Fall 12-2020

Shifting Sources of Humanitarian Aid: The Importance of Network Resiliency and Donor Diversification

Mackenzie Marie Clark
Old Dominion University, mackenziem.clark@gmail.com

SHIFTING SOURCES OF HUMANITARIAN AID: THE IMPORTANCE OF NETWORK RESILIENCY AND DONOR DIVERSIFICATION

by

Mackenzie Marie Clark
B.A. May 2019, Old Dominion University

A Thesis Submitted to the Faculty of
Old Dominion University in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF ARTS

INTERNATIONAL STUDIES

OLD DOMINION UNIVERSITY
December 2020

Approved by:

Erika Frydenlund (Director)

David Earnest (Member)

Matthew DiLorenzo (Member)

ABSTRACT

SHIFTING SOURCES OF HUMANITARIAN AID: THE IMPORTANCE OF NETWORK RESILIENCY AND DONOR DIVERSIFICATION

Mackenzie Marie Clark
Old Dominion University, 2020
Director: Dr. Erika Frydenlund

As instances of forced displacement arise and become increasingly large and prolonged around the world, large influxes of humanitarian aid have become critical in assisting host countries with crisis response. The funding required to meet the immediate, emergency needs presented by a refugee situation is filled primarily by governmental humanitarian contributions, and more specifically, by the United States. Typically, the U.S. is integral to the structure of the networks of humanitarian aid being directed towards a humanitarian response as it is the largest donor, in most cases. However, what does this reliance on U.S. funding mean for the structural integrity of these networks? What happens when the U.S. cannot or will not provide relief to humanitarian crises? I address these questions by drawing on the theory of cascading failure in social network analysis by applying it to four prominent cases of forced migration requiring large influxes of emergency humanitarian assistance. These regional cases represent increasing degrees of reliance on U.S. contributions to humanitarian response for displaced Venezuelans, Syrians, and Rohingyas, as well as the mixed-migration into Europe. Drawing on the results of the network analysis from these cases, I conclude two things. Firstly, I find, largely, humanitarian aid networks which receive a majority of their funding from the U.S. are extremely prone to collapse in the unlikely circumstance that the U.S. significantly reduces or withdraws funding. Secondly, networks which have more diversified sources of funding are less prone to collapse if a major donor "fails," or reduces/withdraws funding. Overall, this study speaks to a

larger conversation about the importance of humanitarian aid networks becoming more resilient to catastrophic shocks to the system that may come as a result of shifting sources of governmental humanitarian assistance. As the global community, and especially the United States, progress through a period of uncertainty and instability, insights on how to maintain the critical flow of aid to humanitarian crises have become all the more important.

This thesis is dedicated mostly to myself and all of my hard work, but also a little bit to Erika and José. Thanks for dealing with me.

ACKNOWLEDGEMENTS

The completion of this thesis would not have been possible without the contributions of my colleagues. First, I would like to thank my advisor and mentor, Dr. Erika Frydenlund, for her unwavering support over the course of my research, as well as my committee members, Dr. David Earnest and Dr. Matthew DiLorenzo, for providing guidance on how to improve this thesis further. Your efforts are greatly appreciated.

I would also like to thank all of my colleagues at the Virginia Modeling, Analysis, and Simulation Center for the unique, multidisciplinary approaches to social science research they have introduced me to in such a short amount of time. Each one of you has contributed to my personal and professional development, as well as my abilities as a researcher, in some form or another. Above all, I would like to thank Dr. José Padilla for constantly challenging me and the way I think and perceive. Though some of the things you've tasked me with have been hard and often put me out of my comfort zone, I have become so, so much better because of it. Both as a student and as an individual, I owe much of my personal development over the course of my time at VMASC to you.

This material, in part, was funded by a grant through the Office of Naval Research under the Minerva Research Initiative under agreement number N00014-19-1-2624. The U.S. Government is authorized to reproduce and distribute reprints for Governmental purposes notwithstanding any copyright notation thereon. The views and conclusions contained herein are those of the author and should not be interpreted as necessarily representing the official policies or endorsements, either expressed or implied, of the Office of Naval Research.

NOMENCLATURE

EC	European Commission
EU	European Union
FTS	Financial Tracking Service
IGO	Intergovernmental Organization
IOM	International Organization for Migration
NGO	Nongovernmental Organization
OCHA	Office for the Coordination of Humanitarian Affairs
PLD	Power Law Distribution
SFD	Scale-free Distribution
SNA	Social Network Analysis
UN	United Nations
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
U.K.	United Kingdom
U.S.	United States
WFP	World Food Programme

TABLE OF CONTENTS

Page

Page

LIST OF TABLES

Table Page

LIST OF FIGURES

INTRODUCTION

Refugee and migrant situations have become some of the largest, most pressing humanitarian issues the global community must address, as more people than ever before have been forcibly displaced from their homes.[1] Since 2010, the number of displaced persons in the world has more than doubled (Figure 1). In the wake of these phenomenon, host countries have often been ill-equipped to deal with the rapidly emergent needs presented by such large influxes of people, often in dire need of assistance. International humanitarian aid contributions are critical in bridging the gap between a host country's domestic capabilities and the demand brought about in the onset of an influx of refugees and migrants. Massive governmental contributions, especially those from the United States, are essential for most countries coping with these situations. However, does this immense dependence on one, singular source of aid leave recipient countries hosting refugees vulnerable to another crisis? In the face of a global financial crisis, what would happen if the United States were to cut even a portion of their funding? What would happen if the United States cut humanitarian funding to a host country entirely?

[1] According to the UNHCR Global Trends Report 2019, more than 1% of the global population has been forcibly displaced.

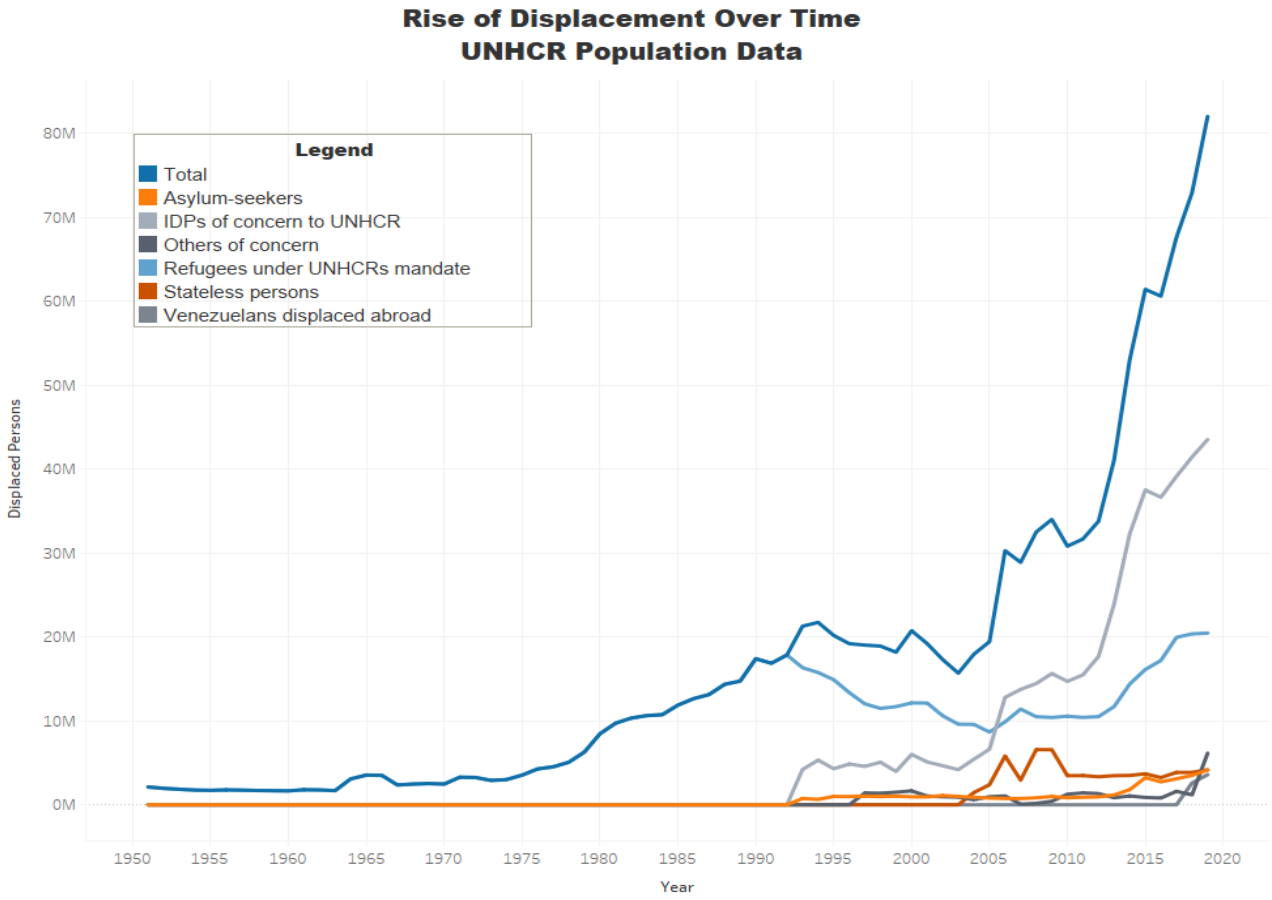

Figure 1 Trends of Displacement

Source: Graph created from data from the UNHCR Population Data Portal (UNHCR, 2020b)

This study uses social network analysis and the network phenomenon of cascading failure in the cases of the four largest, ongoing refugee and migrant situations in the world to explore these questions. The cases, which address the reliance of each individual network on United States' humanitarian contributions from most to least reliant, are as follows: Venezuelans fleeing to surrounding South American countries; Rohingya refugees fleeing to Bangladesh; Syrian refugees in surrounding Middle Eastern Countries; and mixed migrants—economic and refugees—fleeing to European border countries. For each case, I conduct two network analyses: 1) the aid transfers as they are; and 2) the aid networks with the United States removed. Using

this approach, I am able to determine how resilient the structure of each network is to a major systemic shock, demonstrating that reliance on a singular governmental source for aid decreases the robustness of these humanitarian aid networks. Though this study addresses the issue of cascading failure in humanitarian aid networks as they pertain to refugee and migrant situations, it does not address other humanitarian issues. It does, however, providing a starting point for understanding the implications these trends of network behavior could have on other crises.

The paper will proceed as follows. The first chapter reviews three areas of literature relevant to this study. The first area is humanitarian aid and aid effectiveness, and how these issues relate specifically to the United States as well as private donors; the second is social network analysis and network behaviors, specifically power law distributions, preferential attachment, and how these trends relate to cascading failure; the last is literature regarding the use of social network analysis in international studies, and how these areas of study contribute to the findings of this paper. The second chapter explains the social network analysis methodology of this study. The following three chapters address each individual case study by descending reliance on US aid contributions: the aid network for Venezuelan displacement; the aid networks for displaced Rohingya and Syrians; and the aid network for mixed migration to Europe's border countries. The final chapter concludes and summarizes the findings of each case study, their policy implications on a domestic and global scale, and offers suggestions for future areas of research.

Though the four cases identified in this study are the largest instances of forced migration to date, they remain some of the most chronically underfunded humanitarian crises in the world, along with other UNHCR humanitarian initiatives (Figure 2). Despite domestic and international policy initiatives directed at development goals in the four regions, they have been left severely underprepared for such a large influx of people with critical food, clothing, shelter, sanitation, healthcare, and labor market access needs. Significant levels of outside assistance from not only state actors, but also a wide variety of organizations, has been necessary to meet the needs presented by each migration situation.

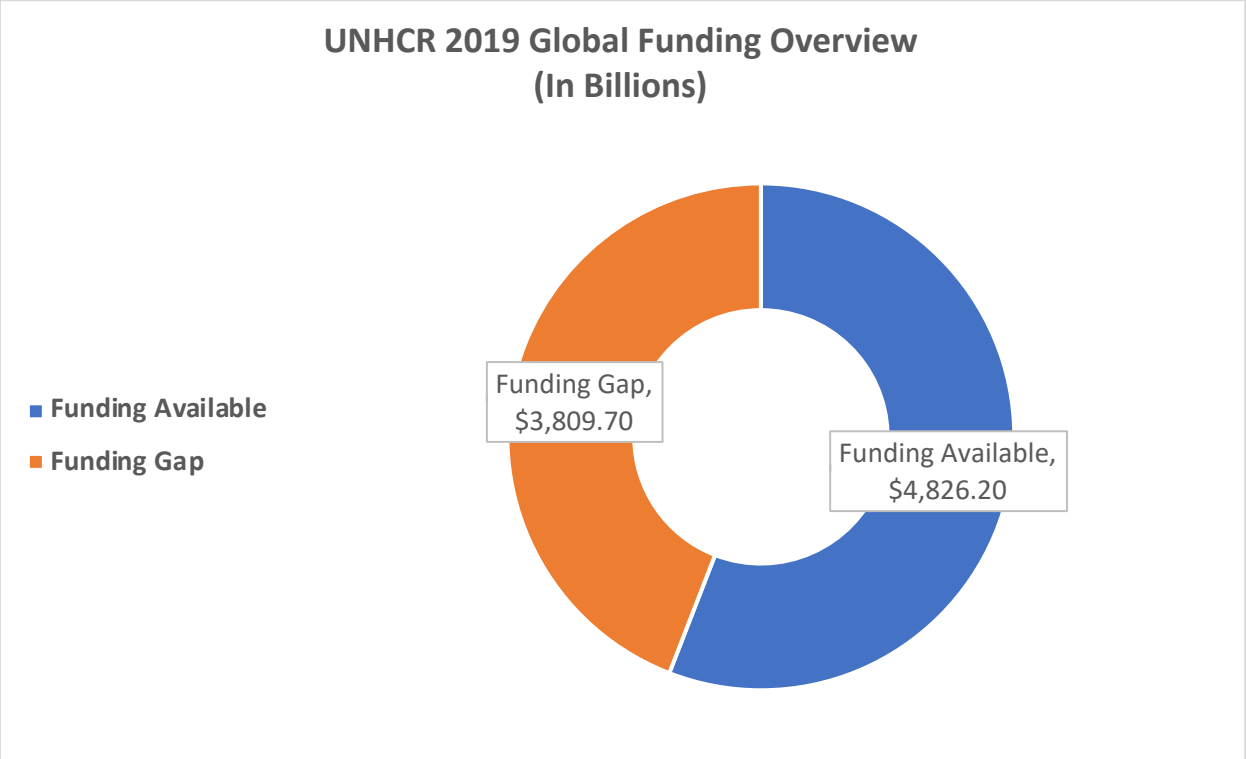

Figure 2 UNHCR Global Funding Overview, 2019

Source: Graph created from data from the UNHCR Global Funding Overview 2019 (UNHCR, 2019)

Traditional policy analysis and statistical models that relate variables describing the donor/recipient relationship provide a lens through which to view humanitarian aid. My contribution in this paper is a focus on the financial transactional relationships *between* actors to provide a *structural* view of humanitarian aid in the four cases. In essence, I attempt to "follow the money" between donors to construct both their relationships and the scale of these connections as a picture of humanitarian aid within the country in response to these specific "crisis" events. This provides a unique insight into the role of the United States as a major provider of humanitarian aid in the four cases. As I examine the networks—both including and excluding the United States as a prominent network actor—issues regarding the resilience of their structure in the face of large shocks to a single, prominent donor become clear.

Network analysis uses connections between entities—states, organizations, and individuals—to derive patterns of structure that offer an abstraction of the real-world patterns of behavior (Hafner-Burton, Kahler, & Montgomery, 2009). In this paper, I use Financial Tracking Service (FTS) data from the United Nations Office for the Coordination of Human Affairs (OCHA) to construct a network of financial humanitarian aid transactions between humanitarian actors including state governments, international nongovernmental organizations, local NGOs, and private donors. Network analysis then serves as a computational social science approach that allows for a deeper examination of actor-to-actor transactions, and, when used in conjunction with qualitative case study analysis, can infer conclusions on the significance of certain donors and what their absence could imply for network resiliency. In the following sections, I review the role of international humanitarian assistance, relevant aspects of network analysis and behavior, and lastly, how network analysis can reveal insights about international relations.

Humanitarian Aid and Aid Effectiveness

Literature addressing the role of humanitarian aid in international studies is limited in comparison to studies addressing foreign aid more generally. While humanitarian aid is meant to serve strictly humanitarian purposes, scholars such as Morgenthau (1962) point to the actual nature of this subsection of aid and its growing likelihood of being used as a foreign policy tool, depending on the context of which the aid is granted. He notes, "While humanitarian aid is per se nonpolitical, it can indeed perform a political function when it operates within a political context" (Morgenthau, 1962). This general sentiment is reflected in various other studies which discuss more specifically the politicization and institutionalization of acts of humanitarianism (Barnett, 2005; Nachmias, 1997), the increasing involvement of national interests in humanitarian intervention (MacFarlane & Weiss, 2000), higher political intervention from non-state actors (Smith, 1990), and competing levels of interest among humanitarian actors (Weiss, 1999).

In understanding the contemporary goals of humanitarian aid, it is important to consider the role of globalization and its impact on humanitarian aid/action and issues of development. Generally, globalization is a major challenger to the contemporary understanding of state autonomy. This is addressed in Clark's (1998) discussion of the rise of globalization in international studies, in which he notes the erosion of the divide between international issues and domestic issues, and how this may contribute to the "demise of state economies" and the "viability of state capacity." This, in turn, has led to a rise of international actors—IGOs or NGOs—in humanitarian action, rather than single state actors being the primary decision-maker (p. 480). Globalization has also created a form of "new humanitarianism" (Kuehlhorn Friedman, 2019), which is characterized as having less regard for the actual recipients of aid, and instead, being more focused on achieving state or institutional goals. As a result, humanitarian operations

can forget to include the complexities of the populations they are aiming to assist in favor of fostering development to improve the operations globalization relies on to persist, such as production of goods for international markets and trade (Kuehlhorn Friedman, 2019). And lastly, for refugee response, globalization and new humanitarianism have resulted in the devolution of the goals and principles of refugee protection that the UNHCR has traditionally held. More specifically, the UNHCR has shifted its primary goal from protecting refugees and their rights and safety towards a more security-driven agenda, defined by the foreign policy objectives of the Global North (Chimni, 2000).

