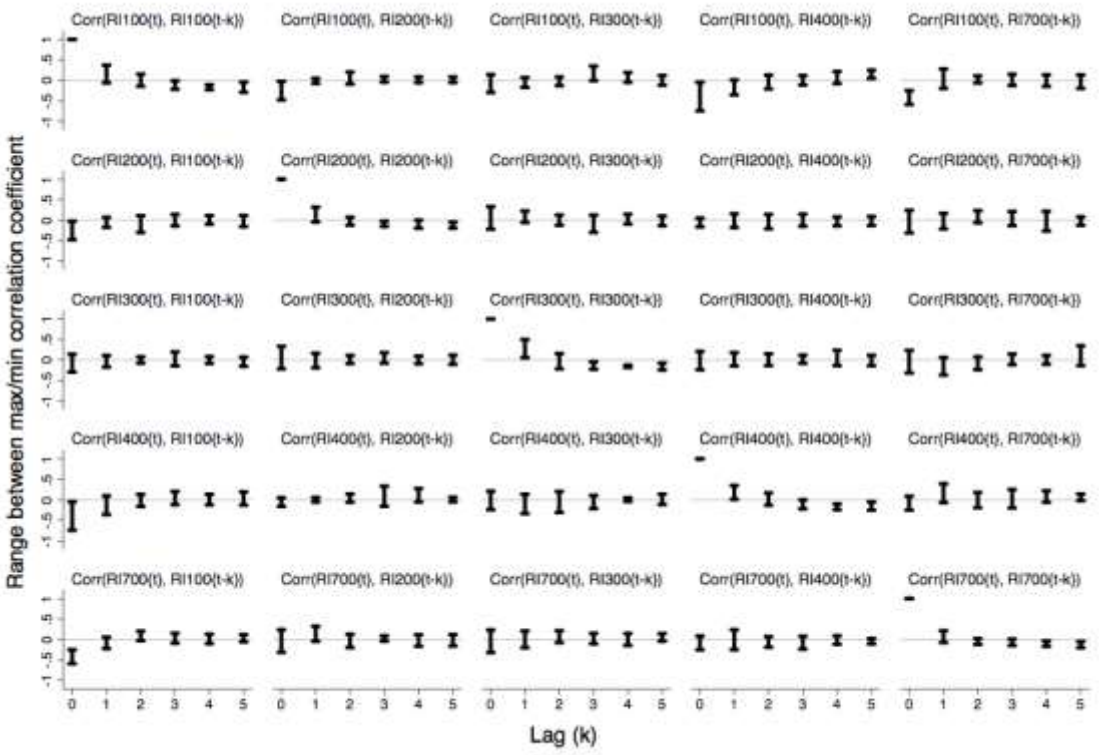
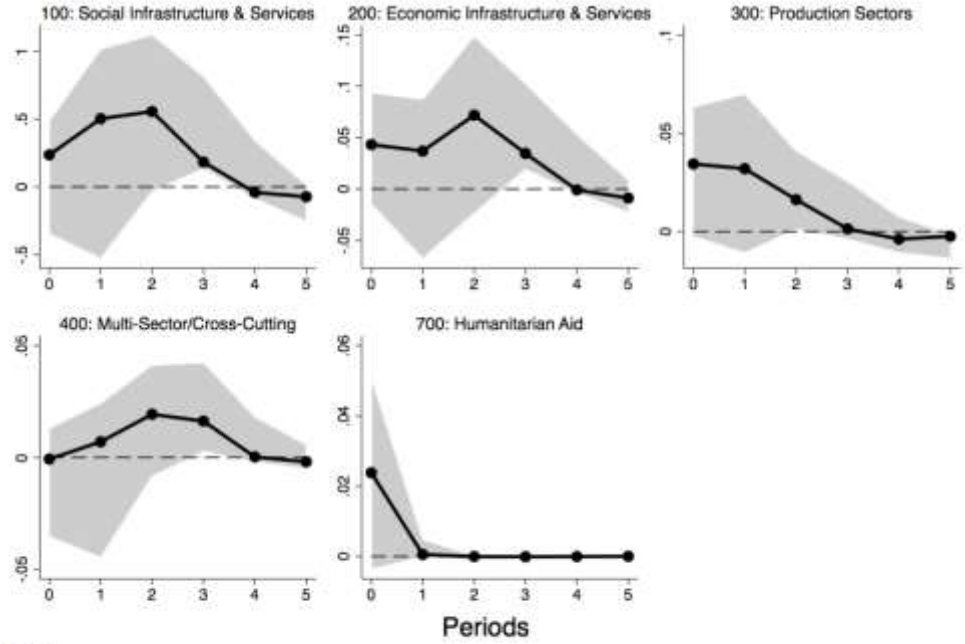


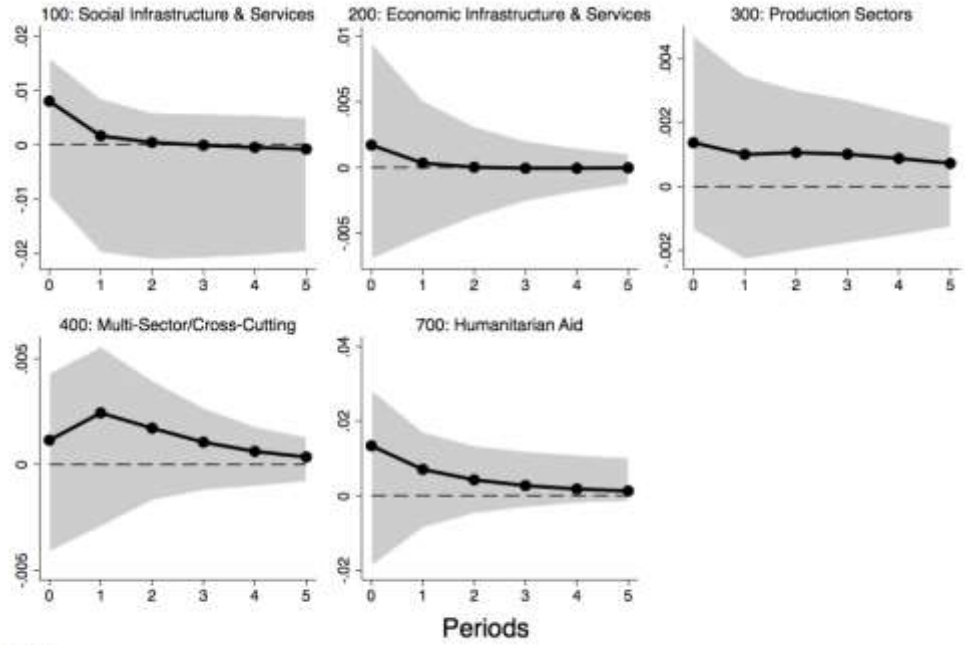
Figure 8: Response of Aid (By Sector) to a Disaster Shock (as % of GDP)