According to the theory of new humanitarianism, humanitarian aid has become used increasingly as a tool of foreign policy. Politicization of aid shifts the focus away from objective assessments of the receiving country's needs towards donor-motivated interests in the receiving country's natural, social, and political landscape and dictates the way aid is handled, allocated, and prioritized (Apodaca, 2017). This, in turn, impacts the effectiveness of humanitarian aid in recipient countries. Studies have addressed the effectiveness of foreign aid and the limited impact this has on international policies of aid-giving (Quibria, 2014), the negative impact politicization of aid, such as earmarking, can have on receiving countries being able to make real political, social, and economic change (Bearce & Tirone, 2010); and how certain donors, specifically NGOs and private donors, have less political or more humanitarian interests than governmental donors (Büthe, Major, & de Mello e Souza, 2012). As increasingly politically-driven aid has given rise to "new humanitarianism," there is a growing need to understand how these trends impact urgent humanitarian development initiatives, such as response to emergent migration crises.

The United States' Role in Humanitarian Aid

According to the Financial Tracking Service, the U.S. is the world's largest provider of humanitarian assistance (Figure 3). It far surpasses the presence of other international donors, and in the three of the four cases of this study, the presence of the United States is clearly shown both in the raw humanitarian contributions and the network analysis of each case, respectively.

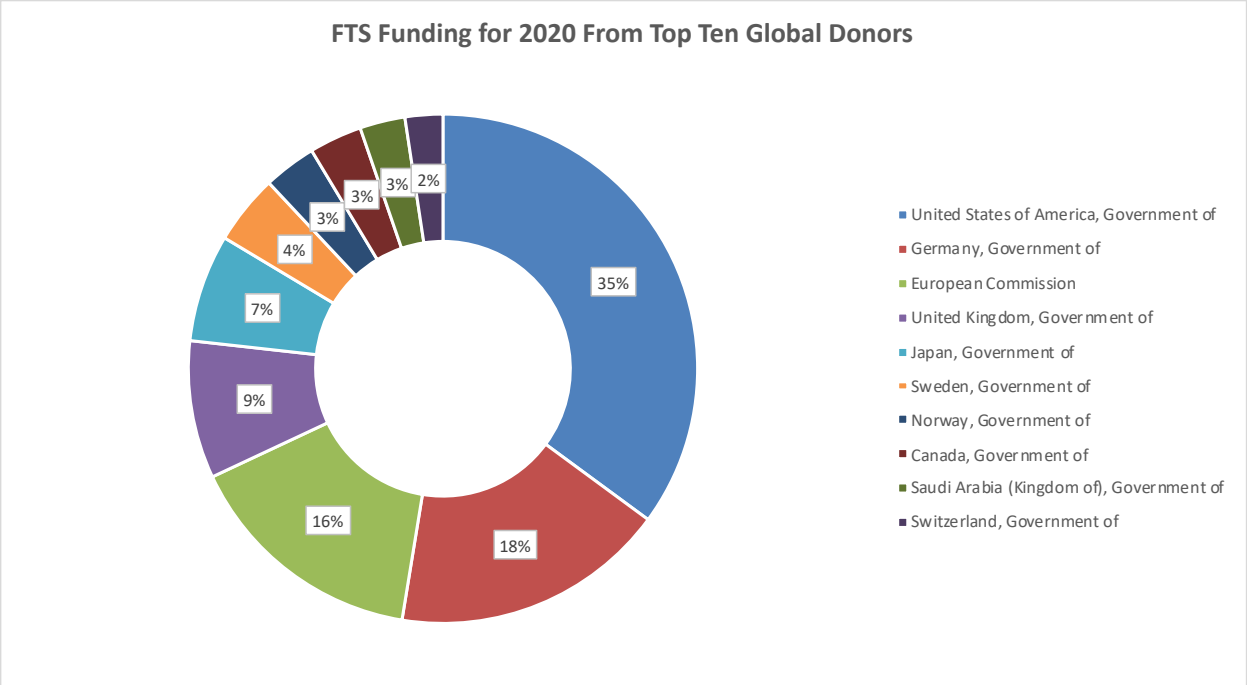

Figure 3 Top Ten Global Donors, 2020

Source: Graph created from data from the Financial Tracking Service Global Funding Overview Summary (Financial Tracking Service, 2020b)

While the country plays an integral part in international networks of humanitarian aid, scholars suggest that its role is largely driven by political and economic interests in the recipient country (Bearce & Tirone, 2010). This has been shown in studies examining the driving factors of U.S. humanitarian aid disbursements and assistance in the later decades of the 1900s. Since the start of the Cold War, political and economic incentives have been found to be the primary

driver of United States' humanitarian initiatives (Lebovic, 1988), even in the case of disaster assistance (Drury, Olson, & Van Belle, 2005). And, increasingly, the division between foreign policy action and humanitarian action has become much less clear (Blanton, 2000). Even more recently, in the National Security Strategy, the Trump Administration advocates the use of assistance programs as a device of foreign policy:

> We want to create wealth for Americans and our allies and partners. Prosperous states are stronger security partners who are able to share the burden of confronting common threats. Fair and reciprocal trade, investments, and exchanges of knowledge deepen our alliances and partnerships, which are necessary to succeed in today's competitive geopolitical environment. Trade, export promotion, targeted use of foreign assistance, and modernized development finance tools can promote stability, prosperity, and political reform, and build new partnerships based on the principle of reciprocity (Trump, 2017).

Despite this, the United States' role in international networks of humanitarian aid cannot be disregarded. It is, however, concerning in the face of a global economic crisis, especially for countries which are heavily reliant on primarily U.S. funds. First, the manner in which the United States utilizes humanitarian aid—to meet political and economic goals, rather than strictly humanitarian ones—is emblematic of the issues presented by new humanitarianism and the impact this has of aid effectiveness (Chimni, 2000). Second, this reliance on politically-motivated aid creates a precarious situation for humanitarian aid and its abilities to meet the increasingly expansive, extended, and rapidly changing needs of host countries around the world. As crises grow and require larger influxes of aid to pursue a proper humanitarian response, funding from other, non-governmental sources may become increasingly important, especially in the wake of potential cuts from large, governmental donors, such as the United States.

The Growing Presence of Private Aid

Perhaps enabled by the same aspects of globalization that result in states feeling reduced capacity and authority (Clark, 1998), or as a response to new humanitarianism and the increasing

politicization of aid, private, non-state donors have become ever more present in modern humanitarian response. These small organizations and individuals collectively make up an increasingly large (though still minor) proportion of assistance, but may offer insights about increasing the ability of diverse humanitarian aid networks to survive shocks and distribute aid more effectively based on need rather than political interests. According to the UNHCR, private donors have increased their financial support from $34 million to $400 million in the last decade, and now comprise 10% of all contributions to the agency (Executive Committee of the High Commissioner's Program, 2018). This does not include other private contributions being made to smaller organizations, so the presence may actually be larger in general networks of humanitarian aid.

In a stark contrast to the U.S., this aid is given for primarily humanitarian purposes, rather than to reach political ends (Büthe et al., 2012). And, because it is less prone to corruption by recipient governments and politicians (Desai & Kharas, 2008) and can be utilized more quickly than governmental aid because it is not subject to the same bureaucratic procedures, such as review and approval processes (Smith, 1990), it may also be more effective than governmentally sourced humanitarian funding for meeting emergent and shifting humanitarian needs. Though in terms of actual capacity, private donors do not match the resource capabilities of large, governmental donors, they are growing in importance and capability in international networks of humanitarian aid. Diversification of aid sources through increasing private funding speaks to the adaptivity of humanitarian aid networks for potential shocks in addition to more agile expenditures to meet changing needs in the receiving country.

Social Network Analysis in International Studies

Network analysis requires an understanding of network behavior and the relationship these analytical principles have with the real-world phenomenon. Social network analysis has

been used in the field of international studies to understand the dynamics between states, intergovernmental organizations, and non-governmental organizations. Conflict and cooperation studies (Faber, 1987; Kinne, 2013; Maoz, 2006), international organizations research (Cao, 2009), and a small number of contributions ranging from development to governance (Kahler, 2009) have relied on social network analysis. However, network analysis has the potential to reveal power dynamics between actors in ways that have yet to be fully realized in the literature. In their discussion on the role of power in international networks, Hafner-Burton et al. (2009) advocate for network analysis because it "Challenges conventional views of power in international relations" (p.559), pointing specifically to evidence that international actors manipulate their networks to capitalize on power dynamics and exercise that power. SNA provides the ability to critically examine international relationships in a computational, statistically-driven manner. In looking at network behaviors and characteristics such as power law distributions and preferential attachment, and how they relate to the potential of cascading network failures in the four cases observed in this study, I argue that the reliance on certain actors (i.e. those driving these specific behaviors, in this case, the United States) create network structures that are less resilient to large shocks.

In international studies, power laws and preferential attachment have been used to understand the growth of trade networks over time (Maoz, 2012), but with limited other use in relation to humanitarian assistance. In this study, I use scale free networks, power law distributions, preferential attachment, and an understanding of these trends as they relate to the potential for cascading failure to provide a computational analysis of the humanitarian aid networks of four major refugee situations, and the potential implications for and fragility of their network structures. By analyzing the four cases, from least resilient to failure to most resilient—

the Venezuelan situation, the Syrian situation, the Rohingya situation, and the European situation—I am able to show how certain networks have built a higher degree of resilience to cascading failure than others. Through these network characteristics and behaviors, I develop a deeper understanding about the importance of the diversification of sources of humanitarian funding and the potential negative impacts of a heavy reliance on a singular hub within these networks.

Social Network Analysis and Network Behaviors

In addition to theories of globalization and aid, this study rests on the use of social network analysis to interpret the financial relationship between humanitarian donors and recipients. Social network analysis (SNA) is utilized across a plethora of fields. In social sciences, SNA has been used to provide greater analytical depth on a variety of phenomena by showing the connections made between people, organizations, markets, or other actors (Barabasi, 2013; Borgatti, Mehra, Brass, & Labianca, 2009). In this study, I rely on three network behaviors—power law distributions/scale-free networks, preferential attachment, and cascading failure—to explain the humanitarian aid financial networks and the potential shortcoming of reliance on a singular, major hub for humanitarian assistance in the four regions. For context, I provide a brief discussion of each below.

Power Laws and Scale-Free Networks

In networks, actors (individuals, organizations, nation states) are characterized as "nodes" whose connections to one another could represent any number of things (e.g. friendships, alliances, alma maters). In this study, "nodes" are representative of international actors such as state governments, NGOs, or IGOs, with the "links" they share representing financial transactions of humanitarian assistance. In the case of a power law distribution, which is dominated by a few, highly connected nodes, known as "hubs," these nodes will remain hubs

regardless of the scale of the network, thus "scale-free." The "hubs" of the network are those actors which share the most transactions with other nodes (actors) in the network, creating a scale-free network whose distribution of links follow a power law distribution. Power law distributions are a characteristic of scale-free networks which are observable in a wide array of both natural and human phenomenon (Barabasi, 2009; Barabasi & Bonabeau, 2003; Broido & Clauset, 2019; Aaron Clauset, Shalizi, & Newman, 2009). The characteristics of a scale-free network, such as the relative distribution of edges across the nodes in a network, remain the same when the size of the network changes.

In network sciences, this type of distribution explains the likelihood of the occurrence of certain events: small-scale events occur frequently, while events of a larger scale are much rarer. These types of networks and distributions can be used to understand human dynamics and patterns of behavior (Barabasi, 2005; A. Clauset, Newman, & Moore, 2004; Vázquez et al., 2006) to breaking down the growth and community structure of complex systems like the Web (Barabasi, 2013; Barabasi & Albert, 1999). Power laws and scale-free networks in the social sciences are predominantly observed in economic phenomenon (Gabaix, 2009; M. Newman, 2004), such as patterns of income distributions (Atkinson, Piketty, & Saez, 2011), firm sizes (Axtell, 2001), stock market trends (Mandelbrot, 1963), and international trade (Hinloopen & Marrewijk, 2006). In political science and international studies, the use of power law distributions to understand the frequency of rare, large events is most common in studies regarding instances of conflict. Most studies of this nature are aimed at explaining conflict size (Cederman, 2003; Friedman, 2015; Richardson, 1948). More recently, power law distributions have also been used to explain trends of terrorist attacks (Aaron Clauset & Wiegel, 2010; Aaron Clauset, Young, & Gleditsch, 2007) and cyberwarfare (Bibighaus, 2015).

The understanding that power laws and scale free distributions are widely applicable to a variety of networks has been questioned frequently (Broido, 2019). Much of the classifications for what makes a distribution "scale free" are not universal (Goh et al., 2002), and often, the calculations leading to the assertion of a scale free distribution are not often not calculated with enough data (Stumpf & Porter, 2012), or are not accurate representations of data (Lima-Mendez & van Helden, 2009). Overall, there are many issues associated with accurately determining the existence of power law/scale free distributions. This study does not attempt to determine the empirical existence of scale-free networks in the relationships of humanitarian giving, but aims to use the general understanding of how network structure supported by a single hub—one that would typically create a SFD—is more fragile in nature (Zhang et al., 2015).

In this study, I use a visual assessment to determine the existence of power laws and scale-free networks in the four case studies and their role in creating the potential for cascading failure to demonstrate a new way to analyze and infer insights about humanitarian actors through the structure of humanitarian aid transactions. The methods utilized in this study, though limited in their contribution to network science, may help expand the use of power law distributions in the fields of political science and international studies outside of strictly conflict-related phenomena by contributing a new analytical lens for evaluating humanitarian financial intervention.

Preferential Attachment

Another behavior observed in the evolution of the networks in this study is the tendency of nodes to create new connections through a process of preferential attachment. One of the methods for understanding this process of network connectivity is the Barabási-Albert Model, which asserts that as a network grows and new connections are made between nodes, the connections made will likely be driven by which node is the most preferable. This preference is

usually based on the existing node's connectivity and linkages to other nodes in the network. Thus, more significant nodes ("hubs") tend to become even more significant over time (Barabasi & Albert, 1999). Intuitively, we can see this in a number of real-world situations. For instance, in academic publishing, the more a paper is cited, the more likely others are to cite it. Similarly, the more people follow someone on social media, the more likely that person is to gain even more followers. While there is some push back against this understanding because of the difficulty in accurately identifying a scale-free network that stems from growth by preferential attachment, the vulnerability to failure that stems from the reliance on hubs in a network that is observed in networks that—at the very least—mimics SFNs (Zhang et al., 2015), is the focus of this study.

Preferential attachment, and its tendency to produce scale-free networks which follow power law distributions, have been demonstrated consistently through investigation of network organization (Krapivsky & Redner, 2001), connectivity (Krapivsky, Redner, & Leyvraz, 2000), clustering (M. E. Newman, 2001; Vázquez, 2003), and general network structure (Dorogovtsev, Mendes, & Samukhin, 2000; Jeong, Néda, & Barabási, 2003; Maoz, 2012). Like power law distributions, preferential attachment explains the evolution and structure of the humanitarian aid networks of the four cases, and their susceptibility to network vulnerabilities such as cascading failures. Described in more detail below, the findings of this study reaffirm the findings of existing literature which addresses these attachment trends and the assertions of the Barabási-Albert Model.

Cascading Failure

The primary theoretical framework for understanding the implications of the presence of a singular, large node in the observed humanitarian aid networks in this study is cascading failure. A cascading failure is one in which the incapacitation (diminishment or removal) of one node in the network causes a series of subsequent incapacitations of nodes related to that one,

often in ways that are unexpected. While this phenomenon is more extensively studied in the area of infrastructure and physical sciences, such as in networks relating to internet or power grids (Crucitti, Latora, & Marchiori, 2004; Motter & Lai, 2002), there is precedent to apply this theory of network science to other, real-world social networks (Albert, Jeong, & Barabási, 2000; Ash & Newth, 2007). Though most scale-free networks are relatively robust in the face of network failures, specifically, to a large number of failures of less significant or smaller nodes, those which rely heavily on a few nodes that play a key role in the networks are extremely vulnerable to cascading failure in the case that one of those key nodes collapses (Albert et al., 2000). Networks with more clustering, leading to a collection of many more distanced "communities" of nodes, may result in resilience against shocks such as node failure (Ash & Newth, 2007). Humanitarian aid networks, which may be vulnerable to funding changes because they are so chronically underfunded, may be susceptible to cascading failures. In other words, if the U.S. were to leave the aid network as the main node, not only would the humanitarian situation lose U.S. funding, but other funding organizations and countries may go bankrupt trying to compensate for the loss of the node. Additionally, a series of organizations that predominantly rely on that funding may not be able to secure enough of an operating budget to continue, leaving not only those services unfulfilled, but also resulting in their dependent organizations failing and over-taxing the organizations that are left to fill the need.

In this study, I assert the importance of donor diversification to create the resilience via clustering, or the creation of more hubs that can control the flow of aid around a network, as proposed by Ash and Newth (2007). While this conflicts with assertions about the ineffectiveness of donor fragmentation (Annen & Kosempel, 2009)—the issue of too many small donations coming from too many donors—so long as there is a coordinating agent for the donors,

the response would remain effective (Steinwand, 2015). These coordinating actors, or a lead donor, as discussed by Steinwand (2015), prevent one country from having to manage all of the fragmented aid flows independently, which could lead to mismanagement of funds and poor aid allocation. Because there is already a large presence of international humanitarian organizations—the UNHCR and IOM—that already serve as major coordinators of aid from a variety of governmental, intergovernmental, nongovernmental, and private donors to a concise and organized humanitarian response, the issue of ineffectiveness in aid presented by donor fragmentation is limited.

From these insights in network science and network vulnerability as it relates to node failure—the failure of significant nodes, in these cases—we are offered a greater depth of understanding of the relationships between donors and recipients of humanitarian aid. By using social networks to analyze the implications of the reliance on a single governmental actor such as the United States for a bulk of investment, we can understand how this is potentially damaging to these networks and their corresponding humanitarian response. In examining the role of the U.S. in each case through SNA, I am able to offer a different perspective—a more computationally driven one—that affords a greater statistical depth to the weight of the United States' relationships with other donors and recipients of aid, as well as the overall impact of its presence on the network. From this, I can analyze the weight the U.S. carries as a network actor, and how this would effect humanitarian aid flows if the country were to be removed as a major actor, which provides important insights on a network's vulnerability to a shock to a major node.

Finally, based on the understanding of the United States' network presence in each case, I can draw conclusions on how the country's position in a network—how influential it is based on how many connections it shares, or how much the network's structure changes when it is

removed, for example—may explain how influential it is in guiding the outcome of a crisis via its humanitarian aid contributions. This, in turn, can help draw further conclusions about the effectiveness of the aid being directed towards the humanitarian response, based on how interest-driven the role of the U.S. is, which can be related to its position and influence in the network compared to other nodes. Much like the concept of new humanitarianism described by Kuehlhorn Friedman (2019), the extent of the role of the United States may be indicative of a more interest-driven, politically strategic context for humanitarian aid networks, rather than one that is driven to meet the needs of vulnerable populations. Network analysis and the computational, statically driven perspective it provides to relationships between donors and recipients of aid offers a much different perspective than previous studies of humanitarian contributions. The following chapter will explain the metrics this study utilizes to understand the attributes of the actors in the network, such as their influence, the relationships they share, and how important these relationships are, providing the basis for which we can begin to fully assess the importance of donor diversification in creating network resilience.

METHODOLOGY

Social network analysis is the study of relationships between actors in a system by quantifying statistical calculations of their relationships. Each actor, or "node" has a number of incoming and outgoing links, called "degrees." These degrees serve to characterize not only how many connections that node has, but also connections of connections; in other words, using SNA, we can calculate the significance of pathways between indirectly connected nodes in a network. Statistical analyses of these direct and indirect connections reveal larger network structures—preferential attachment and power law distributions—as described earlier. In the context of the humanitarian response to refugees and migrants in the cases identified here, this means that we can construct a network of financial transactions between donor states, organizations, individuals, and their recipients to map out the structure of an "aid network." By 'following the money,' SNA provides statistical evidence of powerful actors, both donors and recipients, within this aid network. From these statistics, it is possible to infer insights about the power relationship between actors, the vulnerability of the network to changes in actor preferences, and the power of globalization to shape actor contributions to distant crises.

The network analysis in this study uses *Gephi*, a software platform for entering, cleaning, visualizing, and analyzing network structures. Network analysis requires data to be in a specific structure that lists each actor/node with its direct connection to an actor/node. The data source and limitations are discussed below, as well as the network measurements that were calculated within the Gephi software. This program was chosen for its ability to create visualizations which show network growth and change over time, and the ability to highlight the relationships between donors and recipients to perform a visual analysis of network structure.

Case Study Selection

In this study, four ongoing refugee and migrant situations are discussed across three chapters, each addressing a varying level of network reliance on the United States as a major network actor and international donor. The case selections, from most reliant to least reliant on the presence of the U.S., are discussed below.

The Venezuelan Refugee Situation

The Venezuelan refugee and migrant situation, covered in chapter four, was selected because it represents a situation which is heavily reliant on United States' humanitarian investment, with the absolute majority of aid coming from one country. The data in this set is reflective of aid being directed towards the refugee and migrant response in South American countries. The largest recipient countries include Colombia, Ecuador, Peru, and Brazil, but most other South American countries, as well as Mexico, are also reflected in the dataset. Though the onset of the Venezuelan situation was in 2015, the data does not reflect humanitarian aid contributions until 2017, with the most robust years of data spanning from 2018-2020. While all the data grouped under the Venezuelan situation in the FTS dataset is presented in the network, it is most reflective of the years 2018-2020.

The Syrian Refugee Situation and the Rohingya Refugee Situation

The Syrian and Rohingya refugee and migrant situations, both covered in chapter five, were selected because they both represent scenarios which rely heavily on United States' funding, but also have other major network actors, rather than relying on the absolute influence of the U.S. to maintain network structure and aid operations. In the Syrian case, the aid is being directed primarily to Lebanon and Jordan, but also includes Egypt, Iraq, and Turkey. This case is the largest of the four discussed in the study, with data spanning from 2013 (the first year it is available in FTS) to 2021. In this situation, a refugee response plan is developed for each year,

all of which are included in the network analysis. In the Rohingya case, all the aid is being directed to Bangladesh. Like the Venezuelan situation, aid data is not available until 2017, but is robust from 2017 forward. Like the Syrian case, a response plan is developed for each year, and each is included in the network analysis.

The European Refugee Situation

The European refugee and migrant situation, discussed in chapter six, was selected because it is the least reliant on United States' contributions and more reliant on different sources of aid, such as IGOs, NGOs, and private donors. This network is much smaller than the other three, with donors sending large sums of aid in fewer transactions. The primary recipient country is Greece, followed by North Macedonia and Serbia. The data spans from 2015 to 2019, with the most robust years being 2016 and 2017. Overall, these cases will show the different outcomes that different levels of reliance on the United States for humanitarian investment will present when the node is removed from the network, and the impact this could have both in real-world and network scenarios.

Data Set and Limitations

Data Set

The network analysis in this study is based on datasets from the Financial Tracking Service (FTS) of the United Nations Office for the Coordination of Human Affairs (OCHA).[2] The data represents only international *humanitarian* aid, rather than general foreign aid contributions. In order to be reported, each individual contribution is required by UNOCHA to meet certain benchmarks outlined by the *Criteria for inclusion of reported humanitarian contributions into the Financial Tracking Service database, and for donor / appealing agency*

[2] https://fts.unocha.org/

reporting to FTS.[3] The benchmarks require that the primary objective of the aid being granted is "… To save lives, alleviate suffering and maintain human dignity during and in the aftermath of man-made crises and natural disasters, as well as to prevent and strengthen preparedness for the occurrence of such situations" (Financial Tracking Service, 2004). According to the FTS, this process ensures that all documented contributions meet a standard definition of "humanitarian aid."

I filtered the datasets to capture transfers of all funds targeted specifically to each of the four migration situations observed here, with dates of the transactions included to account for change in relationships over time, and funds which are being used to support countries' responses to each regions' respective refugee and migrant situation. The FTS system categorizes specific funding emergencies or programs by situation which correspond with larger institutional responses to each scenario. In the four cases, respectively, I searched the FTS to capture contributions which are being directed towards:

- "Emergency: Venezuela Outflow- Regional Refugees and Migrants" for the Venezuelan refugee situation
- "Emergency: Europe: Refugees and Migrant Crisis" for the European refugee situation
- "Plan: Joint Response Plan for Rohingya Humanitarian Crisis" for the Rohingya refugee situation
- "Plan: Syria Refugee Regional Response Plan"[4] for the Syrian refugee situation.

By filtering the results in this way, I can ensure that the data encompass only humanitarian aid transactions directed towards the response to the four refugee and migration situations, rather than other areas that attract significant donor contributions, such as internal displacement from the civil conflicts and development efforts also available in FTS.

[3] https://fts.unocha.org/sites/default/files/criteria_for_inclusion_2017.pdf
[4] https://fts.unocha.org/data-search

Data Limitations

It is important to note that while the data was filtered for all years that data is available for each situation, there are some years which have limited or no data. However, as the networks grow from year to year, the data becomes much more comprehensive and robust, with at least 100 aid transactions accounted for in a given year per case. Furthermore, there were a limited number of instances where the data needed to be cleaned to fit the requirements to perform a social network analysis, which are described further below.

First, data entries which contained no monetary data (a blank entry) were removed from the set as they did not contain the information necessary to conduct a complete analysis. The filtered dataset after these blank transactions were filtered are shown in Table 1.

Table 1 Transactions removed due to lack of monetary data

Situation	Total Transactions	Removed	Filtered Dataset (N)
Venezuelan	1,248	16	1,232
Syrian	5,765	3	5,762
Rohingya	1,604	9	1,595
European	478	3	1,604

Data entries which had a blank entry for donating actors or receiving actors were marked as “Undesignated.” They were not removed entirely, because it is still necessary to account for the organization sending or receiving aid that was not blank. While this data was not removed from the set, the “Undesignated” node is not considered as an independent actor in the analysis. The filtered nodes after the designation of the blank entries for actors are shown in Table 2.

Table 2 Nodes marked as "undesignated" due to lack of donor/recipient data

Situation	Total Nodes	Undesignated Nodes	Filtered Dataset (N)
Venezuelan	2,464	77	2,387
Syrian	11,524	142	11,382
Rohingya	3,190	19	3,171
European	950	13	937

After all limitations accounted for, the four networks examined in this study are constructed with the data listed in Table 3, with the “Filtered Nodes” accounting for the total number of network actors, and the “Filtered Transactions” accounting for the total number of sending transactions shared between donors and recipients of aid humanitarian aid.

Table 3 Filtered nodes and edges, network totals

Situation	Filtered Nodes (N)	Filtered Transactions (N)
Venezuelan	136	1,233
Syrian	278	5,762
Rohingya	112	1,595
European	114	475

Another more general limitation which should be noted is the potential shortfalls of data reporting, especially in relation to a crisis. Some individuals and organizations may not meet the reporting criteria outlined by the FTS, and therefore will not be represented in this analysis. This could include aid transactions not being directed towards humanitarian issues, or smaller implementing organizations without the resources or reporting requirements of a larger organization. These smaller organizations are part of an ongoing study I am currently working on to derive the extended aid network qualitatively that is not included in the results presented here as the dataset is currently incomplete.

It is important to consider that, potentially, the networks observed in this study expand further than the bounds explored here. Despite searching for other sources of data, through subjective assessment, FTS appears to be the most complete dataset relative to coordinated humanitarian response to human displacement. This study therefore used the network as it is captured in the dataset, offering a new lens for looking at this issue. However, future studies should aim to identify datasets that include other actors, such as smaller organizations or implementing partners. They should also explore alternative complementary analyses, such as construction of social networks from qualitative data- news articles or big data sources such as social media- in order to identify smaller organizations in the aid network which are not captured here.

Furthermore, though this study treats the networks as static while using dynamic measures, when, in their real-world construction, there are often changes in the presence of actors over time, the main network actors in this case remain the same, even in a year-by-year analysis of each network. In a study regarding the role of all network actors, it may be necessary to treat the network as dynamic, so the changes donor and recipients over time could be noted. However, in this study, I am primarily examining the role of a major state actors, like the United States. Because this role is not often subject to change, examining the network as static to analyze the influence of a single, consistently present major actor is appropriate.

Lastly, it is important to note that this study only addresses the immediate aftermath of the United States withdrawing from a humanitarian aid network. It does not seek to address the international power dynamics that would adapt in the event that the United States were to exit any given network entirely. This study aims to analyze the impact that a single donor can have on overly dependent networks, and potential solutions that could mitigate this. Though this type

of situation would pose major implications for the reorganization of international actors to fill the power void that would be left by the US, this type of theorizing is out of the scope of this study, and should be addressed in future studies.

Network Measurements

In each chapter and for each case study selection, the networks will be used to analyze the original network, which includes the role of the United States, and the theoretical network, which excludes the country's role. By comparing the network measurements of the original and theoretical networks, we are able to determine first, how important the U.S. is to the network, and secondly, the consequences of the U.S. node's failure, and how this would impact the network structure of each case. In the analysis of the original and theoretical networks of the four case studies, I focus on two main statistics which determine a node's overall network influence, degree distribution and measures of centrality, each described below. The following statistics are derived from algorithms built into the Gephi program.

Degree Distribution

Degree distribution is a statistic which is used to show how many nodes within each network share the same degree, with the "degree" being the number of edges/links—in this case, the number of humanitarian aid transactions—connected to each node. This measurement was selected to identify the prominent nodes within the network and how significant their connections are compared to the other nodes in the networks. Degree distributions indicate whether the network follows a power law distribution, thus providing evidence that the network is scale-free. Degree distributions are also used to determine if the network forms around preferential attachment.

Due to the nature of the networks being observed, many nodes often have multiple transactions with the same nodes over the course of a given period of observation. Because of

this, it is important to take the weight of each node into account when measuring the network's degree distribution. Weight is similar to a node's degree in that it is based on the number of edges a node has. However, it takes the weight of each edge into account, in this case, how many times the same node donates to another node. For example, if the U.S. donates to the UNHCR four times and the IOM four times, it will have a weighted degree of eight. Therefore, in the analysis, this measurement is calculated using the "Average Weighted Degree" statistic in Gephi.

Network Centrality

Centrality is a measure of the significance of a node within a network by scoring how critical the node is for maintaining the structure of the network based on its connections to other nodes. I use this measurement to statistically analyze how prominent or well-connected an actor is to other actors within the network, especially those that stand out in the power laws observed in the degree distributions. Gephi provides a number of centrality measures, but for this study, I rely on "eigenvector centrality" and its variant "Page Rank" for reasons described below. While betweenness centrality could have been included, it measures the number of times a node falls on paths between other nodes, which more so highlights the role of "broker" nodes—such as the UNHCR or IOM—rather than the political significance of particular donors.

Eigenvector Centrality

Eigenvector centrality measures the importance of a node based on how many links it shares in the network, how well-connected the node is, and how well-connected its connections are. For example, if the U.S. is a well-connected node and it shares an edge with the UNHCR (another well-connected node), then it will have a higher centrality score. By accounting for these attributes, eigenvector centrality is a statistic for how influential a node is in the observed network based on the node's relationships and how far those relationships extend throughout the network. In a relatable real-world situation, this could be seen as a potential proxy for power or

influence. Each node is given a score from 0 to 1, with 1 being the highest level of influence. Eigenvector centrality provides a better understanding of which actors have the most influence, both as a donor and as a recipient, in the observed humanitarian aid network, and how far this influence may extend.

Page Rank

Page Rank is a variation of eigenvector centrality but adds the ability to account for the directions of edges and the weight of each node. In terms of humanitarian aid networks, this is especially important for two reasons. First, it allows me to take into consideration the role that direction plays in aid contributions (e.g. donor to recipient). Because humanitarian aid is typically granted without condition of repayment, the flow of aid often only goes in one direction. Page Rank accounts for this in the statistical assessment of network structure. Secondly, the weight of each node in humanitarian aid networks is also important to take into account when assessing centrality. This is because many nodes, especially the most prominent, tend to contribute to multiple nodes multiple times. By including a statistic that accounts for the potential anomalies of assessing a humanitarian aid network- including the direction of aid (edge direction) and the number of transactions from one actor to another (weight)- we are able to ensure that they are accounted for when analyzing the network results. For example, a node like the U.S., which gives *out* the most aid, and a node like the IOM, which takes *in* a significant amount of aid, cannot be measured the same in terms of network significance. Though they are both important in the humanitarian response, the U.S. is a more significant network actor, because it has a higher out-degree than the IOM: it gives more aid. By accounting for the direction and frequency of the flow of aid by using Page Rank scoring, we can more accurately show the significance of certain nodes within the network. Like eigenvector centrality, Page Rank scores for nodes also run from 0 to 1, with 1 being the highest level of importance or node

connectivity throughout the network. This statistic, overall, is the most important, especially in terms of assessing node influence.

In the four cases examined in this study, these measurements will be used to characterize the importance of different actors in their respective humanitarian aid network, and the impact this has on not only network resilience, but the real-world humanitarian response. Degree distribution shows how many relationships a donor shared with recipients, and how frequently there is a transaction between the two. The measures of centrality—eigenvector centrality and page rank—show how influential a node is in the network compared to others. Together, they offer great insight when analyzing how important certain nodes are compared to others, and the potential impact on the overall network if these nodes collapsed. In the following chapters, I will use these metrics to provide an understanding of the significance of certain network actors in the relationships shared between donors and recipients of humanitarian aid. In addition, they provide a basis for underscoring how the reliance on a single hub for a majority of funding may leave networks vulnerable to cascading failures from the collapse of a single major node.

THE VENEZUELAN REFUGEE SITUATION: A CASE OF RELIANCE AND VULNERABILITY

According to the UNHCR, the Venezuelan refugee situation is one of the largest instances of forced migration in the entire world, surpassed only by the Syrian refugee situation (Response for Venezuelans, 2020). The migration of Venezuelans to surrounding countries in continental South America and the Caribbean began in 2015 and peaked from 2017 to 2018. Presently, over 5 million Venezuelans have fled from their country (Response for Venezuelans, 2020). As Venezuelans flee their country in search of safety and security, host countries in the region struggle to meet the needs of incoming refugees and migrants.

In response, the international community has contributed hundreds of millions of dollars in humanitarian aid to assist host communities with humanitarian response. The largest contributor, by far, is the Government of the United States, which provides almost 75% of all funding being directed towards the Venezuela migration response, according to FTS data (Financial Tracking Service, 2020a). Without this funding, an already chronically underfunded response (Response for Venezuelans, 2020) would likely face collapse. Especially as the United States ventures towards economic uncertainty in the wake of the coronavirus pandemic, it becomes increasingly important to consider the implications of such a heavy reliance on humanitarian aid from a singular source.

By analyzing humanitarian aid networks and trends of that network behavior, I am able to provide a computational picture of the relationships between donors and recipients. This perspective allows exploration of the depth of the role the United States plays in the Venezuelan humanitarian response and suggests the potentially catastrophic implications of changes in its financial contributions. This case is representative of a situation in which the network structure,

which is heavily dependent on a singular major hub, may be susceptible to shocks--such as funding decreases or withdrawals--from which the network is unable to recover. The analysis will clearly show that, while the United States plays an absolutely essential role in the response to the Venezuelan situation, this reliance decreases network robustness to shocks, and would result in cascading failures across the network in the unlikely circumstance that the U.S. node partially or completely withdraws funding.