Figure 8A: France



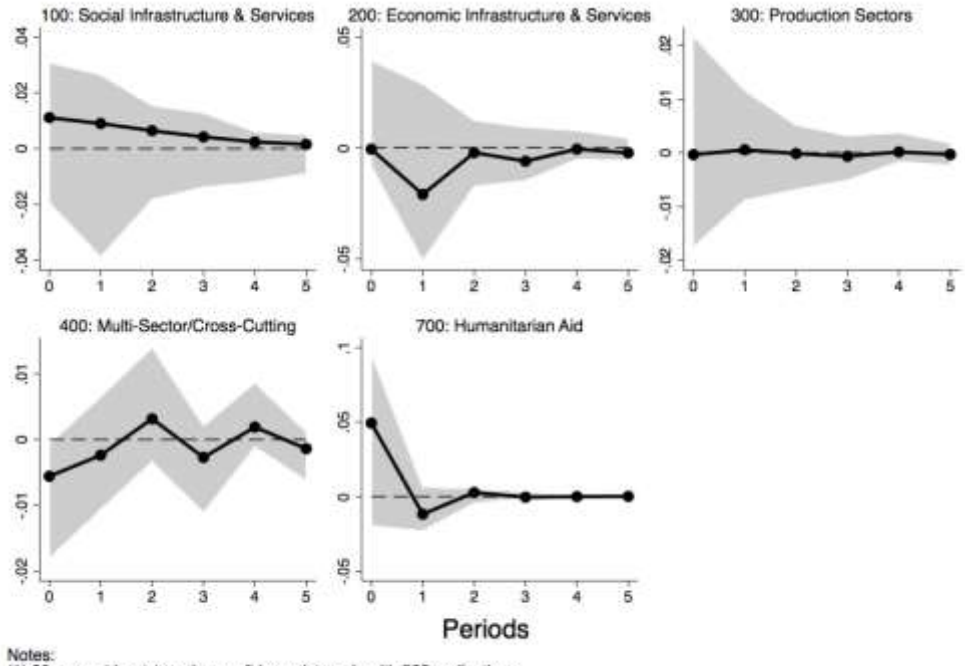
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 8B: Germany



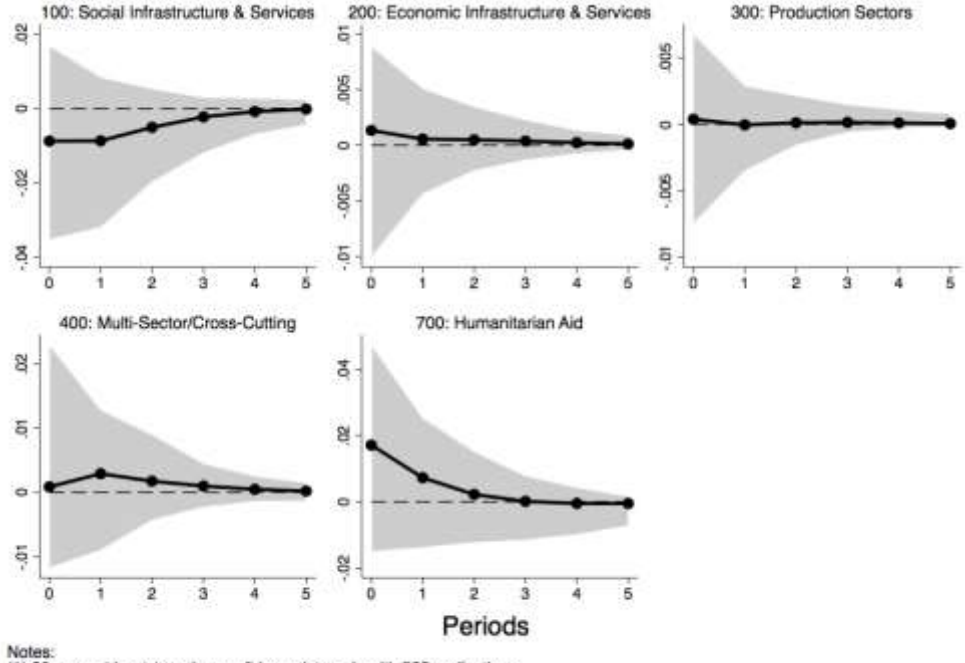
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 8C: Japan



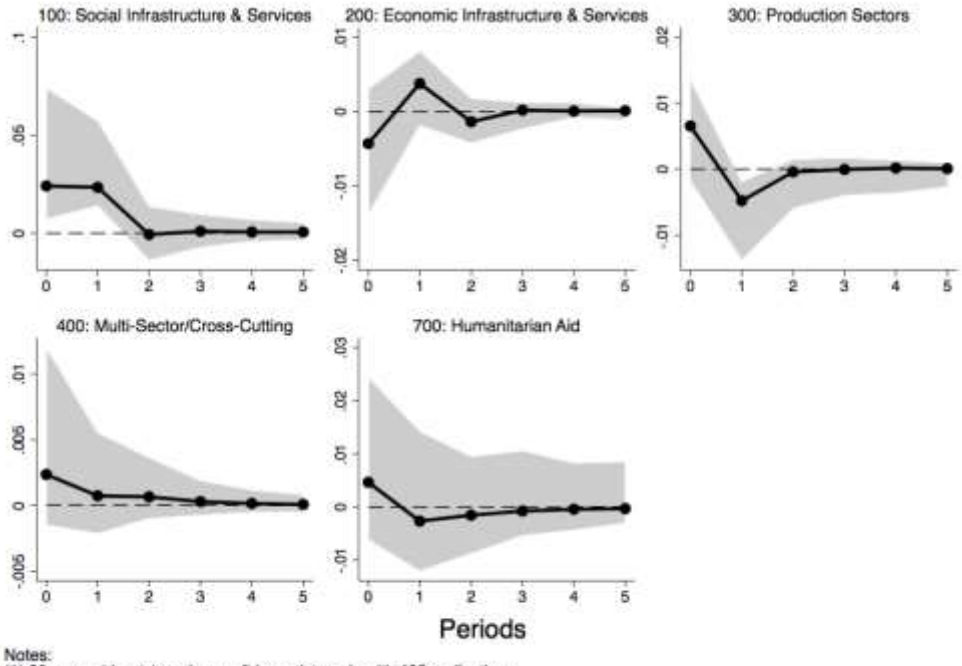
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 8D: Netherlands



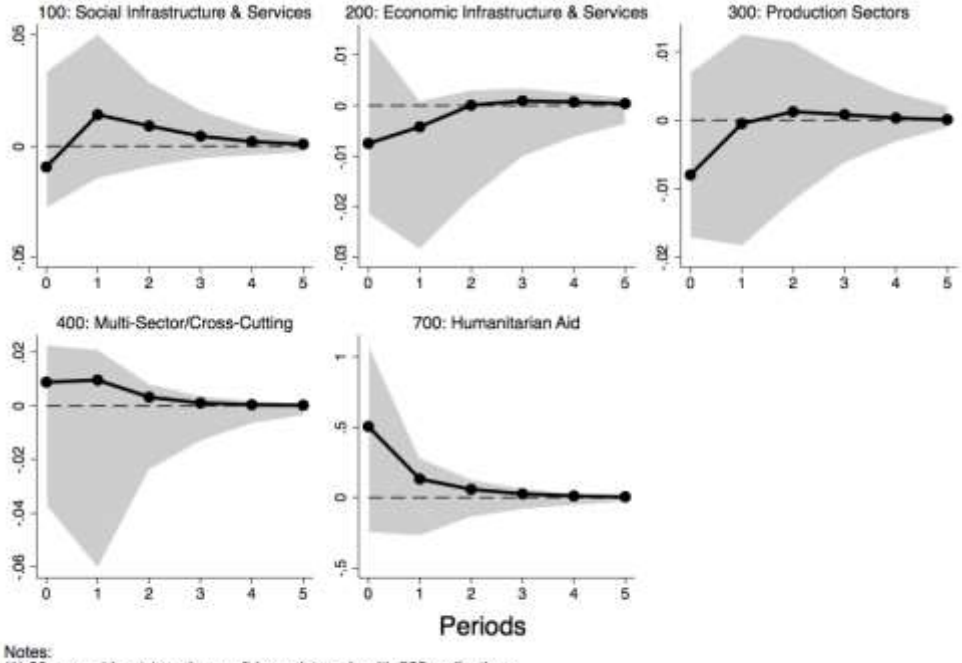
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 8E: United Kingdom