This chapter presents the analysis of the humanitarian aid network for Venezuelan migrants in South America, namely Colombia, Peru, Ecuador, and Brazil. I highlight three primary insights: 1) The Government of the United States is the most significant actor (node) in the network, with influence that expands across almost the entirety of the network; 2) This means that changes in U.S. funding would affect every other donor and recipient across the entire network; and 3) The expansive role of the U.S. and the earmarking of humanitarian aid to the Venezuelan response provides evidence of the country's interest-driven role in the region, and hence, the presence of tenets of new humanitarianism. As these results relate to the possibility of cascading failure—or one node's failure leading to another's and another's throughout the system—they will provide support for the main argument of this study, which asserts the importance of diversifying sources of funding in an effort to make more clustered network communities, with a higher degree of robustness against changes in network structure. Overall, this network is the most vulnerable to shifting sources of humanitarian aid of the four cases in the study, which could be mitigated by influxes of funding from other sources.

Trends of Extreme Reliance

Of all the networks explored in this study, the case of Venezuelan migration response is by far the most reliant on U.S. humanitarian contributions. The sheer volume of funding the U.S. provides to the Venezuelan refugee and migrant response far surpasses that of any other actor in

the network. The next nine largest donors, when combined, do not even provide half of what the United States has contributed since the onset of the refugee and migrant influx in 2015 (Figure 4). Though this is likely related to the United States' strategic goals in the region, it still plays an important part in the network structure, and has adverse implications in the unlikely scenario the U.S. cannot or will not continue to provide funding.[5] And while the real-world expression of raw contributions tells this story well, the network expression of these relationships enforces it, and provides a deeper insight into the potential pitfalls of this kind of structure in the wake of a global crisis.

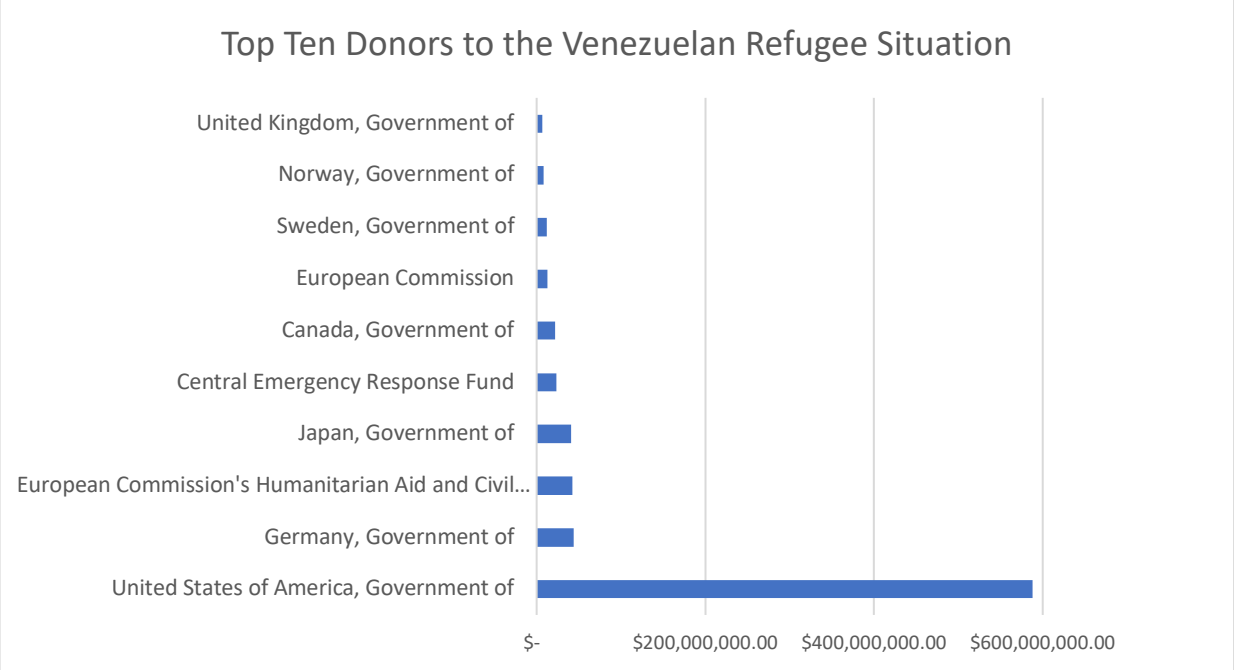

Figure 4 Top Ten Donors to the Venezuelan Refugee Situation

[5] A recent report by the Atlantic Council (2019), outlines the importance of providing humanitarian aid to Colombia- the largest receiver of Venezuelan refugees and U.S. humanitarian aid- to maintain the United States' regional security and economic interests.

Network Analysis

The network statistics of the Venezuelan humanitarian aid network—the full set is available in Appendix A—paint a similar picture to that of the funding statistics: The U.S. is the singular most important node in the network (eigenvector = 1), and has, by far, the largest network presence (weighted out-degree = 547). For network robustness this is a shortfall. As discussed in the literature review, while scale-free distributions provide a stability in some aspects, in this scenario, the distribution has eliminated other strong clusters from forming in the network, thereby reducing network robustness and making the network more vulnerable to failure with the removal of a single influential node. The following network measurements and their corresponding analysis will support this argument and the importance of diversifying major network donors.

Measures of Centrality

The measures of centrality for the humanitarian aid network surrounding the Venezuelan refugee and migrant situation clearly show the significance of the U.S., and assert its role as a major hub in the network. Essentially, the role of the U.S. as a hub is indisputable, which reflects the literature that the US has historical (Fajardo, 2003) and contemporary interests (The Atlantic Council, 2019) in the region, even beyond humanitarian response.

The eigenvector centrality scoring of the top ten nodes in the network shows how significant the United States is compared to other network actors. With the highest score possible (1), the U.S. extends its influence over virtually the entire network. In descending order of eigenvector centrality, the following three actors (IOM, UNHCR, and UNICEF) are each organizations that accept aid to redistribute to implementing actors on the ground (Table 4). In a scenario where the U.S. dramatically reduced or withdrew its presence from this aid network, these humanitarian organizations would likely be unable to fill the gap left by its absence,

especially because the U.S. provides them with a significant portion of their funding. Here, the eigenvector results show that reliance on the United States, while necessary, would likely be harmful in the case of their withdrawal.

Table 4 Top Ten Nodes Based on Eigenvector Centrality, Original Network

Actor	Eigenvector Centrality
United States of America, Government of	1
International Organization for Migration	0.7835
United Nations High Commissioner for Refugees	0.5851
United Nations Children's Fund	0.2854
European Commission's Humanitarian Aid and Civil Protection Department	0.0884
Canada, Government of	0.0694
World Vision International	0.0676
World Food Programme	0.0633
Norwegian Refugee Council	0.0605
Central Emergency Response Fund	0.0598

The results for the page rank scoring uphold the same findings of the eigenvector centrality scores. Again, the influence of the United States across the network, this time accounting for edge direction and weight, is significant, even compared to other prominent nodes (Table 5). The same nodes—the UNHCR, IOM, and UNICEF—follow the U.S. in network influence, but again, these actors are unlikely to replace the U.S. as a major network hub in the occurrence of its departure from the network, especially because they are really a broker of humanitarian aid and the majority of their funding resources are supplied by the U.S.

Table 5 Top Ten Nodes Based on Page Rank, Original Network

Actor	Page Rank
United States of America, Government of	0.1669
United Nations High Commissioner for Refugees	0.0897
International Organization for Migration	0.0792
United Nations Children's Fund	0.0554
European Commission's Humanitarian Aid and Civil Protection Department	0.0336
Norwegian Refugee Council	0.0276
Canada, Government of	0.0182
Sweden, Government of	0.0160
Central Emergency Response Fund	0.0159
Caritas Switzerland	0.0159

Overall, the centrality scoring of the United States shows, first, that it is the most influential node in the network, and second, that it leaves very little room for other nodes to match its scale in significance. In the case of a major shock to the U.S., maintaining network structure would be impossible, especially in an already underfunded situation with stretched resources, and would likely cause instances of cascading failure across the rest of the network, especially as other nodes would be unable to manage the strain caused by the removal of the network's only major donor hub.

Degree Distribution

While measures of centrality do not show the extent to which the absence of the United States in the Venezuelan network would cause disruption, measures of degree distribution can afford greater depth in this regard. By showing the number of transactions the nodes in the network share with other nodes in the network, I can determine which nodes create clustering and how present instances of clustering are in the Venezuelan network. These results also show the sheer volume of transactions directed and received by the top nodes within the network.

From this, we can draw conclusions on the vulnerability of the network to the removal of a hub like the U.S.

The weighted out-degree of both the original and theoretical network show not only how expansive the role of the United States is, but also how small the roles of other nodes are by comparison. As the U.S. hub has the most widely distributed connections across the network (Table 6), there are few other clusters which are strong enough to maintain the structure of the network if the presence of the U.S. node were to be removed. Because the distribution of the network is so skewed, it leaves the network vulnerable to collapse if an "attack" were made on a major node, such as the United States (Motter & Lai, 2002).

Table 6 Top Ten Donors Based on Weighted Out-Degree, Original Network

Actor	Weighted Out-Degree
United States of America, Government of	547
European Commission's Humanitarian Aid and Civil Protection Department	97
Central Emergency Response Fund	47
Canada, Government of	44
Private (individuals & organizations)	37
Sweden, Government of	36
Germany, Government of	34
Switzerland, Government of	21
United Nations Children's Fund	21
Netherlands, Government of	17

To illustrate this point, when the US is removed from the network, there is a dramatic shift in the degree distribution of the network (Table 7). First, almost half of the volume of financial transactions is removed from the network, or 547 transactions, amounting to almost $600 million in humanitarian funds. Major recipients of aid (Table 7) lose more than half of the

aid transactions they were receiving. Second, while the network is more evenly distributed amongst the top donors, and there are more instances of clustering, there is no node which compares to the volume of funding that was distributed by the United States, with the second most influential node—the European Commission's Humanitarian Aid and Civil Protection Department—making up only 97 transactions, amounting to less than $50 million. Likely, the nodes represented in the theoretical out-degree distribution would not be able to compensate for this unhinging of structure. Based on the results of the measures of centrality, if the hub of this network were to fail, the reverberations of its failure would be felt—at least to some degree—by every other node in the network. This is evidence of overreliance on a singular hub, which the literature points to as is indicative of networks susceptible to cascading failures (Albert, Jeong, & Barabási, 2000). Not only would the network lose a significant portion of its connections and the humanitarian funding which corresponds to them, but the burden of aid held by a single actor shows the inability of another actor in the node to regenerate lost connections by increasing their portion of donations to meet the needs of displaced Venezuelans.

Table 7 Top Ten Recipients Based on Weighted In-Degree, Original and Theoretical Network Comparison

Actor, Original Network	Weighted In-Degree		
	Original	**Theoretical**	**Change**
International Organization for Migration	279	82	-197
United Nations High Commissioner for Refugees	264	123	-147
United Nations Children's Fund	168	106	-62
Norwegian Refugee Council	76	68	-8
Caritas Switzerland	46	46	0
World Vision International	34	17	-17
International Rescue Committee	31	31	0
Caritas Germany (DCV)	25	25	0
World Food Programme	24	11	-13
Save the Children	21	14	-7

For instance, a failure in the major hub in this network would also be detrimental to recipients of aid—not just donors and those who would have to compensate for its failure—especially those which receive a majority of their funding from the U.S. When comparing the original and theoretical distributions, the top three recipients of aid—IOM, UNHCR, and UNICEF—all have their in-degree reduced by about half when the United States is removed from the network, meaning they lose half of all incoming transactions, and the humanitarian funding that corresponds to them. There are, however, remaining communities surrounding the mid-sized hubs in the network that fall behind the U.S. in the scale-free distribution, such as the European Commission's Humanitarian Aid and Civil Protection Department (97 outgoing connections) and the Central Emergency Response Fund (47 outgoing connections). While these organizations and their surrounding communities uphold the structure of the theoretical network to an extent, it is significantly changed from that of the original network. These clusters cannot commit the same volume of connections and aid as the United States, however, leaving the network and humanitarian response open to additional failures due to increased strain.

In addition to contributing to the network failures, this would also cause a reduction in resources and services available on the ground to refugees and migrants in need of emergency assistance, as these implementing organizations would experience significant losses of funding. From this, we can observe the true extended hold the United States has across the network. Top aid recipients are not only that, but are significant brokers of humanitarian aid for other smaller organizations. What the network analysis does not show is the how the collapse of the U.S. node would subsequently cause the failure of these major brokers because they can no longer afford to provide their services to the Venezuelan response. This is the importance and main contribution of the implications of cascading failures in networks of humanitarian aid. What we observe is a

network that is heavily reliant on one governmental donor that also has a heavily vested strategic interest in the region (The Atlantic Council, 2019). This investment is emblematic of the tenets of new humanitarianism, which is characterized by a lack of regard for recipients of aid (Kuehlhorn Friedman, 2019), or, in this case, the brokers that are responsible for coordinating aid to the organizations conducting the humanitarian response.

Its removal not only halves the connections to most of the brokers and alters the importance of other nodes in the remaining network, it cuts off 10 smaller organizations from the network entirely through direct funding and likely cuts even more out of the network that we cannot observe without knowing specifically how each U.S. dollar to the brokers is allocated to NGOs on the ground. While cascading failures could happen at other nodes as well, the significance of the U.S. node also points to the amount of power that it can wield in this context, where the other actors likely sense the significance of the U.S. in the response's subsistence. Not only that, if an economic crisis causes the U.S. to reduce or withdraw funds, its connectivity in a larger global market likely means that the other donor countries in the network would have to reduce or withdraw their support because of the same economic situation.

Overall, the comparison of the original and theoretical networks show that the United States plays an integral part in the Venezuelan humanitarian aid network, as one might expect given the historical (Fajardo, 2003) and contemporary interests in the area (The Atlantic Council, 2019). However, the reliance on this hub to maintain the network's structure in the face of a large systemic shock could result in major failures across the network. These results have not only negative network implications, but also indicate a poor outlook for real-world humanitarian operations. In the event of the withdrawal of the United States' contributions in the Venezuelan migration situation, donors and recipients alike would experience the strain on the network's

structure, and likely, a series of cascading failures would take place across the network making the entire humanitarian response unsustainable.

The Implications of the U.S. Role in the Humanitarian Response

As the analysis of the Venezuelan case shows, the network is particularly prone to cascading failure in the rare event that the U.S. node withdraws or collapses. While there are other well-connected nodes in the network, for example, the European Commission Humanitarian Aid and Civil Protection Department, the impact of this node's failure would not be nearly as detrimental to the network's structure as the failure of the United States. Even other well-connected nodes in the Venezuelan network only share a small fraction of the overall network transactions compared to the U.S node. In this case, it is unlikely that the United States will withdraw from the network, primarily due to its stability as a country and strategic goals in South America. However, with the pending threat of a financial crisis in the wake of the coronavirus pandemic, is this type of network failure inching closer towards reality? Will the reliance on one governmental source of aid for almost three quarters of financial assistance prove to be detrimental?

Generally, scale-free networks, such as the one demonstrated in this network, are considered to be relatively robust to failures of large numbers of nodes, so long as they are less influential. Because most of the actors in the network display low levels of connectivity (Table A.1), a failure in one node will not necessarily result in the failure of nodes across the network. In fact, the Venezuelan network is resilient in the sense that even if most of the smaller nodes, or smaller implementing organizations, were removed, the network would retain the majority of its structure. A majority of these nodes and the humanitarian services they provide could be replaced through the continuation of U.S. contributions. Most of the time, these failures will stay localized to the small cluster they began in. In this regard, the network displays a strong degree

of robustness against a large number of small node failures. However, in the case where the main cluster fails- in this case, the cluster surrounding the U.S.- there are typically widespread, cascading failures across the network (Albert et al., 2000). In this case, especially taking into consideration the observed measures of centrality and the volume of the degree distribution of the U.S. hub, the network would completely fall apart. The benefit the U.S. gains from this is being able to earmark funds and drive the direction of the humanitarian response in a way that aligns with their regional interests. The other organizations in the network are, by default, beholden to U.S. interests because of its absolute centrality in the network. This has, in turn, negative implications for not only the stability of the network's structure, but humanitarian action, in general (Kuehlhorn Friedman, 2019).

From the insights of this case, I can draw three conclusions which contribute to the overall argument of this study. The first pertains to network structure. While relying on a singular hub is often necessary in some networks, in this case, it could prove to be a major weakness of ongoing response to Venezuelan migration, particularly in the long-term when donor fatigue could set in. As sources of humanitarian aid begin to shift, the Venezuelan network may not prove to be as resilient to change as some other scenarios, such as those discussed in the following chapters. Overall, this case conforms to the literature regarding cascading failures in that while typically scale-free networks are stable in that they are resistant to collapse when multiple small nodes fail (Albert et al., 2000), they can prove to be prone to collapse in the unlikely event that a major hub is impacted.

The second conclusion is regarding the importance of incorporating a more diversified donor pool into humanitarian aid networks. As discussed by Motter and Lai (2002), especially in the case of scale-free networks, cascading failures may occur in a network with the loss of a

singular significant node. However, to combat this, recommendations from Ash and Newth (2007) regarding the importance of clustering in promoting network robustness to cascading failures come into play. In the case of the Venezuelan situation, major network problems could be avoided if there were other nodes that could sustain higher levels of strain—in this case, donor nodes with a higher out-degree, with the ability to contribute great amounts of aid to a humanitarian response—given the removal of the significant U.S node from the network. This, in turn, would create more clustering and longer path lengths, hence decreasing the likelihood of a failure expanding over the entirety of a network, as it would in the current Venezuelan network structure.

The third conclusion relates to the implications of the United States' role has for both network and real-world power, and the impact this has on acts of humanitarianism. Based on other studies of fungible network power of actors in international networks (Hafner-Burton, Kahler, & Montgomery, 2009) and the country's strategic role in the region (The Atlantic Council, 2019), we can assume that the United States prefers to be the primary contributor of aid, and hence, maintain the largest network presence. With this power, the U.S. is able to use its integral network position to control the flow of aid around the network (Borgatti, Mehra, Brass, & Labianca, 2009), primarily through earmarking where donors specify the ways in which those funds can be used, and hence, the course of the humanitarian response in a manner that serves to support the U.S.'s interests in the region. The implications of the United States' network presence and the role it plays as a governing body of aid is extremely emblematic of the major tenets of new humanitarianism, especially the disregard of recipient needs in favor of donor self-interests (Kuehlhorn Friedman, 2019).

Though the entire removal of the US from the Venezuelan case is unlikely, it is not entirely impossible. As will be illustrated in the following three cases, donor diversification creates more resilient networks in the face of shifting sources of humanitarian aid by the major hubs. Rather than relying on a singular governmental node for a bulk of the assistance, it is preferable to rely on a wider variety of donors to reduce dependency on any singular node and increase resiliency of the network structure to significant shocks such as economic withdrawal of any given node.

In this case, if humanitarian contributions decrease as the U.S. economy begins to decline, the results show there would likely be little that could be done to maintain the structure of the network surrounding the Venezuelan humanitarian response. The network is too reliant on one hub and has few other clusters that could handle the volume of aid that would be necessary to maintain the humanitarian response. A potential, but unlikely because of global donor fatigue and the challenges of collective action, solution to this major pitfall would be diversification of the donor pool, especially in favor of donors which have less strategically-driven motivations for giving (Büthe, Major, & de Mello e Souza, 2012; Smith, 1990). In the following chapters, this possibility will be explored through the cases of the Syrian and Rohingya refugee situations (Chapter 5), and the European migration situation (Chapter 6), all of which rely on U.S. aid to a degree, but not as heavily as the Venezuelan refugee situation. These cases allow us to consider similar humanitarian responses operating under a different funding network structure for comparison.

CLUSTERING THROUGH EXPANDED DONORSHIP, THE SYRIAN AND ROHINGYA REFUGEE SITUATIONS

This chapter will focus on two refugee situations: the Syrian refugee situation and the Rohingya refugee situation. The Syrian refugee and migrant situation is the largest instance of forced migration in the world, beginning in 2010 with the start of the Syrian Civil War, peaking in 2015, and continuing today with over 5.5 million persons of concern (UNHCR, 2020d). Like the Venezuelan case, the Syrian situation is underfunded (over 25% of required funding is unmet each year) and has required immense amounts of funding from international sources, though the United States is not the only major contributor of funding (UNHCR, 2020d). The Rohingya refugee situation is much smaller in scale, peaking in 2017 with about 900 thousand persons of concern today fleeing Myanmar and seeking refuge in Bangladesh (UNHCR, 2020c). Similarly to the other cases, the situation is severely underfunded, with only 53% of funding requirements being met (UNHCR, 2020c).

While these situations are entirely unique in their emergence, continuance, geography, and scale, their network structures are relatively similar in that they show a higher degree of clustering compared to the Venezuelan network, and they have a more diversified donor pool. In both cases, the United States is the largest donor. However, the significance of the U.S. in these two cases as compared to other nodes in the network is not as skewed as it is in the Venezuelan case. In these two cases, we see a greater degree of international involvement from other countries as major network donors, especially from European countries and institutions and, increasingly, private donors. As discussed in the literature, private aid is much less driven by self-interest than governmental aid, and therefore, may bode well for humanitarian responses in the two situations (Büthe et al., 2012; Smith, 1990). When compared to the previous case in the

Venezuelan network, there are stark differences which make the two cases in this chapter potentially much more resilient to shifting sources of humanitarian aid.

In a similar fashion as the previous chapter, network analysis affords greater depth for understanding the implications of the relationships shared amongst donors and recipients of aid in the two networks. The two cases in this chapter will make a major departure from the results presented in the previous chapter. First, the Syrian and the Rohingya cases display much less vulnerable network structures when compared to the Venezuelan case. While the United States remains a major hub, other major hubs exist which would provide support in the absence of the U.S. Second, the cases show that when a higher degree of clustering is present in a network, the removal of the U.S. is not as significant as in the Venezuelan network. And, third, the higher resistance to cascading failure based on the additional presence of other hubs *and* reduced reliance on a single node implies that there is a greater presence of unearmarked, humanitarian driven aid that more directly serves the interests of those in need, rather than the self-interests of donors. This, in turn, limits the presence of the tenets of new humanitarianism (Kuehlhorn Friedman, 2019) and shows, at least to a degree, that the presence of private donors affords a higher degree of unearmarked, need-driven aid. Overall, these networks are more robust to both the failure of multiple minor node disturbances *and* the failure of a single major hub, such as the U.S., because of the stability the scale-free distribution offers against small node failures, and the reduced vulnerability the presence of many major hubs provides against an attack on another. The analysis will show that while the United States is a significant part of the networks' structures, its removal is much less catastrophic when there are other major hubs present in the network.

In the following sections, the two cases will be analyzed in conjunction with one another to demonstrate and bolster the inferences made regarding the importance of clustering and donor diversification in the previous chapter. First, the analysis will show that there are multiple nodes acting as hubs in each network, even though the U.S. provides the most funding in each scenario, with more than $500 million being provided to the Syrian situation and more than $550 million to the Rohingya situation. Second, in the case of the failure of the U.S. node, the network would likely retain most of its structure; though significant reverberations would be felt across the network, these would not necessarily affect all other nodes in the network as directly as in the Venezuelan case. In regards to cascading failure, the two cases in this chapter provide additional support for the original argument of utilizing donor diversification to provide a more robust network structure, in that they show that more instances of clustering in a network do provide a higher degree of robustness in the face of node failures. While these networks are still vulnerable to shifting sources of aid, they are more resilient to change because of the higher degree of donor diversification in the networks. Overall, the networks are far more resistant to the failure of major hubs—in addition to the implied resistance to multiple failures of minor nodes based on the scale-free distribution—making it far more robust than that of the Venezuelan case, and provide support for the case of diversification of donorship to prevent cascading failure.

Resiliency in Clustering

Both the Syrian and Rohingya refugee situations' network statistics—the full sets can be referenced in Appendix B and Appendix C, respectively—display a much different picture of donor relationships when compared to those of the Venezuelan case. In both cases, the United States contributes the most funding, but rather than providing the absolute majority, there are other countries which also provide a significant contribution to the humanitarian response. The next largest donor—Germany in the Syrian situation and the U.K. in the Rohingya situation—

provide about 50% of what the U.S. contributes, and the other donors provide a relatively significant amount of funding as well. In the Venezuelan case, the second largest donor—the European Commission's Humanitarian Aid and Civil Protection Department—did not even provide 25% of what the U.S. contributed.

In the Syrian case, the donor trends, as reported by the FTS, show the presence of two major nodes that contribute the most significant levels of funding, and are the most significant hubs in the network: The United States and Germany (Figure 5). They are followed by other European governments and departments, which also contribute relatively large amounts of money. This provides the first piece of evidence that points to more instances of clustering in the network. In observing the presence of multiple significant nodes, there is in turn a more robust network, with a bigger presence of significant nodes with the ability to handle higher loads in the absence of one of the hubs, such as the U.S. In other words, the other major contributors, such as Germany, the European Commission, and the United Kingdom, would be able to form additional connections to make up for some of those lost in the collapse of the U.S., hence maintaining both the network's structure and the humanitarian response. While the removal of the U.S. node would prove to be a major loss, there is still the possibility of retaining and revitalizing funding levels though the other major donors in the network, thereby minimizing the disturbances and localizing any network failures.

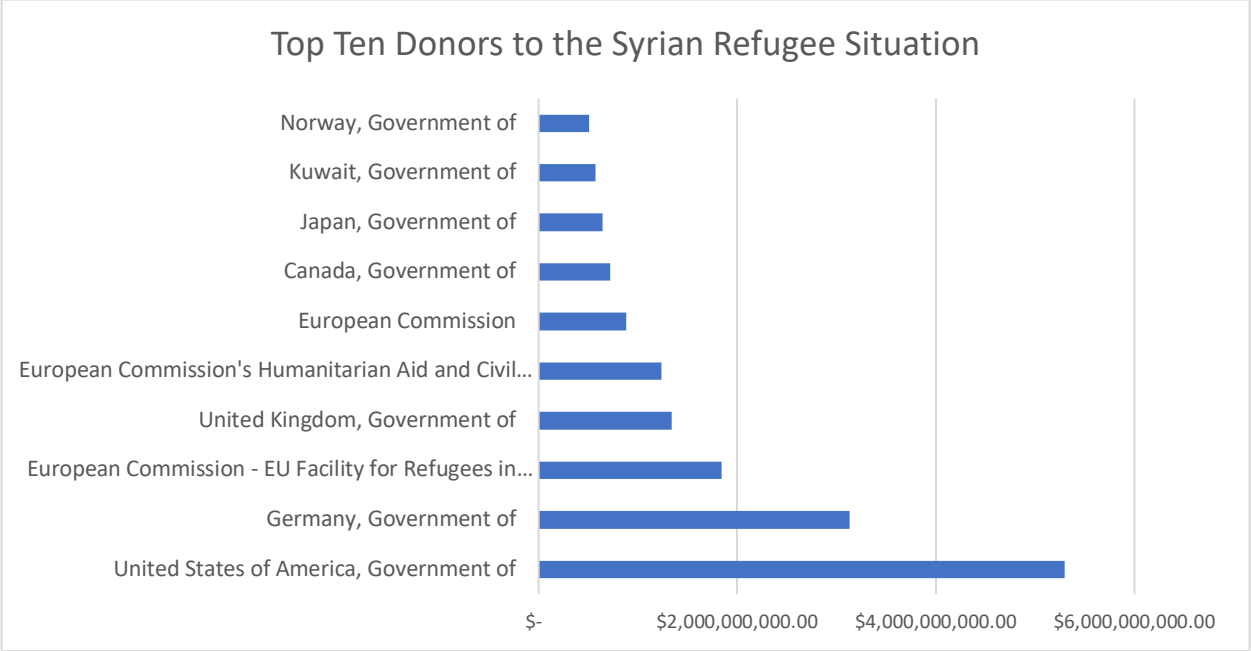

Figure 5 Top Ten Donors to the Syrian Refugee Situation

In the Rohingya case, FTS donor statistics display trends which are relatively similar to those of the Syrian case. The United States provides the most funding, but the United Kingdom also provides a significant proportion of humanitarian aid to the response (Figure 6). Again, this helps to create another major hub within the network, rather than the presence of a singular uncontested hub, as in the Venezuelan case. While the donors that are smaller than the U.S. and the U.K. do not provide as much as some of the larger donors in the Syrian case, they do provide more opportunity to create clustering. As with the Syrian case, this supports the theory of a more resilient network that shows a higher degree of robustness against multiple failures of smaller nodes *and* the failure of a major hub. Again, if the U.S. node were to be excluded from the network, some of its structure would be retained due to the presence of other smaller hubs with the potential to support some of the losses felt in the absence of the U.S. In this case, major contributors such as the United Kingdom and Japan would likely generate additional connections

to make up for the connections lost in with the collapse of the United States node. Despite this being, yet again, a major loss in funding, it would not be as detrimental as the departure of U.S. involvement from the Venezuelan network, which would entirely collapse when losing the absolute majority of its funding.

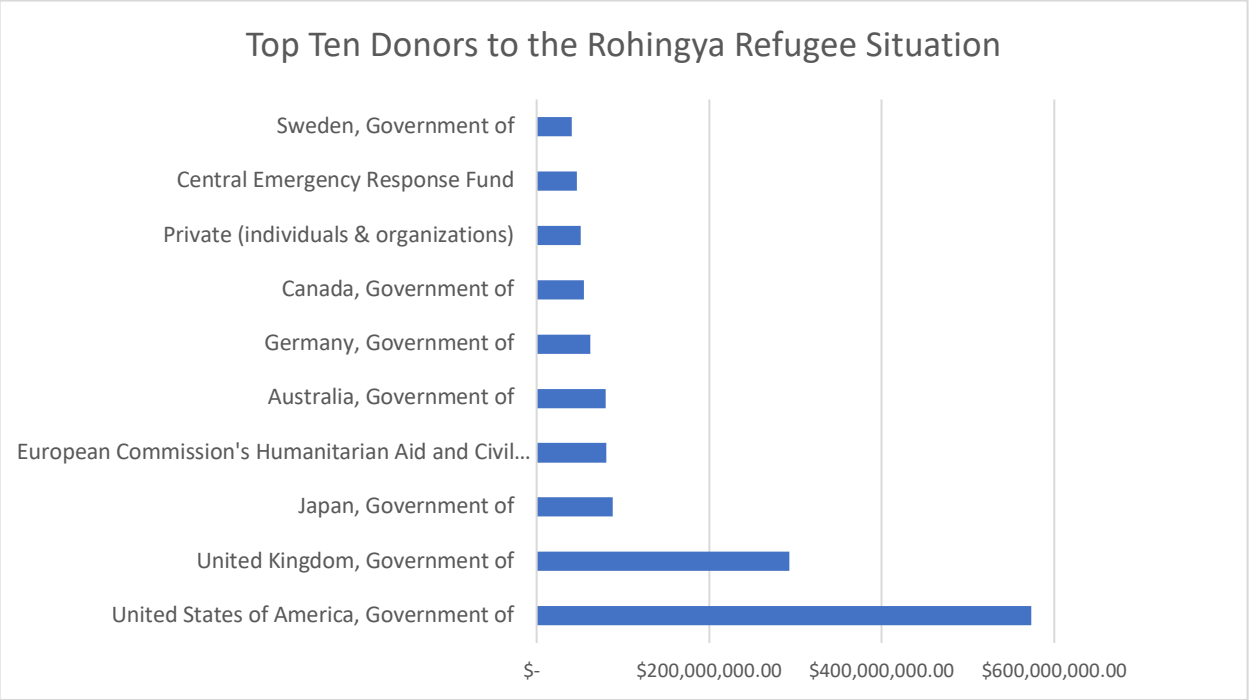

Figure 6 Top Ten Donors to the Rohingya Refugee Situation

While donor contribution data is an important part of understanding the presence of certain actors in terms of raw funding of these two humanitarian aid complexes, the network statics provide another method of analyzing how impactful these funding relationships are. As the following sections will show, the role of the United States, though important, is far less impactful in the Syrian case and the Rohingya case than in the Venezuelan case. This changes the resiliency of the network in the face of major shocks causing potential cascading failures,

while maintaining some of the resilience benefits of scale-free networks that are robust to changes to many smaller nodes.

Network Analysis

The network analysis of the Syrian and Rohingya refugee situations help provide more context about which relationships in the two cases are the most important and how the removal of the United States from these two scenarios would impact network structure. In these cases, the networks are much more stable because the most central nodes and degree distributions are much less reliant on a single node, such as the United States. Instead, there is a better distribution of influence and significance across the network, with a greater presence of clusters around multiple prominent nodes to help support a more resilient network structure. The following network measurements and their corresponding analysis will uphold the argument brought about by the analysis of the Venezuelan situation. First, it will show that the United States, while a major network hub, will not completely deconstruct the network if removed because the network is not overly reliant on a single node, and, second, it will show that this is due majorly to the higher degree of clustering and distribution of influence across the two networks.

Measures of Centrality

The measures of centrality for the Syrian and Rohingya cases are much less deterministic than those of the Venezuelan case. In the Venezuelan case, the results showed that in addition to being the largest donor, the United States had influence over essentially the entire network. In the following cases, despite the U.S. being the largest donor of humanitarian aid, it does not exert the most control over the networks. This is likely because the connections it shares with other recipients in the network are more limited than they were in the Venezuelan case. This does, however, point to a more limited impact on the entire network if the node were to fail, because the failure would be much more isolated. The role of the U.S. and other network hubs, as

determined by the measures of centrality, show the probability of a much less daunting outcome if the U.S. were to leave the network.

In the Syrian network, the eigenvector centrality scoring shows that, while the United States plays a significant role across the network, UNICEF is the most influential node, sharing the most connections with the most nodes across the network. Despite not being a major donor, this is important because this node is a kay actor in receiving and dispersing aid to other nodes in the network. While the U.S. follows closely behind UNICEF, other major donors also show significance across the network, such as Germany and private donors (Table 8). In the scenario where the U.S. hub is removed from the network, there are a variety of other significant nodes that could share the strain of its departure, hence creating robustness against the removal of a single hub and the possibility of cascading failures outside of the U.S. cluster.

Table 8 Top Ten Nodes Based on Eigenvector Centrality, Syrian Original Network

Actor	**Eigenvector Centrality**
United Nations Children's Fund	1
United States of America, Government of	0.9781
United Nations High Commissioner for Refugees	0.9727
World Food Programme	0.8912
Germany, Government of	0.6030
Private (individuals & organizations)	0.5252
Japan, Government of	0.4425
Canada, Government of	0.4346
Norway, Government of	0.4131
United Kingdom, Government of	0.3844

The results of the page rank scores are like that of the eigenvector centrality s. Again, the United States is not the most prominent node in the network, even when accounting for edge

weight and directionality, and is outranked by many major recipients of aid (Table 9). The U.S. node is closely rivaled by private donors. Here, the results show that if the U.S. node were to fail, there are other nodes that could uphold the network by generating new connections and additional funding—though likely not as much as the United States—to maintain both the network's structure and the corresponding humanitarian response.

Table 9 Top Ten Nodes Based on Page Rank, Syrian Original Network

Actor	**Page Rank**
United Nations Children's Fund	0.0859
United Nations High Commissioner for Refugees	0.0752
World Food Programme	0.0549
United States of America, Government of	0.0442
Private (individuals & organizations)	0.0432
Germany, Government of	0.0250
Japan, Government of	0.0239
European Commission's Humanitarian Aid and Civil Protection Department	0.0211
United Nations Relief and Works Agency for Palestine Refugees in the Near East	0.0211
United Kingdom, Government of	0.0206

In the Rohingya network, we see a similar pattern of the United States being surpassed in significance based on measures of centrality, despite donating the most aid. Again, this is likely because the hub, while giving out a significant amount in its loads, is not connected to many other nodes in the network. Based on the eigenvector centrality scoring, the most prominent node across the entire network is private donors, with a score of 1, while the United States is much further removed with a scoring of 0.21 (Table 10). While private donors do not contribute nearly as much as the U.S. in humanitarian aid—about $50 million compared to about $575 million from the U.S.—they share the most connections with the most nodes in the network, which, in

turn, helps directly support the operations of smaller actors that implement services on the ground. These private contributions, while more limited, are essential in creating a significant portion of the network's structure, as well as supporting a more effective and rapid humanitarian response (Desai & Kharas, 2008) to Rohingya refugees in need.