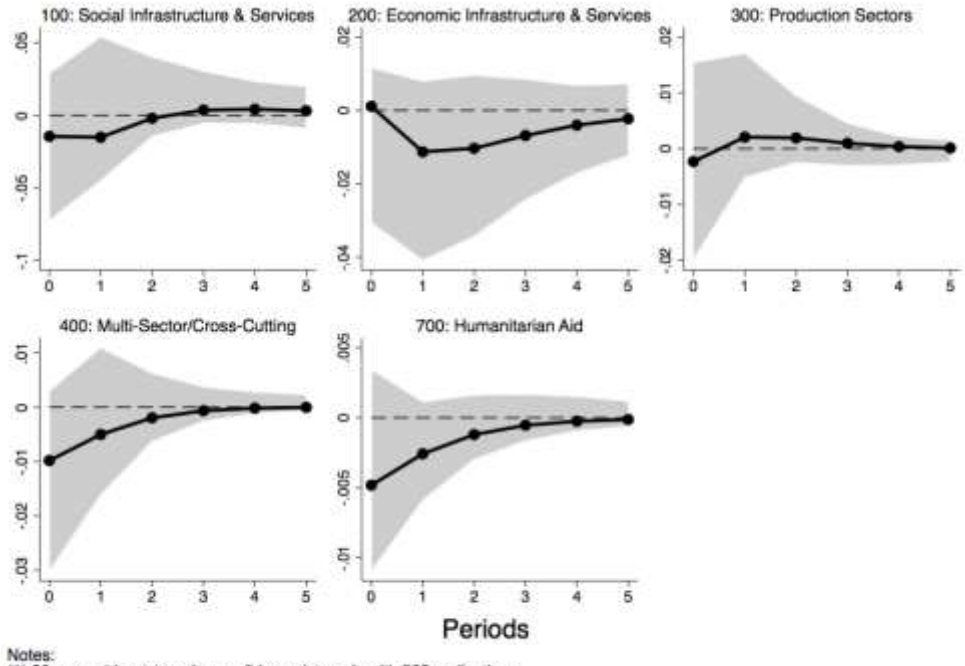
Notes:
(1) 90 percent bootstrapping confidence intervals with 496 replications.

Figure 8F: United States



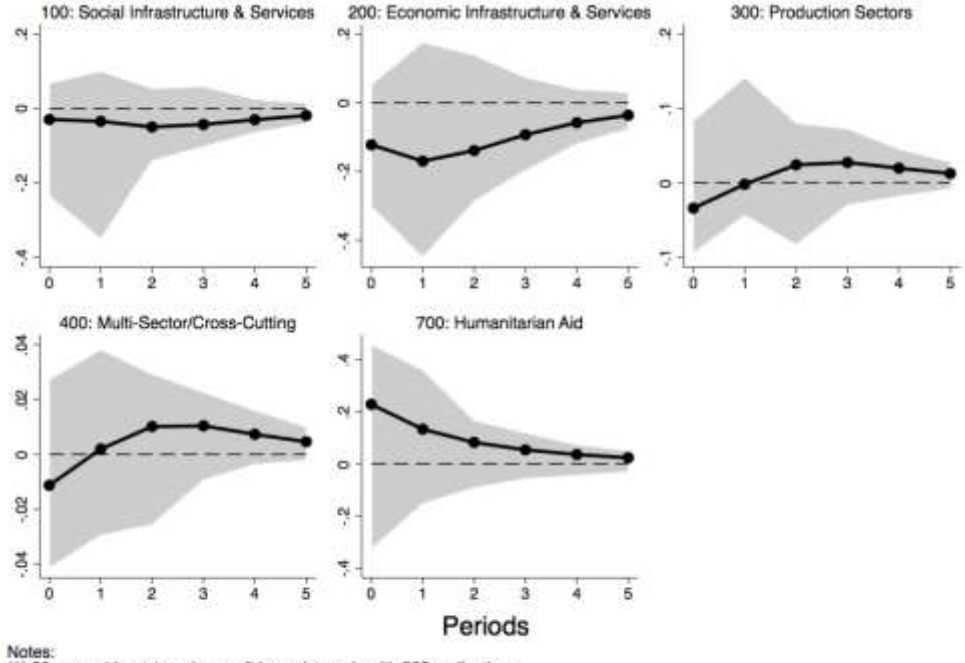
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 8G: UN/Development Banks



Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 8H: EU Institutions



Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Appendix Table 1: Main characteristics of commitments data. Average 2002-2011

ODA by region – share of total (percent)			
Total ODA		**Humanitarian Aid**	
Africa	35.5	Africa	41.6
- North of Sahara	3.3	*- North of Sahara*	1.0
- South of Sahara	31.1	*- South of Sahara*	39.6
- Regional	1.0	*- Regional*	1.0
Americas	7.7	Americas	5.9
- North & Central America	3.8	*- North & Central America*	4.1
- South America	3.4	*- South America*	1.3
- Regional	0.5	*- Regional*	0.4
Asia	36.1	Asia	37.0
- Far East Asia	10.2	*- Far East Asia*	5.2
- Middle East	9.1	*- Middle East*	12.7
- South & Central Asia	16.3	*- South & Central Asia*	18.5
- Regional	0.5	*- Regional*	0.6
Europe	4.8	Europe	2.4
Oceania	1.2	Oceania	0.2
Unspecified	14.7	Unspecified	12.9
Main donors – share of total (percent)			
Total ODA		**Humanitarian Aid**	
United States	28.1	United States	47.8
Japan	15.4	United Kingdom	7.3
Germany	9.7	Japan	5.1
France	8.9	Netherlands	4.7
United Kingdom	7.3	Canada	4.2
Netherlands	5.5	Sweden	4.1
Canada	3.2	Germany	4.1
Spain	3.0	Norway	3.9
Norway	2.8	Switzerland	3.2
Sweden	2.8	France	3.0
Main recipients – share of total (percent)			
Total ODA		**Humanitarian Aid**	
Iraq	5.8	Sudan	9.2
India	3.8	Iraq	6.9
Afghanistan	3.3	Afghanistan	6.4
Pakistan	3.0	Ethiopia	5.1
Vietnam	2.8	Pakistan	4.9
Congo, Dem. Rep.	2.6	Congo, Dem. Rep.	3.6
Nigeria	2.5	South of Sahara, regional	3.5
Indonesia	2.5	West Bank & Gaza Strip	3.0
Bangladesh	2.1	Somalia	2.9
Ethiopia	2.1	Haiti	2.7
Aid by sector/purpose – share of total (percent)			
Total ODA		**Humanitarian Aid**	
Social Infrastructure & Services	38.4	Emergency Response	84.1
Economic Infrastructure & Services	15.4	*- Emergency food aid*	25.1
Production Sectors	7.5	*- Emergency/distress relief*	55.9
Multi-Sector/Cross-Cutting	8.5	*- Relief co-ordination and protection*	3.1
Budget Support/Other Commodity Aid	4.5	Reconstruction relief	13.1
Dev. Food Aid/Food Security Ass.	1.4	Disaster prevention and preparedness	2.8
Action Relating to Debt	9.7		
Humanitarian Aid	7.4		
Administrative Costs of Donors	3.4		
Refugees in Donor Countries	1.6		
Unallocated / Unspecified	2.1		