Table 10 Top Ten Nodes Based on Eigenvector Centrality, Rohingya Original Network

Actor	**Eigenvector Centrality**
Private (individuals & organizations)	1
United Nations High Commissioner for Refugees	0.9244
World Food Programme	0.4058
United Nations Children's Fund	0.4044
United Kingdom, Government of	0.2408
United States of America, Government of	0.2127
Japan, Government of	0.1331
International Organization for Migration	0.1185
US Fund for UNICEF	0.0951
Canada, Government of	0.0938

The limited network role of the U.S. is also upheld in the page rank scoring, where the U.S. is ranked seventh among the top ten highest ranked nodes (Table 11). It is surpassed again by private donors, as well as other major recipients of aid. This is likely because the cluster of recipient nodes receiving aid from the U.S. is small compared to others, much like the Syrian case. While the Rohingya network would lose a massive amount of funding, the network would maintain its structure because of the strong presence of clustering around other prominent nodes in the network. This type of diversification in donorship helps to create a more resilient network in the face of the failure of a single hub in addition to the robustness against multiple failures of small nodes, and proves that while the U.S. is a hub, its failure could be contained.

Table 11 Top Ten Nodes Based on Page Rank, Rohingya Original Network

Actor	Page Rank
United Nations Children's Fund	0.1299
United Nations High Commissioner for Refugees	0.0772
Private (individuals & organizations)	0.0690
World Food Programme	0.0689
International Organization for Migration	0.0389
United Kingdom, Government of	0.0348
United States of America, Government of	0.0347
European Commission's Humanitarian Aid and Civil Protection Department	0.0240
Japan, Government of	0.0212
Canada, Government of	0.0208

Overall, the analysis of the measures of centrality for both networks show that despite being the *largest donor* in both cases, the U.S. can be displaced as the most *significant node*. Because these measures are based on a node's connections, it can be inferred that in the Syrian and Rohingya cases, the United States has a more limited set of connections than it did in the Venezuelan network. In the unlikely event that the U.S. was removed from either of these networks, other significant nodes with a wider expanse over the network would play a major role in maintaining the network structure through the creation of new connections and expanded contributions, though they would likely be unable to make up such a massive loss of funding. Despite this, the centrality analysis of the two cases shows that, in regard to cascading failure, there is a much better change in maintaining resiliency against shifting humanitarian contributions when there are multiple nodes playing a significant role in the network.

Degree Distribution

The more isolated role of the United States in the Syrian and Rohingya network structure displayed in the measures of centrality is also upheld in the analysis of the degree distributions of the original and theoretical networks. As in the Venezuelan case, these distributions help show

which nodes- both donors and receivers- are responsible for creating community clusters. In contrast to the Venezuelan case, these distributions show that first, the two networks have many more nodes with a significant out-degree, and hence more clustering, and second, the impact of the U.S. leaving the network is much less significant, comparatively. In these two cases, the presence of a more diversified donorship with a large number of connections to a wider variety of recipients is critical to the resilience of the network's structure to the collapse of a hub.

The weighted in-degree of the Syrian network shows that the United States represents the most sending transactions in the whole network, but, unlike the Venezuelan network, it does not constitute the absolute majority of them. In this case, there are other influential nodes which also have a significant out-degree. The distribution is much less skewed towards the United States, and in this network, there are a variety of other hubs that contribute to a more robust network structure characterized by a higher presence of clustering around significant nodes (Table 12). The more equal gradient of degree distribution in scale-free distribution, at least in the case of the Syrian network, provides robustness against the failure of a single hub in addition to the resilience it already provided against the failure of multiple small nodes.

Table 12 Top Ten Donors, Syrian Original Network

Actor	Weighted Out-Degree
United States of America, Government of	625
Private (individuals & organizations)	491
Germany, Government of	324
United Kingdom, Government of	303
Japan, Government of	298
European Commission's Humanitarian Aid and Civil Protection Department	294
Canada, Government of	288
Norway, Government of	254
European Commission	182
France, Government of	180

In this case, the theoretical network that excludes the role of the United States as a primary donor would be much more able to support the network's structure. Rather than failures emanating from the collapse of the U.S. node, the failure would likely be isolated to the node's direct connections in its cluster, while the other major donors—private donors, Germany, and the United Kingdom—would still be able to support their clusters and their direct connections, with the potential to regenerate new connections to replace the failed ones. The failure of the U.S. node, in turn, would not lead to cascading failure across the network, but would remain localized to a singular community.

The difference between the original and theoretical in-degree distributions support this, as well. When the U.S. is removed from the Syrian network, many major recipients of aid- UNICEF, UNHCR, and WFP- all maintain a majority of their receiving connections with other nodes in the network (Table 13), and no nodes are disconnected from the network. This is likely because there are other major donors that are providing funding to the same nodes, which, in turn, helps to retain the structure of the network even when a major donor like the U.S. is

removed. So, even if funding is lost, the major recipients of aid are still able to maintain, at least to a degree, their response on the ground, rather than being disconnected from the network and losing all funding entirely. In this case, the major aid recipients, which are responsible for dispersing aid to other smaller nodes in the network and to humanitarian response operations on the ground, also maintain their structure in the network. This is also much different from the Venezuelan network, in which the major recipients lost a large majority of their connections when the U.S. node was removed from the network.

Table 13 Top Ten Recipients Based on Weighted In-Degree, Syrian Original and Theoretical Network Comparison

Actor, Original Network	Weighted In-Degree		
	Original	Theoretical	Change
United Nations Children's Fund	1110	1004	-6
United Nations High Commissioner for Refugees	971	851	-120
World Food Programme	783	696	-87
United Nations Relief and Works Agency for Palestine Refugees in the Near East	282	236	-46
Norwegian Refugee Council	179	167	-12
International Organization for Migration	171	121	-50
United Nations Population Fund	133	99	-34
Danish Refugee Council	122	113	-9
Save the Children	117	109	-8
United Nations Development Programme	105	93	-12

While the recipients in the theoretical network (Table 5.6) would experience a significant loss of resources as a result of the withdrawal of the U.S., they would still retain major structural aspects of the network. Because other nodes also maintain a high out-degree, no smaller actors are cut off from the network, as other network hubs retain their connections to them, even in the absence of the United States. In the Syrian case, this contributes to increased network resiliency

and a better resistance to cascading failure in the wake of the loss of a major hub. This is also positive for the humanitarian response, because both major brokers of aid still retain their position in the network, and ground services provided by recipients of aid—typically the smaller node in the network—are not halted entirely when the U.S. is removed from the network. While there would be strain on the network, the distributions show that, likely, the other major donors and recipients in the network would be able to maintain the network's structure and, in turn, the humanitarian response for Syrians in need.

The weighted in and out-degree distributions of the Rohingya network parallel those of the Syrian case. However, there is a departure between the two cases in that the United States does not have the highest out-degree in the original network; it is surpassed by private donors (Table 14). While private donors do not contribute the most money, they do play a relatively large role in maintaining the structure of the Rohingya network. Largely, this is due to the fact that while they do not contribute the most money, they do have the most connections with a significant portion of the network's smaller nodes. This is important to not only the network structure, but also to the actual flexibility of the humanitarian response (Desai & Kharas, 2008) to meet the emergent needs of the Rohingya refugees and migrants Despite this, the United States is still a hub with a large out-degree, and there are other hubs (the United Kingdom) which also help to support clustering and network structure in the situation of a node's failure.

Table 14 Top Ten Donors, Rohingya Original Network

Actor	Weighted Out-Degree
Private (individuals & organizations)	315
United States of America, Government of	140
United Kingdom, Government of	136
European Commission's Humanitarian Aid and Civil Protection Department	77
Japan, Government of	76
Canada, Government of	72
Australia, Government of	66
Central Emergency Response Fund	56
Switzerland, Government of	49
US Fund for UNICEF	44

The out-degree distributions between the original and theoretical network also show the much more limited role of the U.S. node in the Rohingya network. Much like the Syrian network, and much differently than the Venezuelan network, the major recipients in the Rohingya case lose very few connections with the removal of the U.S. (Table 15), and only two nodes are cut off from the network entirely. Largely, this is because few recipients in the Rohingya network rely solely on the U.S. for funding, such as some of the nodes in the Venezuelan network. Because the connections from other major hubs are not lost with the collapse of the U.S. node, other major actors are still able to maintain connections with these recipients, hence holding together the structure of the network, rather than causing it to break apart. Again, though this would result in a major loss of resources for the recipient actors, they would still be able to maintain their structure and role in the network because first, other major donors maintain their network position, and second, major brokers of aid—UNICEF, UNHCR, the WFP, and the IOM—all maintain their roles as major pathways for aid, as well. There would

be strain, but the instance of network failure would be isolated to the U.S. cluster, rather than spread across the network.

Table 15 Top Ten Recipients Based on Weighted-In Degree, Rohingya Original and Theoretical Network Comparison

Actor, Original Network	Weighted In-Degree		
	Original	Theoretical	Change
United Nations Children's Fund	488	454	-34
United Nations High Commissioner for Refugees	333	323	-10
World Food Programme	268	236	-32
International Organization for Migration	152	105	-47
Save the Children	55	55	0
United Nations Population Fund	42	42	0
BRAC	23	23	0
CARE International	22	17	-5
Action Contre la Faim	19	19	0
World Health Organization	17	14	-3

In the analysis of the two cases, the results show that while the United States is extremely important to the network, the presence of other hubs in the helps to create some form of resilience against the removal of the largest source of humanitarian funds. Between the measures of centrality and the degree distributions, it is clear that even the largest hub can have a more isolated impact on the network's structure in the event of its failure if there are other significant hubs present in the network, as well. In these two cases, the possibility of cascading failure across the network is much more unlikely, as there are more clusters which would prevent failure from spreading too far from the affected node. These cases show that while scale-free distributions inherently carry a high degree of robustness against multiple failures across small nodes (Albert et al., 2000), these networks can also build resilience against the failure of a major

hub through increased clustering and the presence of other major network actors to continue to support structure in the absence of a significant node (Ash & Newth, 2007).

A More Isolated Impact

In the cases of the Syrian and the Rohingya refugee crises, the humanitarian aid networks, while dependent on United States' funding to a degree, are much less vulnerable to cascading failure than the Venezuelan case. In these instances, we see how the presence of other hubs prevents total network collapse, even in the event of the largest source of funding being removed entirely from the network. Based on these two cases, it can be inferred that donor diversification, and especially the inclusion of private donors, may be preferable to an extreme reliance on a single source of aid, such as the United States. Not only does this help create resilience in the network, but it also may help combat some of the negative implications highly politicized, earmarked funding has on aid effectiveness (Bearce & Tirone, 2010) and humanitarianism, in general (Kuehlhorn Friedman, 2019) by providing more flexible aid driven by need rather than governmental interests.

These cases are much more stable, in that they have a more evenly dispersed gradient of significance and linkages driving their scale-free distributions, especially when compared to the Venezuelan case. There are also more hubs and more clustering surrounding them, which helps to support a higher degree of network robustness against the failure of a single significant node, as in the case of the United States. In this way, these two cases uphold the findings of Ash and Netwth (2007) in that the assert the importance of degree distribution as it relates to increased clustering and network flows:

> Local failures could be propagated locally and resolved, thus affecting only a small part of the network. Clustering also appears to be an important factor. High clustering provides a series of alternative pathways through which flows can pass, thus avoiding the failed component. The results here show that the degree distribution is an important factor in promoting modularity and clustering. That is,

> the way links are allocated to nodes drives the modular and clustered nature of the resulting network. (p. 681)

As networks, such as the two explored in this chapter, express more clustering around multiple significant nodes, they increase their changes of avoiding cascading failures as a result of the collapse of a single node in addition to being resilient against multiple failure of smaller nodes (Albert et al., 2000). Other hubs—other European governments and private donors—contribute to these networks by providing alternative pathways for aid to flow from node to node in the network, rather than relying significantly on the United States to provide these paths. This, in turn, also has major implications for the role of the United States in the humanitarian response, and the extent to which the country is able to extend its influence outside of its network role into fungible power (Hafner-Burton et al., 2009).

Because there are other major actors involved in these networks that provide alternative pathways for flows of humanitarian aid, the United States cannot as easily exploit its network position to achieve its own self-interest (Borgatti et al., 2009). In the Venezuelan situation, the absolute authority and position of the U.S. node is what allows it to transfer its network power into fungible power than can be used to alter outcomes in order to serve a strategic purpose (Hafner-Burton et al., 2009). However, the presence of other prominent interests in both cases—those of the EU and private donors—reduce the absolute authority of the United States in the network and make it harder for any one actor to dominate and drive the course of the humanitarian response. While the political connotation surrounding humanitarian aid investment has negative implications for the extent to which this assistance can serve the refugee and migrants in need (Kuehlhorn Friedman, 2019), the growing presence of private donors in these networks may combat this, as aid from private individuals and organizations is much more driven by humanitarian need than self-interest (Büthe et al., 2012). And, in addition to

combatting the politicization of humanitarian action as asserted by new humanitarianism (Kuehlhorn Friedman, 2019), privately sourced aid also allowed for a wider availability of flexible, rapidly deployable aid that can serve the needs of the vulnerable population because it is less subject to bureaucratic processes and earmarking (Desai & Kharas, 2008).

The insights from these two cases further the argument from the Venezuela chapter. First, the Syrian and Rohingya cases illustrate that when there are multiple hubs in a network, the structure will be maintained to a degree, even in the case of the removal of another major hub. In these cases, the networks are much more resilient to change in the face of shifting sources of humanitarian aid. Second, these cases provide support for the inferences made about the importance of donor diversification. As there are a higher presence of other large donors outside of the U.S. node, the node's removal was not as significant because other donors provide support to the community structure. This helps to create resilience against cascading failure and provides an opportunity for the network to isolate the node's failure to its cluster, rather than impacting the whole network, as it did in the Venezuelan case. Thirdly, the shift in the structure away from the absolute prominence of the United States in its network and real-world presence speaks to a larger conversation about the role of highly political, self-interest driven governmental aid, the negative impact this can have on humanitarian outcomes, and, from this, presents a case for the preferability of private funded humanitarian operations (Desai & Kharas, 2008).

In the two cases of this chapter, if the United States were to divert funding away from the crises, there would be a major loss of resources, but there would be other hubs that could maintain the humanitarian aid networks, at least to a degree. This provides support for the arguments made in the previous chapter, as well as provides evidence of the importance of donor diversification in aid networks. A more even distribution of aid sources, in these cases, proved to

be more favorable than relying primarily on United States' contributions and also had more positive implications for ensuring aid is fulfilling a humanitarian purpose, rather than a political one (Kuehlhorn Friedman, 2019). In the following chapter, this idea will be expanded upon in the case of the European refugee situation to see if it applies to other types of donorship. This situation is the least reliant on U.S. aid, but still relies heavily on other sources of aid, such as IGOs, NGOs, and private donors.

THE EUROPEAN REFUGEE SITUATION

This chapter will focus on, arguably, the most unique of the four humanitarian aid cases discussed in this study: the European refugee situation. The European situation is focused primarily in the Mediterranean region, where most refugees and migrants are arriving, and hence, where most of the aid contributions are being sent (UNHCR, 2020a). While refugee flows began before 2015, the largest influx of over one million refugees and migrants was in 2015, with the following years presenting more limited flows, but still amounting to over 100,000 per year (UNHCR, 2020a). Of the four cases, the Europe situation exemplifies a still chronically underfunded response (UNHCR, 2020a), but more diverse donor profile.

The United States is not the largest donor in this case; it is surpassed significantly by European donors. While the aid network is the smallest of the four cases, it brings to light not only the importance of clustering and donor diversification in creating network resilience against the failure of hubs, such as in the Syrian and Rohingya networks, but the importance of NGOs, IGOs, and private donors, or, more generally, actors which are collectives of individuals, organizations, and states that contribute aid. In regards to the collapse of the U.S. node, this network is the least vulnerable, first because the U.S. plays a relatively small role, and second, because there are other hubs present that, in their real-world expressions, are much less prone to significant failure because they are collective organizations. Hence, the failure of one actor which falls under the collective node, compromised of multiple actors, will not necessarily lead to the failure of the entire node itself, whereas in the case of the United States, it is one single actor whose failure would lead to the collapse of an entire node. When compared to the previous cases, the case of the European refugee situation is far more robust to shifting sources of aid than the Venezuelan refugee situation (Chapter 4). And while it is resilient to changes in network

structure, this resiliency is slightly different than that of the Syrian and Rohingya cases (Chapter 5). In this case, the network is able to maintain structure in the face of the collapse of a hub due to the nature of the actors which make up its composition in addition to other important components such as clustering. Lastly, the composition of network actors—specifically, the large presence of private donors and NGO activity—adds to the conversation regarding new humanitarianism and the effectiveness of highly earmarked aid by providing a basis to compare a network that is much less reliant on a governmental source to one that receives a majority of its funding from a single state government. Overall, this chapter will provide support for the argument regarding donor diversification to achieve network resilience *and* for the argument addressing the faults of new humanitarianism and the negative impact this has on aid effectiveness in the humanitarian response.