Appendix Table 2: Humanitarian aid sector definitions

Sector	Purpose	CRS Guidelines' Defintion
Emergency Response (An emergency is a situation which results from man-made crises and/or natural disasters)	Material relief assistance and services	Shelter, water, sanitation and health services, supply of medicines and other non-food relief items; assistance to refugees and internally displaced people in developing countries other than for food or protection.
	Emergency food aid	Food aid normally for general free distribution or special supplementary feeding programmes; short-term relief to targeted population groups affected by emergency situations. Excludes non-emergency food security assistance programmes/food aid.
	Relief co-ordination; protection and support services	Measures to co-ordinate delivery of humanitarian aid, including logistics and communications systems; measures to promote and protect the safety, well- being, dignity and integrity of civilians and those no longer taking part in hostilities. (Activities designed to protect the security of persons or property through the use or display of force are not reportable as ODA.)
Reconstruction Relief & Rehabilitation (This relates to activities during and in the aftermath of an emergency situation. Longer-term activities to improve the level of infrastructure or social services should be reported under the relevant economic and social sector codes.)	Reconstruction relief and rehabilitation	Short-term reconstruction work after emergency or conflict limited to restoring pre-existing infrastructure (e.g. repair or construction of roads, bridges and ports, restoration of essential facilities, such as water and sanitation, shelter, health care services); social and economic rehabilitation in the aftermath of emergencies to facilitate transition and enable populations to return to their previous livelihood or develop a new livelihood in the wake of an emergency situation (e.g. trauma counselling and treatment, employment programmes).
Disaster Prevention & Preparedness	Disaster prevention and preparedness	Disaster risk reduction activities (e.g. developing knowledge, natural risks cartography, legal norms for construction); early warning systems; emergency contingency stocks and contingency planning including preparations for forced displacement.

Note: Disaster Prevention & Preparedness does not include prevention of floods and conflicts. These are included in the purposes 41050 Flood prevention/control and 15220 Civilian peace-building, conflict prevention and resolution
Source: OECD Guidelines for Reporting in CRS++ Format.

Appendix Table 3: Catastrophic Disasters and Foreign Aid

Rank	Event	Donor	Total Disbursements (2010 USD, MM)	Aid surge (2010 USD, MM)	Ratio of Disbursements to previous two years average
1	Haiti (2010)	Development Banks-UN	126.37	75.85	2.50
	Haiti (2010)	EU Institutions	284.27	180.31	2.73
	Haiti (2010)	France	141.75	104.58	3.81
	Haiti (2010)	Germany	43.57	32.84	4.06
	Haiti (2010)	Japan	71.98	52.33	3.66
	Haiti (2010)	United States	1106.84	815.05	3.79
2	Indonesia (2005)	Development Banks-UN	23.05	2.71	1.13
	Indonesia (2005)	EU Institutions	82.90	n.a.	n.a.
	Indonesia (2005)	France	13.14	0.25	1.02
	Indonesia (2005)	Germany	144.21	53.34	1.59
	Indonesia (2005)	Japan	322.05	121.47	1.61
	Indonesia (2005)	Netherlands	177.46	81.05	1.84
	Indonesia (2005)	United Kingdom	55.23	28.41	2.06
	Indonesia (2005)	United States	175.04	-28.09	0.86
3	Myanmar (2008)	Development Banks-UN	34.99	3.93	1.13
	Myanmar (2008)	EU Institutions	54.51	34.96	2.79
	Myanmar (2008)	France	4.85	3.92	5.20
	Myanmar (2008)	Germany	13.39	8.14	2.55
	Myanmar (2008)	Japan	48.81	9.53	1.24
	Myanmar (2008)	United Kingdom	73.03	59.46	5.38
	Myanmar (2008)	United States	73.18	59.29	5.27
4	Sri Lanka (2005)	Development Banks-UN	51.31	41.03	4.99
	Sri Lanka (2005)	EU Institutions	18.50	n.a.	n.a.
	Sri Lanka (2005)	France	3.19	0.71	1.29
	Sri Lanka (2005)	Germany	68.48	43.61	2.75
	Sri Lanka (2005)	Japan	148.43	92.34	2.65
	Sri Lanka (2005)	Netherlands	62.82	39.51	2.70
	Sri Lanka (2005)	United Kingdom	6.97	-3.78	0.65
	Sri Lanka (2005)	United States	61.05	37.81	2.63
5	China (2008)	Development Banks-UN	60.68	10.74	1.22
	China (2008)	EU Institutions	55.61	4.04	1.08
	China (2008)	France	161.51	-12.48	0.93
	China (2008)	Germany	365.80	7.21	1.02
	China (2008)	Japan	325.63	-64.22	0.84
	China (2008)	Netherlands	17.88	-14.00	0.56
	China (2008)	United Kingdom	75.62	12.41	1.20
	China (2008)	United States	66.66	35.23	2.12
6	Thailand (2005)	Development Banks-UN	8.21	2.81	1.52
	Thailand (2005)	EU Institutions	22.91	n.a.	n.a.

Rank	Event	Donor	Total Disbursements (2010 USD, MM)	Aid surge (2010 USD, MM)	Ratio of Disbursements to previous two years average
	Thailand (2005)	France/c	101.24	74.70	3.81
	Thailand (2005)	Germany	22.17	-4.10	0.84
	Thailand (2005)	Japan	83.26	-9.02	0.90
	Thailand (2005)	Netherlands/c	10.32	3.52	1.52
	Thailand (2005)	United States	26.59	0.00	1.00
7	Iran (2004)	Development Banks-UN	6.44	-3.60	0.64
	Iran (2004)	France	18.55	6.16	1.50
	Iran (2004)	Germany	46.05	1.32	1.03
	Iran (2004)	Japan	36.55	14.75	1.68
8	Haiti (2004)	Development Banks-UN	12.43	4.72	1.61
	Haiti (2004)	France	24.17	10.11	1.72
	Haiti (2004)	Germany	8.57	4.45	2.08
	Haiti (2004)	Japan	6.82	1.03	1.18
	Haiti (2004)	United States	105.20	6.53	1.07
9	Indonesia (2006)	Development Banks-UN	28.62	6.55	1.30
	Indonesia (2006)	EU Institutions	153.41	70.51	1.85
	Indonesia (2006)	France	21.02	7.46	1.55
	Indonesia (2006)	Germany	206.50	91.57	1.80
	Indonesia (2006)	Japan	192.41	-44.46	0.81
	Indonesia (2006)	Netherlands	161.60	25.92	1.19
	Indonesia (2006)	United Kingdom	81.42	40.49	1.99
	Indonesia (2006)	United States	225.69	44.82	1.25
10	India (2005)	Development Banks-UN	78.31	14.94	1.24
	India (2005)	EU Institutions	215.86	n.a.	n.a.
	India (2005)	France	16.34	-1.40	0.92
	India (2005)	Germany	158.98	8.32	1.06
	India (2005)	Japan	37.13	8.68	1.31
	India (2005)	Netherlands	82.86	-29.18	0.74
	India (2005)	United Kingdom	394.38	22.26	1.06
	India (2005)	United States	181.23	-10.07	0.95
11	Samoa (2009)	Development Banks-UN	4.70	3.43	3.70
	Samoa (2009)	Japan	15.07	6.84	1.83
12	Guatemala (2006)	Development Banks-UN	3.50	-1.17	0.75
	Guatemala (2006)	EU Institutions	35.38	0.92	1.03
	Guatemala (2006)	France	3.99	1.75	1.78
	Guatemala (2006)	Germany	21.29	0.69	1.03
	Guatemala (2006)	Japan	45.91	18.99	1.71
	Guatemala (2006)	Netherlands	22.14	-5.10	0.81
	Guatemala (2006)	United States	95.48	14.62	1.18
13	Algeria (2003)	Development Banks-UN	3.90	0.60	1.18
	Algeria (2003)	France	154.76	26.78	1.21

Rank	Event	Donor	Total Disbursements (2010 USD, MM)	Aid surge (2010 USD, MM)	Ratio of Disbursements to previous two years average
	Algeria (2003)	Germany	15.56	11.67	4.00
	Algeria (2003)	Japan	1.46	n.a.	n.a.
	Algeria (2003)	United States	3.79	-2.42	0.61
14	Maldives (2005)	Development Banks-UN	9.17	7.04	4.32
	Maldives (2005)	Japan	28.84	22.07	4.26
15	Bangladesh (2008)	Development Banks-UN	53.41	6.24	1.13
	Bangladesh (2008)	EU Institutions	181.38	74.19	1.69
	Bangladesh (2008)	France	0.92	-1.49	0.38
	Bangladesh (2008)	Germany	61.57	24.22	1.65
	Bangladesh (2008)	Japan	68.26	11.66	1.21
	Bangladesh (2008)	Netherlands	78.51	-8.40	0.90
	Bangladesh (2008)	United Kingdom	225.85	40.08	1.22
	Bangladesh (2008)	United States	137.04	53.15	1.63
16	China (2010)	Development Banks-UN	78.55	8.14	1.12
	China (2010)	EU Institutions	42.59	-5.76	0.88
	China (2010)	France	180.54	11.70	1.07
	China (2010)	Germany	352.73	-12.61	0.97
	China (2010)	Japan	360.21	42.83	1.13
	China (2010)	Netherlands	5.64	-6.99	0.45
	China (2010)	United Kingdom	54.92	-22.12	0.71
	China (2010)	United States	86.46	26.46	1.44
17	Haiti (2008)	Development Banks-UN	38.85	5.66	1.17
	Haiti (2008)	EU Institutions	109.59	14.45	1.15
	Haiti (2008)	France	34.55	1.87	1.06
	Haiti (2008)	Germany/c	16.16	12.16	4.03
	Haiti (2008)	Japan	13.46	5.55	1.70
	Haiti (2008)	United States	264.19	55.83	1.27
18	Dominican Rep. (2004)	Development Banks-UN	3.82	0.98	1.35
	Dominican Rep. (2004)	France	2.74	0.47	1.21
	Dominican Rep. (2004)	Germany	11.87	3.26	1.38
	Dominican Rep. (2004)	Japan	19.06	-7.79	0.71
	Dominican Rep. (2004)	United States	34.04	-6.74	0.83
19	Chile (2010)	Development Banks-UN	4.21	-0.40	0.91
	Chile (2010)	EU Institutions	16.15	7.96	1.97
	Chile (2010)	France	14.47	1.83	1.14
	Chile (2010)	Germany	27.04	0.17	1.01
	Chile (2010)	Japan	17.06	6.46	1.61
	Chile (2010)	United States	13.25	11.22	6.53

Notes:
a. Aid surge is the difference between the aid flows in the year the disaster occurred and the average aid flows in the two years preceding the catastrophic event.
b. Shaded rows denote events for which there was a large increase in aid. See text for details.
c. Figures are the reported for one year after the catastrophic event occurred.

Appendix Table 4: Humanitarian aid surges for large disasters

Rank	Event	Donor	Humanitarian Aid surge (2010 US$, MM)	Aid surge (ratio to previous two years average) /d	Recipient's change in total ODA (2010 US$, MM)	Humanitarian aid surge as percentage of recipient's change in total ODA
1	Haiti (2010)	Development Banks-UN	1.14	1.17	75.85	1.50
	Haiti (2010)	EU Institutions	106.32	3.05	180.31	58.97
	Haiti (2010)	France	25.92	40.72	104.58	24.78
	Haiti (2010)	Germany	26.06	5.83	32.84	79.36
	Haiti (2010)	Japan	54.73	44.93	52.33	104.58
	Haiti (2010)	United States	727.82	13.65	815.05	89.30
2	Indonesia (2005)	Development Banks-UN	0.00	n.a.	2.71	0.00
	Indonesia (2005)	EU Institutions	n.a.	n.a.	n.a.	n.a.
	Indonesia (2005)	France	2.88	695.79	0.25	1165.35
	Indonesia (2005)	Germany	41.83	370.20	53.34	78.42
	Indonesia (2005)	Japan	163.06	+Inf	121.47	134.24
	Indonesia (2005)	Netherlands	113.65	19.26	81.05	140.21
	Indonesia (2005)	United Kingdom	13.51	+Inf	28.41	47.54
	Indonesia (2005)	United States	28.06	2.97	-28.09	-99.91
3	Myanmar (2008)	Development Banks-UN	1.10	8.46	3.93	28.02
	Myanmar (2008)	EU Institutions	21.56	3.09	34.96	61.68
	Myanmar (2008)	France	3.33	40.64	3.92	84.96
	Myanmar (2008)	Germany	7.84	3.99	8.14	96.31
	Myanmar (2008)	Japan	15.05	9.79	9.53	157.94
	Myanmar (2008)	United Kingdom	51.92	31.25	59.46	87.32
	Myanmar (2008)	United States	55.22	8.86	59.29	93.14
4	Sri Lanka (2005)	Development Banks-UN	0.69	3.47	41.03	1.67
	Sri Lanka (2005)	EU Institutions	n.a.	n.a.	n.a.	n.a.
	Sri Lanka (2005)	France	0.61	3.62	0.71	85.22
	Sri Lanka (2005)	Germany	29.91	6.40	43.61	68.60
	Sri Lanka (2005)	Japan	92.53	1362.32	92.34	100.21
	Sri Lanka (2005)	Netherlands	27.39	4.81	39.51	69.31
	Sri Lanka (2005)	United Kingdom	2.47	3.70	-3.78	-65.26
	Sri Lanka (2005)	United States	32.02	16.93	37.81	84.69
7	China (2008)	Development Banks-UN	0.46	1.88	10.74	4.33
	China (2008)	EU Institutions	1.90	7.90	4.04	47.09
	China (2008)	France	1.70	+Inf	-12.48	-13.63
	China (2008)	Germany	5.86	66.04	7.21	81.19
	China (2008)	Japan	6.24	+Inf	-64.22	-9.71
	China (2008)	Netherlands	0.00	n.a.	-14.00	0.00
	China (2008)	United Kingdom	2.75	+Inf	12.41	22.18
	China (2008)	United States	3.48	8.81	35.23	9.88
8	Thailand (2005)	Development Banks-UN	0.10	2.62	2.81	3.70
	Thailand (2005)	EU Institutions	n.a.	n.a.	n.a.	n.a.