Like the previous chapters, the network analysis helps to provide a more computational depth to the funding relationships in the humanitarian response. This case, while similar to the Syrian case and Rohingya case to a degree, provides a slightly different argument for creating resiliency against the failure of large nodes than the other three cases have afforded. First, the European situation, while not as clustered at the Syrian and Rohingya cases, still displays a higher degree of robustness to the collapse of major nodes than the Venezuelan case, due to the nature of the major actors working in combination with the network clustering. Second, the removal of the U.S. node, while still a relatively important donor in the network, goes almost unnoticed. The same could likely be said for other major state donors, because there is a more significant presence of collective actors—the European Commission and its associated departments or private donors—that can maintain without the presence of other states. Overall, the analysis and corresponding discussion will show that departing from the reliance on a single

state actor for a majority of humanitarian aid and possibly relying more on collectives of actors provides a much more stable network structure that is more robust to the failure of a major node.

In this chapter, I will use the analysis of the network statistics in conjunction with the discussion to show how a wider variety of donorship may be favorable in maintaining a higher degree of resilience in a network's structure against the departure of major international donors like the United States. I will also use this to provide support for the previous arguments made about the impact of the increasingly interest-driven context of humanitarian investment and the impact this has on aid effectiveness. First, the analysis will show that there are multiple hubs in the network, and the U.S. is not one of them despite providing a relatively large amount of funding to the humanitarian response. Second, in the case of the removal of the U.S. node, the network is able to maintain its structure almost entirely. In this network, a case can be made for the potentially declining role of the U.S. in international relations in some cases, such as humanitarian intervention. And, lastly, as it relates to cascading failure, this chapter will show that while clustering is important in a network, the actual composition of actors—in this case, their collectiveness in nature—also plays a role in preventing major node collapses and failures across a network. This, in turn, provides strong support for the argument regarding the importance of donor diversification in creating robustness against the failure of large network actors. Overall, the European humanitarian aid network supports the findings of the previous three cases by showing the importance of clustering and diversification to maintain structure, but, in addition, shows how other, less traditional donors may come to play an increasingly important role in networks of humanitarian donorship.

Collective Actors and Crisis Aversion

In the case of the European refugee situation, the contribution data from the FTS shows how noteworthy the European Commission and its associated departments—in this case, the

Humanitarian Aid and Civil Protection Department—are to the humanitarian response. The Commission provides a majority of the funding, but in contrast to the Venezuelan case, the hub in the network is a collective of states, rather than a single state, such as the United States. In this way, the Commission is much less prone to collapse, because a decrease in finding from one state in the IGO will not necessarily mean a decreasing in funding from the other states. As this chapter will show, other collective actor groups—private donors—also contribute a large amount of funding to a wide variety of recipients (about $85 million, which closely rivals the United States' $92 million).

Figure 7 shows that after the European Commission's Humanitarian Aid and Civil Protection Department and the European Commission itself, the United States—typically the largest donor—donates a small fraction of what the first two largest donors do, or about $95 million, compared to about $715 million from the Commission. It also shows that private donors, in the case of the European refugee situation, are on par with the U.S. in terms of raw contributions, with the U.S. only contributing about $7 million more than private donors. However, in the actual network expression, private donors play a much more significant role in terms of community clustering than the United States does. While the funding seems to be skewed towards the European Commission, the network analysis will show that there is still a strong presence of clustering in the European case that this network would experience a very limited structural shock from the removal of the U.S.

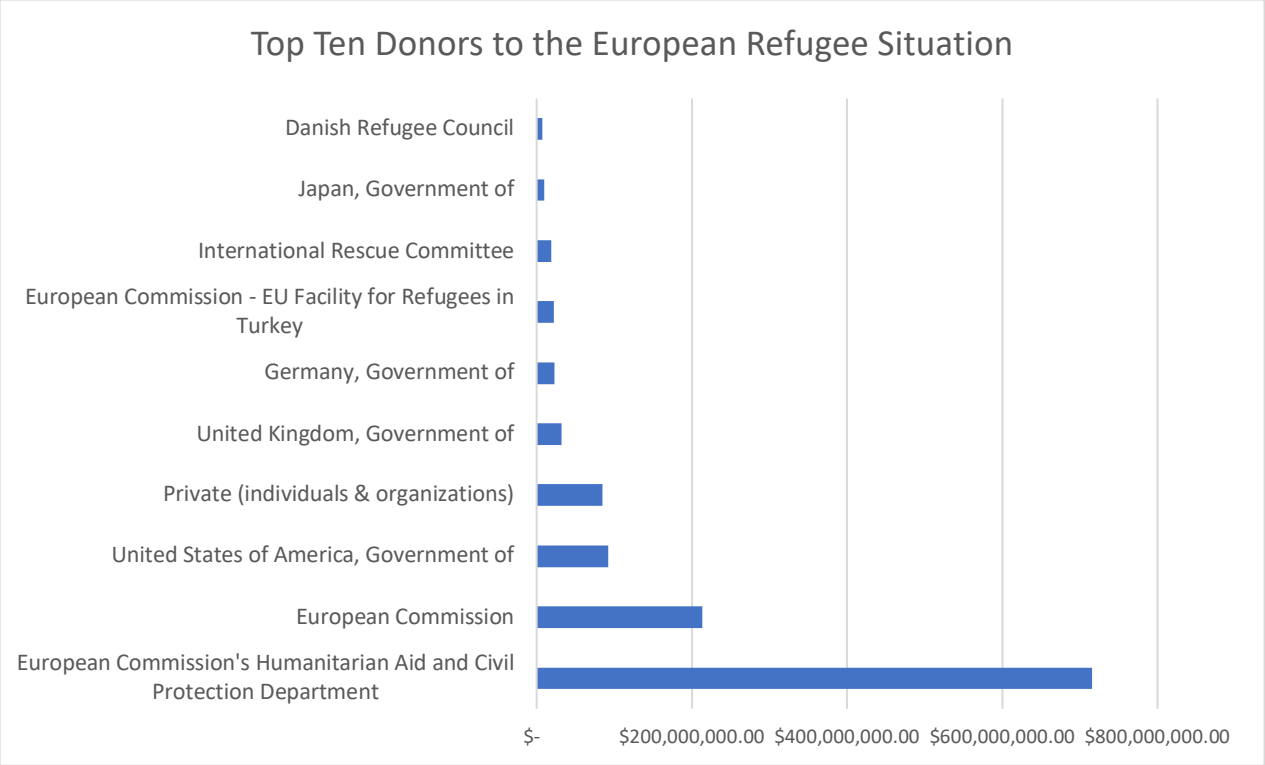

Figure 7 Top Ten Donors to the European Refugee Situation

The contributions show clearly that the United States plays a much more limited role in comparison to the other three cases in this study. In the following sections, the network analysis will uphold these findings, and will show that in addition to the importance of increasing clustering to create resiliency, other, collective actors may also be beneficial in maintaining network structure in the face of a shock. Overall, the case will provide support to arguments made in the two previous chapters regarding the importance of clustering to create network resilience against cascading failures, and also provides support for the negative implications for networks of aid and aid effectiveness of the reliance on a singular government for humanitarian contributions and the corresponding response.

Network Analysis

The following analysis of the European refugee humanitarian aid network provides a more computational understanding of the relationships shared by the prominent donors and their respective recipients. It will show that, while the United States could still be considered a major donor in terms of raw funding, its network presence is far less impressionable that in the past three cases. Despite the European Commission's Humanitarian Aid and Civil Protection Department providing a disproportionate amount of funding, this network is much more stable than the Venezuelan case because of the distribution of connections across the network, and because of the nature of the European Commission as an IGO itself. The following network measurements—the full set of which is available for reference in Appendix D—and their corresponding analysis will uphold the arguments presented in the previous chapters. First, it will show that the reliance on the European Commission as a major donor is not as catastrophic as the reliance on the United States. Secondly, it will show that clustering, in addition to the different actors involved in this case, help to uphold the network's structure in the case of a major network disruptions, and hence, helps to prevent against cascading failures emanating from the collapse of a significant node. Lastly, these results will contribute to arguments against the politicization of aid and the negative impact interest-driven governmental funding has on aid effectiveness and humanitarian response.

Measures of Centrality

The measures of centrality of the European refugee situation are similar to those of the Syrian and the Rohingya cases. These cases showed that, while the United States was the largest donor, it did not have the most influence over the entire network. Similarly, while the European Commission's Humanitarian Aid and Civil Protection Department is the largest donor, it is not the most influential node across an entirety of the network. And, while the U.S. is the third

largest donor in the network, it does not appear in the top ten influential nodes based on eigenvector centrality or page rank scorings in the original network. This is likely because these nodes share fewer connections with fewer nodes than the more influential nodes in the network; however, the U.S. shares very, very few connections making its impact on network structure almost nonexistent in the case of its removal. In the situation of the United States' failure as a node, the network would only be slightly impacted, as many nodes in the network are influential enough to maintain the structure in its absence.

The eigenvector centrality scoring shows that, while the European Commission's Humanitarian Aid and Civil Protection Department is the largest donor, the node with the most influence over essentially the entirety of the network is the collective actor of private donors (Table 16). It is followed by other major recipients of aid—UNHCR, IRC, and Caritas—which are responsible for the dispersion of aid to other nodes in the network from larger donors, or directly to humanitarian response operations on the ground. Likely, the massive network presence of private donors is due to the volume of donations emanating from this node to a large sum of other nodes in the network. In the case of the United States' collapse, the network would maintain essentially its entire structure, because the top ten nodes which maintain the structure of the system do not include the role of the U.S. at all.

Table 16 Top Ten Nodes Based on Eigenvector Centrality, Original Network

Actor	Eigenvector Centrality
Private (individuals & organizations)	1
United Nations High Commissioner for Refugees	0.7440
International Rescue Committee	0.3216
Caritas Hellas - Caritas Greece	0.3193
HSA Humanitarian Support Agency	0.2444
Medecins du Monde	0.2138
Adventist Development and Relief Agency	0.1963
European Commission's Humanitarian Aid and Civil Protection Department	0.1834
ACT Alliance / Norwegian Church Aid	0.1697
Nun Kultura	0.1502

The page rank scoring of the top ten nodes in the European network parallel the findings of the eigenvector centrality scoring. When accounting for the weight and direction of the connections in the network, private individuals still hold the most influence over the network (page rank= 0.1811), followed by the UNHCR, UNICEF, the Humanitarian Aid and Civil Protection Department, as well as other major European states and humanitarian organizations (Table 17). Again, this is likely because private donors share the most connections with the most nodes in the network, therefore limiting the role of other major donors by reducing the number of actors they contribute to directly. Similarly, the U.S. is not displayed in the top ten ranking because, despite giving out more aid than private donors, it shares very few connections with only a few nodes.

Table 17 Top Ten Nodes Based on Page Rank, Original Network

Actor	Page Rank
Private (individuals & organizations)	0.1812
United Nations High Commissioner for Refugees	0.0669
United Nations Children's Fund	0.0639
European Commission's Humanitarian Aid and Civil Protection Department	0.0506
Germany, Government of	0.0262
United Kingdom, Government of	0.0261
International Organization for Migration	0.0242
Medecins du Monde	0.0208
European Commission	0.0205
International Rescue Committee	0.0181

Overall, the measures of centrality show that despite the real-world expression of humanitarian contributions being made up of European and U.S. funding, private donorship is essential in upholding this network's structure. Although it is the third largest donor, the role of the U.S. is much more limited in terms of connections across the network. Similar, to the Syrian and Rohingya cases, other significant nodes in the network would play a primary role in maintaining network structure if the U.S. ceased involvement. And, unlike previous cases, other nodes in the network would be more able to make up for losses in funding and resources, because the U.S. is not as significant of a donor as it is in the other three cases. In terms of cascading failure, there is a much better chance of maintaining network structure in the case of a major node failing. This is due, in part, to the more resilient nature of the major nodes in that they are collectives of states, organizations, and individuals, rather than a singular entity, and also because of the more even spread of influence across the network, in contrast to the Venezuelan case, where few other nodes held as much influence at the U.S.

Degree Distribution

As in the Syrian and Rohingya cases, the more limited role of the United States despite its humanitarian contributions is displayed well in the degree distribution of the European refugee situation. The following statistics show which nodes form hubs and the clusters which surround them in the network. Because this network is the smallest of the four cases, the degree distribution for the nodes that would be considered significant enough to create a large cluster is lower than in the previous three cases. Despite this, we see instances of clustering around major nodes in the network, especially private donors, the Humanitarian Aid and Civil Protection Department, and other European governments, but with a much more isolated presence of the U.S., which plays an extremely small role in the distributions.

The weighted-out degree of the top ten donors shows how small the role of the United States is in comparison to other donors in the network (weighted out-degree= 8). In this case, the actors which constitute the largest volume of sending transactions are private donors, followed by the European Commission and other European countries (Table 18). While the presence of the other donors following the private donors seems to be small, in relation to the size of the network, they are still large enough to be considered hubs with an important role in creating clustering and the different pathways for aid in the network's structure. The United States, however, barely contributes to this structure, as the results of the weighted in-degree distribution in the original and theoretical networks will show.

Table 18 Top Ten Donors Based on Weighted Out-Degree, Original Network

Actor	Weighted Out-Degree
Private (individuals & organizations)	207
European Commission's Humanitarian Aid and Civil Protection Department	48
United Kingdom, Government of	30
Germany, Government of	24
European Commission	23
Switzerland, Government of	12
Japan, Government of	9
Norway, Government of	9
Spain, Government of	9
United States of America, Government of	8

In the European refugee situation, the removal of the U.S. from the network structure goes almost unnoticed when comparing the original network to the theoretical network. Major recipients of aid lose very few connections, and they maintain their standing in the degree distribution (Table 19). In this case, the network is able to uphold the network structure essentially perfectly in the face of losing the U.S. as a substantial donor, due to the actor's more contained role compared to the other three cases. In this case, no nodes are disconnected from the network when the U.S. is removed. There are a substantial amount of alternative pathways for aid to flow through—most of which are provided via the connections of private donors and the Commission—which allow the network's structure to be maintained in the absence of the U.S. node.

Table 19 Top Ten Recipients Based on Weighted In-Degree, Original and Theoretical Network Comparison

Actor, Original Network	Weighted In-Degree		
	Original	Theoretical	Change
United Nations High Commissioner for Refugees	77	75	-2
United Nations Children's Fund	60	57	-3
International Organization for Migration	27	26	-1
International Rescue Committee	25	25	0
Medecins du Monde	23	22	-1
Caritas Hellas - Caritas Greece	17	17	0
Danish Refugee Council	17	17	0
Adventist Development and Relief Agency	16	16	0
HSA Humanitarian Support Agency	14	14	0
CARE International	13	13	0

Because of an increased presence of clustering compared to a situation like the one identified in the Venezuelan case, the failure of the U.S. node would have very limited implications for the rest of the network. All the major actors identified by the weighted out-degree distribution would be able to handle the extra strain resulting from the collapse of the United States. Likely, the other major donors would be able to generate new connections and additional funding and resources to make up for those lost in the absence of the U.S. node's contributions. The failure, at least in the case of the European network, would be localized to the United States' very small cluster. All other major clusters would feel a much narrower impact, and the possibility of cascading failures in this scenario of a major donor collapsing would be very unlikely. Overall, this network and the donors and recipients within it are much less vulnerable to a shift in the United States' trends of humanitarian giving.

The network analysis of the European case has illuminated important insights regarding the vulnerability of humanitarian aid networks to a reduction or complete loss of contributions

from the United States. First, it shows that, while the United States may be a significant donor, this position can be displaced in the network when other actors have a large out-degree and higher instances of clustering. In this way, the collapse of the U.S. would be limited to the few nodes it disperses aid to, rather than to a significant proportion of nodes in the network. Secondly, this case shows that collective organizations—IGOs and NGOs—as well as collectives of private donors, can make up a significant portion of network structure, and, because they are comprised of more than one state, organization, or individual, they are much less prone to collapse than a single entity is. Thirdly, these results and their implications provide support for the importance of integrating a more diverse donor pool into networks of humanitarian aid. Because there is a more limited reliance on a single state for most of the funding, the interest-driven nature of governmental sources of aid is also limited. This scenario, above all, provides support for the significance of private donors and NGOs and the positive implications they have for aid effectiveness (Desai & Kharas, 2008) and humanitarianism, in general (Kuehlhorn Friedman, 2019). Overall, the European case presents a form of network resiliency that is like that in the Syrian and Rohingya cases in some regards, but unique in others. The implications of this case, especially as it relates to donor typology, are discussed in the following sections.

Donor Typologies and the Impact on Networks of Aid

The case of the European refugee situation and its corresponding humanitarian aid network has upheld many of the conclusions drawn from the other three cases. First, it asserts the importance of clustering in networks, and shows how this can create resiliency against the collapse of a major state donor, such as the United States. It supports the major ideas presented in the case of the Venezuelan refugee situation: that the reliance on a single, governmental source of aid may prove to be harmful to a network's structure if a rare, but large systemic shock were to occur, as well as to the humanitarian response and aid effectiveness, in general. The

cases have supported the main argument that lies in the importance of clustering and donor diversification to limit failures to certain communities (Ash & Newth, 2007), but the European refugee situation also introduces a more contemporary understanding of humanitarian assistance. While governmental donorship is still common in this network, the nature in which it is contributed is much more stable than the case of the Venezuelan situation. In this case, the potential importance of collective donorship—as it relates to both governmental and private actors—and the way it helps to diversify a donor pool without causing a significant loss of resources is brought to the forefront.

While the European network is resilient because of its structure, the real-world expression of the major donors in the network is also important in understanding the network's resilience to the failure of large nodes. Because the largest donors and the most influential network actors are *actually* collectives of actors—both in the case of the European Commission, an IGO that is collective of states and in the case of private donors that is a collective of private organizations and individuals—they are less prone to a situation which would cause them to remove *all* humanitarian contributions from the network. For example, if the United States were to face a full-blown economic crisis in the wake of the coronavirus pandemic,[6] the Venezuela humanitarian response is much more prone to collapse because it relies on a singular hub: the United States. In this case, there are no other states, organizations, or individuals that would uphold the node in the absence of contributions from the U.S., which would lead to the collapse of the entire node. In contrast, nodes representing the European Commission and private donors are made up of a multitude of actors. If a state in the European Commission were to face an economic crisis, this would not necessarily lead to the collapse of the entirety of the IGO. For

[6] A report by the New York Times on July 30, 2020 (Casselman) details the impact coronavirus has taken on the United States' economy, which has resulted in the reduction of about five years' worth of economic growth.

example, the Commission was able to retain its expansive donorship in the European network despite the Greek financial crisis because the other members of the Commission were able to sustain their economic standing. Similarly, the economic downfall of one private individual or organization would not necessarily lead to the downfall of another. Essentially, in the instances of collective donorship, an attack on one is not necessarily an attack on all, and they are able to retain their contributions. In regard to creating resilience in humanitarian aid networks, this helps to create nodes which are prone to collapse and hence more resistant to situations which would cause cascading failure emanating from the collapse of a single hub.