Rank	Event	Donor	Humanitarian Aid surge (2010 US$, MM)	Aid surge (ratio to previous two years average) /d	Recipient's change in total ODA (2010 US$, MM)	Humanitarian aid surge as percentage of recipient's change in total ODA
	Thailand (2005)	France/c	-0.08	0.13	74.70	-0.10
	Thailand (2005)	Germany	0.00	n.a.	-4.10	0.00
	Thailand (2005)	Japan	0.00	n.a.	-9.02	0.00
	Thailand (2005)	Netherlands/c	0.89	1.77	3.52	25.38
	Thailand (2005)	United States	2.46	6.77	0.00	-58349.49
9	Iran (2004)	Development Banks-UN	0.45	+Inf	-3.60	-12.58
	Iran (2004)	France	3.77	83.76	6.16	61.18
	Iran (2004)	Germany	-1.36	0.41	1.32	-102.85
	Iran (2004)	Japan	18.12	+Inf	14.75	122.85
10	Haiti (2004)	Development Banks-UN	0.39	+Inf	4.72	8.27
	Haiti (2004)	France	4.65	14.52	10.11	45.94
	Haiti (2004)	Germany	3.31	1158.36	4.45	74.36
	Haiti (2004)	Japan	0.00	n.a.	1.03	0.00
	Haiti (2004)	United States	4.50	2.89	6.53	68.93
11	Indonesia (2006)	Development Banks-UN	1.37	+Inf	6.55	20.88
	Indonesia (2006)	EU Institutions	57.48	2.37	70.51	81.53
	Indonesia (2006)	France	-0.60	0.58	7.46	-8.04
	Indonesia (2006)	Germany	20.31	1.97	91.57	22.18
	Indonesia (2006)	Japan	-75.03	0.08	-44.46	168.75
	Indonesia (2006)	Netherlands	10.51	1.17	25.92	40.57
	Indonesia (2006)	United Kingdom	10.49	2.55	40.49	25.90
	Indonesia (2006)	United States	69.83	4.26	44.82	155.79
12	India (2005)	Development Banks-UN	2.87	3.51	14.94	19.22
	India (2005)	EU Institutions	n.a.	n.a.	n.a.	n.a.
	India (2005)	France	0.02	+Inf	-1.40	-1.74
	India (2005)	Germany	6.79	8.85	8.32	81.51
	India (2005)	Japan	0.00	n.a.	8.68	0.00
	India (2005)	Netherlands	-1.55	0.02	-29.18	5.31
	India (2005)	United Kingdom	3.71	2.49	22.26	16.68
	India (2005)	United States	1.64	1.21	-10.07	-16.33
13	Samoa (2009)	Development Banks-UN	0.16	+Inf	3.43	4.80
	Samoa (2009)	Japan	0.00	n.a.	6.84	0.00
14	Guatemala (2006)	Development Banks-UN	-0.12	0.60	-1.17	10.19
	Guatemala (2006)	EU Institutions	-4.60	0.54	0.92	-502.25
	Guatemala (2006)	France	-0.62	0.00	1.75	-35.45
	Guatemala (2006)	Germany	0.08	1.15	0.69	11.74
	Guatemala (2006)	Japan	-0.58	0.00	18.99	-3.04
	Guatemala (2006)	Netherlands	-2.26	0.00	-5.10	44.20
	Guatemala (2006)	United States	8.96	4.25	14.62	61.25
16	Algeria (2003)	Development Banks-UN	0.00	n.a.	0.60	0.00

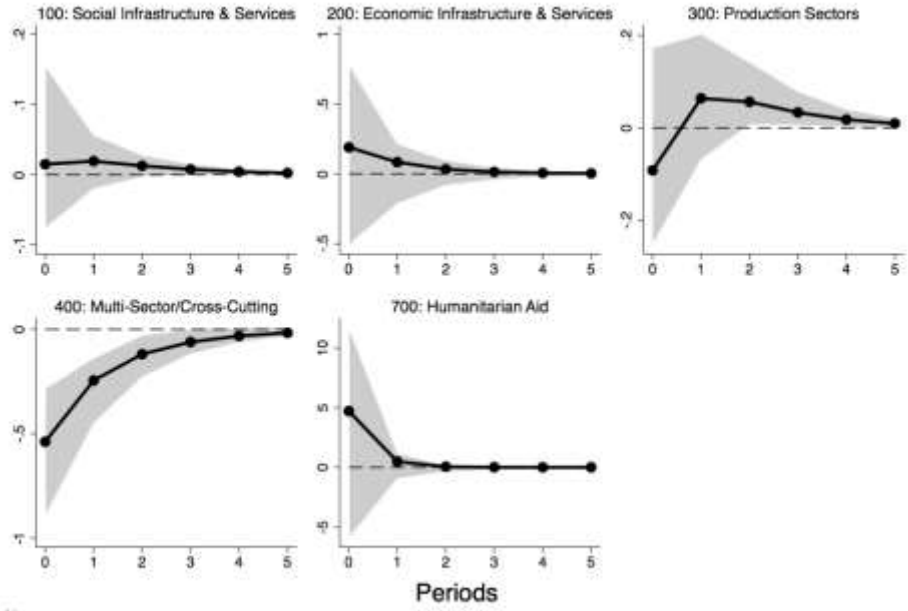
Rank	Event	Donor	Humanitarian Aid surge (2010 US$, MM)	Aid surge (ratio to previous two years average) /d	Recipient's change in total ODA (2010 US$, MM)	Humanitarian aid surge as percentage of recipient's change in total ODA
	Algeria (2003)	France	5.56	35.39	26.78	20.76
	Algeria (2003)	Germany	0.78	2.46	11.67	6.66
	Algeria (2003)	Japan	n.a.	n.a.	n.a.	n.a.
	Algeria (2003)	United States	-2.93	0.26	-2.42	121.50
18	Maldives (2005)	Development Banks-UN	0.57	2063.77	7.04	8.13
	Maldives (2005)	Japan	22.23	837.95	22.07	100.71
19	Bangladesh (2008)	Development Banks-UN	-1.06	0.72	6.24	-16.92
	Bangladesh (2008)	EU Institutions	37.06	4.89	74.19	49.96
	Bangladesh (2008)	France	-0.69	0.02	-1.49	46.54
	Bangladesh (2008)	Germany	0.33	1.17	24.22	1.37
	Bangladesh (2008)	Japan	10.46	6.28	11.66	89.69
	Bangladesh (2008)	Netherlands	-2.63	0.37	-8.40	31.34
	Bangladesh (2008)	United Kingdom	4.91	1.70	40.08	12.25
	Bangladesh (2008)	United States	37.84	46.81	53.15	71.20
20	China (2010)	Development Banks-UN	-0.15	0.88	8.14	-1.87
	China (2010)	EU Institutions	-1.43	0.00	-5.76	24.88
	China (2010)	France	-0.77	0.17	11.70	-6.56
	China (2010)	Germany	4.20	2.17	-12.61	-33.27
	China (2010)	Japan	0.27	1.09	42.83	0.62
	China (2010)	Netherlands	0.00	n.a.	-6.99	0.00
	China (2010)	United Kingdom	-1.40	0.39	-22.12	6.35
	China (2010)	United States	-3.46	0.34	26.46	-13.09
21	Haiti (2008)	Development Banks-UN	0.11	1.02	5.66	1.96
	Haiti (2008)	EU Institutions	43.24	2.70	14.45	299.17
	Haiti (2008)	France	1.03	14.00	1.87	54.96
	Haiti (2008)	Germany/c	8.97	14.38	12.16	73.80
	Haiti (2008)	Japan	2.29	+Inf	5.55	41.30
	Haiti (2008)	United States	36.02	3.85	55.83	64.52
23	Dominican Rep (2004)	Development Banks-UN	0.29	+Inf	0.98	29.02
	Dominican Rep (2004)	France	0.34	27.08	0.47	72.74
	Dominican Rep (2004)	Germany	0.19	+Inf	3.26	5.93
	Dominican Rep (2004)	Japan	0.00	n.a.	-7.79	0.00
	Dominican Rep (2004)	United States	-0.01	0.92	-6.74	0.19
24	Chile (2010)	Development Banks-UN	0.07	+Inf	-0.40	-17.03
	Chile (2010)	EU Institutions	4.15	141.73	7.96	52.12
	Chile (2010)	France	0.69	+Inf	1.83	37.90
	Chile (2010)	Germany	0.61	+Inf	0.17	352.07
	Chile (2010)	Japan	6.35	+Inf	6.46	98.26
	Chile (2010)	United States	7.67	+Inf	11.22	68.36

Notes:

a. Aid surge is the difference between the aid flows in the year the disaster occurred and the average aid flows in the two years preceding the catastrophic event.
b. Shaded rows denote events for which there was a large increase in total aid. See Appendix Table 3.
c. Figures are the reported for one year after the catastrophic event occurred.
d. '+Inf' refers to those cases in which there is positive disbursement in the year the event occurred, but the previous two years average was zero. 'n.a.' refers to events for which both disbursement and previous two years average are zero.

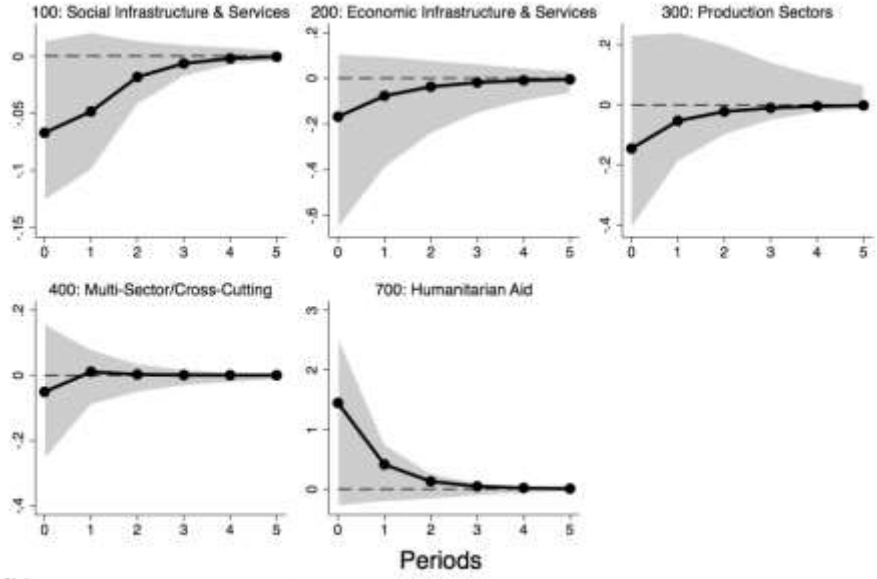
Appendix Figure 1 - Response of RI index (By Sector) to a Disaster Shock

Figure 1A: France



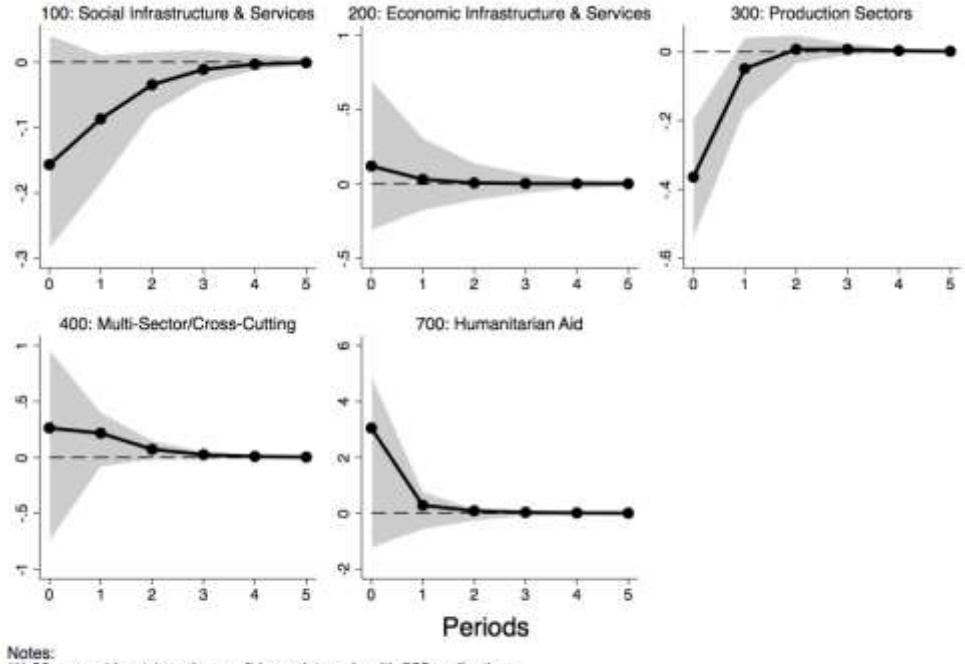
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 1B: Germany



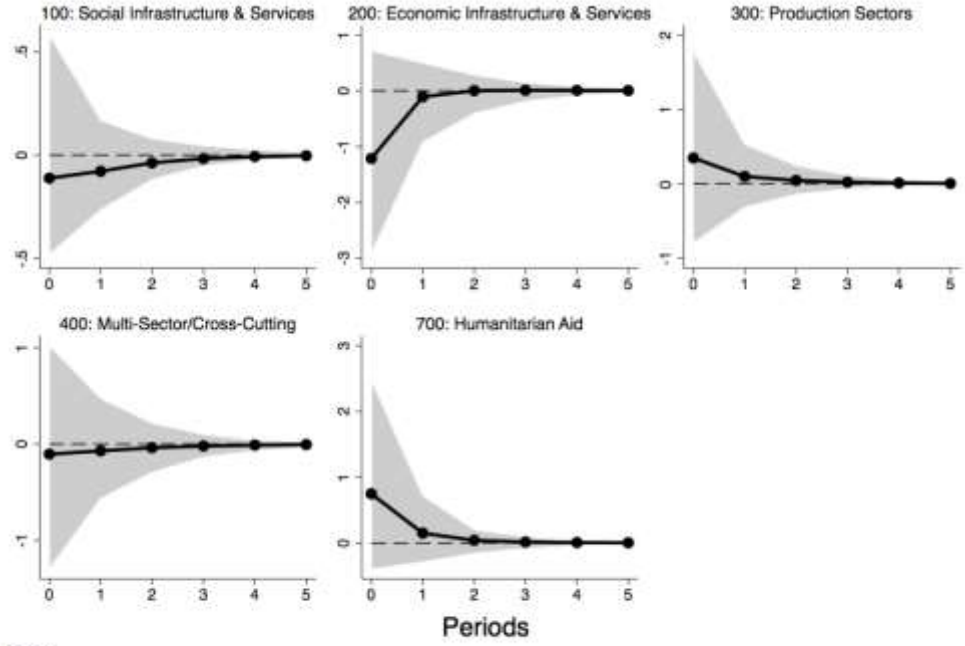
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 1C: Japan



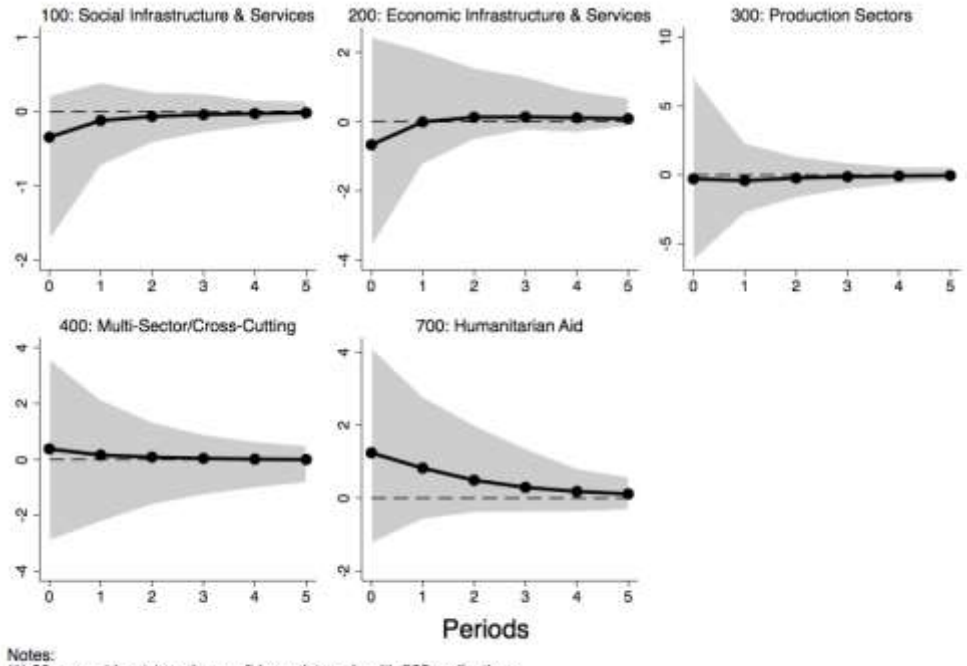
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 1D: Netherlands



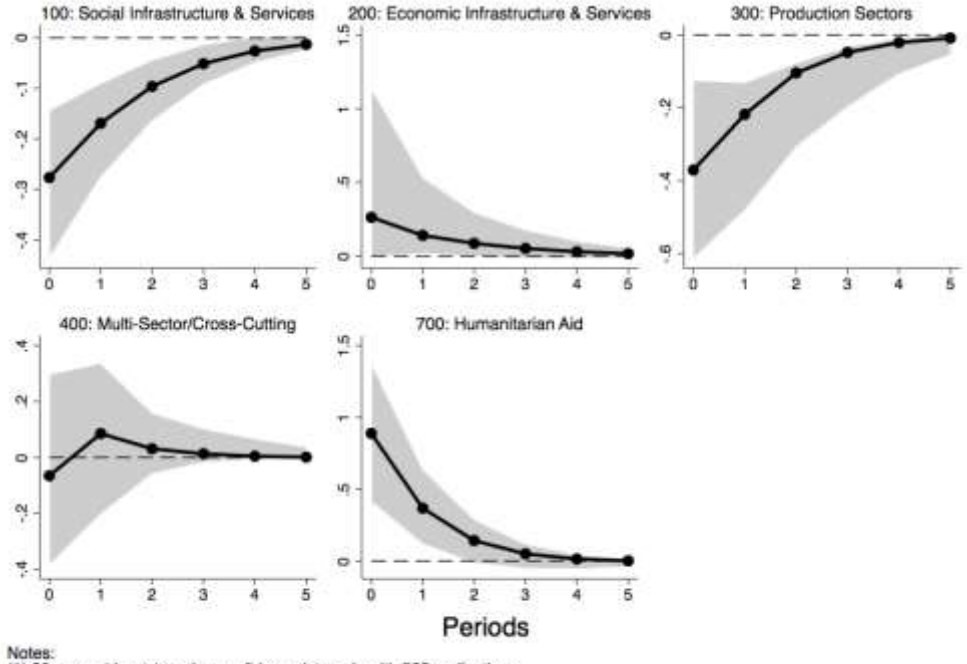
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 1E: United Kingdom



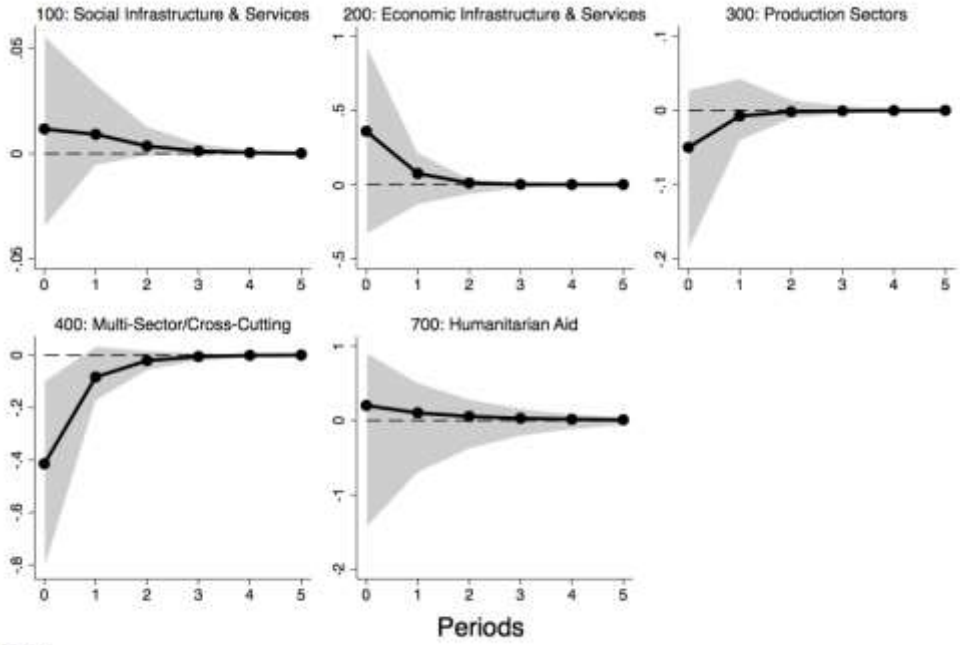
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 1F: United States



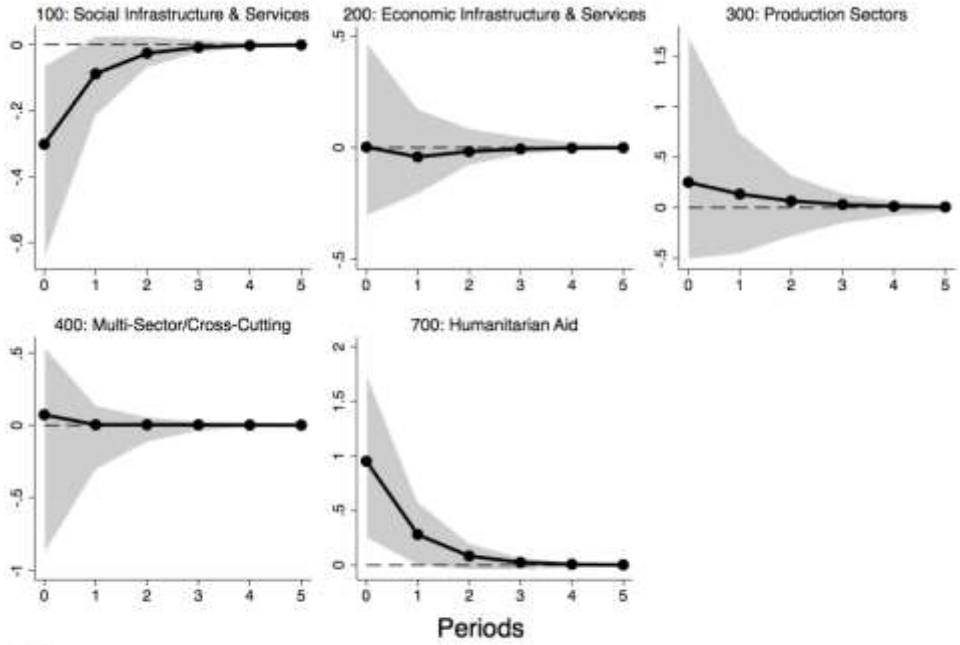
Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 1G: Development Banks - UN



Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.

Figure 1H: European Institutions



Notes:
(1) 90 percent bootstrapping confidence intervals with 500 replications.