And finally, the implications this case presents for the effects of limiting the impact of a single state actor as a major network presence are essential in understanding how important donor diversification is in driving more effective aid allocation and humanitarian response. In limiting the presence of the U.S. and its power over aid in a network, aid is likely going to be less earmarked, more flexible, and more readily available to meet the emergent needs of refugees and migrants. Private donorship, in this light, is very important in avoiding the interest-driven direction of humanitarian aid from governmental sources. These types of contributions start to counter the interest-driven ideas of new humanitarianism outlined by Kuehlhorn Friedman (2019), as they are driven largely by humanitarian need, not state goals (Büthe et al., 2012). From this, the response to the refugee and migrant situation in Europe is not only more robust to the failure of major nodes, but more able to meet the constantly changing demands presented by retaining increased levels of funding from private sources, which are more readily deployable than other sources of funding (Desai & Kharas, 2008).

The European case presents important implications for the future of humanitarian contributions. Donor diversification and clustering are critical in creating network resilience and

preventing cascading failure, as the cases addressed in Chapter 4 and Chapter 5 have shown. However, creating nodes which are resilient to real-world stressors that would lead to their collapse is equally important. If nodes which are collectives of actors became more common in networks of humanitarian aid, other preventative network constitutions would become less of a concern. Overall, the argument can be made that creating node resilience in addition to creating network resilience is the optimal way to prevent cascading failures that could lead to the collapse of an entire network, at least in the case of networking relationships between the recipients and donors of humanitarian aid contributions. This argument will be addressed further in the following chapter, as well as the general implications of this study as they relate to network studies, international policy making, humanitarian assistance, and its effectiveness.

CONCLUSIONS

While the collapse of the U.S. as a network actor is unlikely, in the future, there may be increasing pressure for the country to significantly reduce foreign assistance, especially in the wake of the coronavirus pandemic and the Trump Administration nationalist agenda. This study, through the four refugee situations, has made two important contributions. First, through the four case studies, this study has illustrated an overreliance on particular donors in the networks. Second, the study has used this insight to extend the theory of cascading failure to include social and financial networks to show that, though they follow power law distributions and have resilience to small-order shocks, a big shock could literally collapse the entire humanitarian initiative. Together, these findings support new insights on how international actors could support more resilient networks of aid that are better equipped to provide an effective humanitarian response, especially in the face of shifting sources of aid.

This chapter will, first, summarize the findings of the four cases in the previous chapters, and discuss their implications, how they depart from one another, and how they relate to each other. Then, it will address how the findings have contributed to network science, and how they have contributed to international studies, at least as it related to humanitarian aid. Finally, the chapter will bring together these findings into one, final discussion, which will address policy implications, as well as future research endeavors that could bring additional depth to the results of this study. Overall, the research presented in this study has made a case for the integration of a more diverse donor pool in international networks of humanitarian aid. While humanitarian aid networks that follow a scale-free distribution have some resilience to small changes in minor actors, they are vulnerable to cascading failures due to changes in major nodes. Though instances of small perturbations may occur, humanitarian aid networks—those following a scale-free

network distribution—are already robust to these small shocks, which typically impact response efforts on the ground, rather than massive funding efforts. This study focuses on larger shocks to a limited number of significant nodes, and the vulnerability these networks have to these types of shocks. The prominent nodes in this study—state actors—experience shocks as a result of changes in foreign policy or economic downturns that force them to reconsider assistance levels. Due to their prominent network position, these shocks have a major impact on the structure of the network which cascade down to lower level nodes, and in turn, impact humanitarian response on the ground. Largely, this reliance on certain donors in networks of humanitarian aid is where major state actors derive their power and ability to assert an interest-drive aid agenda over a humanitarian one, as theorized in the tenets of new humanitarianism (Kuehlhorn Friedman, 2019). These changes in major donors, in a globalized world with many humanitarian and development situations that span over many years, cause this situation to be foreseeable in the future as donor fatigue sets in and global financial changes take place. Though the process of putting these suggestions into action in the real-world expression of these networks may prove to be difficult, there is evidence to support that, to a degree, change in the proportions of international donors of humanitarian aid is taking place, and, in turn, may be creating a more effective, resilient typology of international donorship that is less reliant on powerful, interest-driven governmental financing.

Variations of Need

Each of the four cases has demonstrated a different degree of reliance on the United States' humanitarian contributions, and from this, I showed how variations in network structure can create or diminish resilience to shocks in the major donor nodes. The chapters proceeded from most reliant on U.S. assistance (the Venezuela situation) to the least reliant on a single actor and thus more diversified (the European situation). The arguments for each chapter relied on

network behaviors and characteristics that underscored the dependency of the network on certain major nodes that serve as hubs and the types of shocks the aid network might be vulnerable to. By illustrating a hypothetical scenario in each case study in which the U.S. "leaves" the aid network (an extreme case of total withdrawal), I showed the reliance of other actors that may seem to have no direct relationship with the U.S., which illustrates the possibility of the network succumbing to cascading failures much like a power grid or the internet might. This was most dramatic in the network most reliant on the U.S. as the sole hub (the Venezuela case), and much less apparent in the case where private donors play an increasingly large role (the European case). Though different in their donor typologies and reliance on certain actors, each case also provided support for the argument in this study addressing the interest-driven context that state actors typically impose in their aid contributions, as outlined in the theory of new humanitarianism (Kuehlhorn Friedman, 2019). In cases where the typology of donors was more diverse—governmental, intergovernmental, nongovernmental, and private—there were a greater number of prominent nodes which limited the ability of any single state actor from expressing their self-interest over the entirety of the network, thus reducing the presence of the major tenets of new humanitarianism. This gradient of reliance on a single donor, and in turn, a gradient of power based on the donor's position in the network, is discussed in the following sections.

The Venezuelan Situation

The Venezuelan refugee and migration situation illustrated a case for the potential shortcomings of taking in an absolute majority of humanitarian contributions from a single state source. The humanitarian aid network for the Venezuelan case followed a power law distribution, where a few hubs are connected to many nodes, but most are smaller actors (such as local service organizations) with very few connections. In this case, the U.S. was singularly connected to every node in the network, if not directly, then indirectly. While this network is

resilient to multiple failures across many small nodes—in this case, small NGOs implementing services on the ground—it is extremely vulnerable to a shock to the United States, which is the most prominent node in the network. This network, in addition to lacking robustness to the failure of the major hub, is also vulnerable to the ideals of new humanitarianism in that the U.S. has an uncontested presence with the ability to assert its self-interest over the entirety of the network and translate this power into real-world outcomes (Hafner-Burton et al., 2009).

This chapter highlighted the vulnerabilities of aid networks that are scale-free and follow a power law distribution in that the structure generates extreme dependency on one central actor. As preferential attachment characterized network growth over the years, the U.S. only became increasingly centralized, leaving no strong clusters or communities that could compensate for a hypothetical decline or withdrawal of the U.S. This network structure translates to a reliance on the U.S. to maintain both the network structure and the real-world humanitarian response efforts.

The analysis between the original (with U.S.) and theoretical (without U.S.) network showed that the removal of the U.S. node left the entirety of the network vulnerable to collapse. This was demonstrated in the differences in degree distribution when the U.S. node was removed for the major recipients of aid, which lost about half of their network connections in the theoretical network results. Overall, there were few other nodes which had strong enough clusters to support the network in the absence of the U.S. The U.S. has influence over the entirety of the network (eigenvector = 1.0) that is unmatched by another major donor and, because of this, the network lost a majority of its structure when the node was removed. While it can be argued that networks of social science can restructure themselves to accommodate shocks in a way that infrastructure and physical networks cannot, restructuring in a humanitarian aid network that is highly reliant on a single source of funding and is already chronically

underfunded (Financial Tracking Service, 2020a) is unlikely. Since funding affects not only those organizations that receive money, but also the burden on other donors attempting to keep services functioning, there would likely be a series of cascading failures across the network, as donors and mediating funding agencies (such as IOM and UNHCR) fail to compensate for the strain on the network left in the absence of the United States.

The Syria and Rohingya Situations

While the Venezuelan situation presented the most vulnerable scenario of the four explored in this study, it did not offer an alternative or more desirable network structure. The Syria and Rohingya cases, however, provide examples of a more stable network of humanitarian aid, despite receiving a significant portion of funding from the United States. While in these two cases, the removal of the U.S. as a major donor would have a significant impact on both real-world and network operations, there were other actors that could, to a degree, uphold response and network structure in the absence of the United States. This was largely due to the more frequent instances of clustering in the network, especially amongst European governments and some private donors. Because node influence was more evenly dispersed across multiple hubs in the network, there was less of a risk of cascading failures, and therefore a more isolated impact of the U.S. node's withdrawal. This, in turn, contributed to a more limited influence of the United States both as a network presence and as an international force contributing aid to achieve its strategic self-interests. Because the power of the U.S. is more contested by other nodes, its presence is limited, and so then is its ability to exploit its network position to alter real-world humanitarian responses (Hafner-Burton et al., 2009).

This chapter contributed to the argument around preventing cascading network failures in two ways. It provided additional evidence to support some of the ideas presented in the previous chapter, drawn from the Venezuelan case: clustering and the presence of other significant nodes

can help prevent failure from spreading across the entirety of a network. In other words, a higher degree of clustering in a network helps keep the failure of a hub—such as the United States—isolated to its direct cluster. This chapter also contributed to the argument about the importance of donor diversification in creating more resilient networks of aid and a more effective response that is rooted in humanitarian need rather than state interests abroad. These two cases embodied these ideas well. They both illustrated a more diverse donor pool that contributed significant amounts of aid to the humanitarian response. Though the absence of U.S. funds and network presence would have a notable impact, it would not be as catastrophic as in the Venezuelan case, as other major network actors would be able to provide some additional compensatory support. Overall, instances of failure cascading across the entirety of the network because of the U.S. removal are much less likely in the Syrian and Rohingya situations.

The European Situation

The European situation, while supporting the findings of the previous three cases, also brings to light other important findings on potential solutions to instability in networks of humanitarian aid. In this case, the United States played a far less significant role than in the other three cases, though still being the third largest donor. Both in the contribution amounts and in the network statistics, the U.S. was less influential. When comparing the original and the theoretical situations, the network structure barely changed with the removal of the U.S. node. Instead, the most significant donor was the European Commission's Humanitarian Aid and Civil Protection Department, and the most influential node, with by far the most connections to the largest sum of recipients was private donors. And while this may have been expected because the refugee and migrant situation is unfolding in Europe, a location where the U.S. has more limited political interests and influence, this case a different network typology with fewer vulnerabilities to cascading failures.

This chapter supported previous arguments regarding the importance of clustering to create more resilient networks of humanitarian aid. However, the European case contributes to the argument about donor diversification in a different manner than the Syrian and Rohingya cases. In the European refugee situation, the major donors, excluding the United States, are collective bodies of either states, organizations, or individuals. And while the overall network representing contributions to the European situation is resilient because it presents more instances of clustering and more than one prominent node, the nature of the nodes—the donors, at least—may help to reduce vulnerability, as well. Because collectives are more resistant to outside pressures—an attack on one is not necessarily an attack on all—the European situation, despite an absolute majority of funding coming from a single source, is more resilient because of the nature of the source—an IGO, an organizations of governments, rather than a single government. This case also furthered the arguments regarding new humanitarianism, and how the interest-driven context of this theory can be limited via the inclusion of a more diverse donor typology, such as private donors, that are driven more by humanitarian goals than self-interests. These arguments, as well as the ones brought to light in the previous cases, are discussed further in the following sections.

Differing Measures of Analysis

This study—though focusing on humanitarian aid—relied on the frequency of transactions between donors and recipients to assess the influence of certain actors within a network, rather than the actual dollar amount of each transaction. This was done to assess how many actors would be cut off entirely from a network in the absence of the United States, and what other actors, regardless of their monetary contribution, would help support what recipients remained and their humanitarian responses. This offers its own limitations, but, overall, was successful in showing one vantage point on the presence certain donors have over a variety of

recipients, from international organizations to small, on-the-ground NGOs. It is important to note that, largely, even when accounting for the monetary weight of each transaction rather than just accounting for the number of transactions, the results of the overall network analysis and each individual case are largely consistent, except for the case of private donors in the Rohingya and Syrian networks, and to a lesser degree, in the European network. However, the originally discussed implications and role of large state donors is persists in both the transactional and monetary analysis. To demonstrate this, a sample of the top five nodes from the transactional networks (based on page rank scoring) are compared to their page rank scoring in the monetary networks.

In the Venezuelan network, the network remains largely unchanged when the monetary data is used to conduct the analysis. Largely, the top five actors maintain their ranking, though their page rank scorings vary (Table 20). Overall, this is to be expected. The United States contributed by far the most money *and* shared the most transactions with the most recipients in this network. Therefore, in both methods of analysis, the United States is the most prominent donor, both in the actual amount of funding it contributes, and in the number of relationships it shares with recipients in the network.

Table 20 Top Five Actors in the Venezuelan Network Based on Page Rank, Transactional and Monetary Comparison

Actor, Venezuelan Network	Transactional	Monetary	Old Ranking	New Ranking
United States of America, Government of	0.1669	0.2433	1	1
United Nations High Commissioner for Refugees	0.0897	0.0928	2	2
International Organization for Migration	0.0792	0.0479	3	4
United Nations Children's Fund	0.0554	0.0363	4	5
European Commission's Humanitarian Aid and Civil Protection Department	0.0336	0.0338	5	6

The Syrian and Rohingya cases remain largely the same, as well. However, in both of these cases, private donors presented themselves as major network donors based on the transactional data; when the monetary weight of each transaction is included, they fall down in the ranking. In the Syrian network, private donors fall from the fifth largest donor to the ninth (Table 21), while in the Rohingya case, they fall from the third to the thirteenth (Table 22). In both cases, they are displaced by other major state donors, specifically the United States. This points to the conclusion that private donors *are* influential in the amount of transactions they share with smaller implementing organizations, but because they donate smaller sums of money, when the weight of the monetary donations is accounted for, they have slightly less influence.

Table 21 Top Five Actors in the Syrian Network Based on Page Rank, Transactional and Monetary Comparison

Actor, Syrian Network	Transactional	Monetary	Old Ranking	New Ranking
United Nations Children's Fund	0.0859	0.0785	1	4
United Nations High Commissioner for Refugees	0.0752	0.1173	2	1
World Food Programme	0.0549	0.1086	3	2
United States of America, Government of	0.0442	0.1003	4	3
Private (individuals & organizations)	0.0432	0.0219	5	9

This is also to be expected. While private donors share a significant amount of transactions with recipients of aid, when the weight of the monetary value of each transaction is accounted for, they lose a majority of their network influence. While these cases support the findings about state power, they do show the difficulty that private donors have in exerting real influence over both a network and the real-world humanitarian responses corresponding to each refugee and migrant situation. Largely, private donors do not meet the sheer volume of funding contributed by major state donors like the United States, and therefore—even though they contribute to the most recipients more frequently—their presence in the network is reduced. It is important to note, however, that private donors do still sit among the moderately influential donors in the network, even when accounting for monetary weight. This, in itself, supports that private donors are a growing presence in international trends of humanitarian giving, particularly in terms of influence. In addition to this, they support a wide variety of smaller implementing organizations that are important to meeting the emergent needs in the humanitarian response. While they don't send the most money, these relationships are significant because of their real-world connotation, which is contributing money to smaller organizations and giving them the ability to meet the constantly evolving needs of refugees and migrants.

Table 22 Top Five Actors in the Rohingya Network Based on Page Rank, Transactional and Monetary Comparison

Actor, Rohingya Network	Transactional	Monetary	Old Ranking	New Ranking
United Nations Children's Fund	0.1299	0.0857	1	3
United Nations High Commissioner for Refugees	0.0772	0.0832	2	4
Private (individuals & organizations)	0.0690	0.0130	3	13
World Food Programme	0.0689	0.1199	4	2
International Organization for Migration	0.0389	0.0538	5	6

The European network, similar to the Venezuelan network, only shows minor changes in node influence when the monetary weight of each transaction is included in the analysis. Most notably, private donors are displaced by the European Commission, but this is to be expected because of how much the EC contributes to the situation. Private donors are only displaced to the third ranked node in the network, largely because they contribute a significant amount of money in addition to sharing, by far, the most transactions with the most recipients of aid. Overall, this shows that private donors in the European case can, to a degree, maintain their network influence, even when accounting for the monetary amount of each transaction.

Table 23 Top Five Actors in the European Network Based on Page Rank, Transactional and Monetary Comparison

Actor, European Network	Transactional	Monetary	Old Ranking	New Ranking
Private (individuals & organizations)	0.1812	0.0776	1	3
United Nations High Commissioner for Refugees	0.0669	0.1762	2	2
United Nations Children's Fund	0.0639	0.0414	3	5
European Commission's Humanitarian Aid and Civil Protection Department	0.0506	0.1947	4	1
Germany, Government of	0.0262	0.0184	5	10

While a monetary analysis supports the findings regarding the role of large state donors, it does show the limitations of power that collectives of private donors have. Though private donors have a large network presence based on the number of transactions they share with recipients of aid, when the actual dollar amount of aid is accounted for, they are often displaced by state donors. This, overall, shows that private donors are still easily contested by major state donors, though their role in international humanitarian aid networks is growing. Even before accounting for the monetary amount of each transaction, the difference between private donors transforming network influence into fungible power was starkly different from the way a major state donor like the United States can exert influence. Because private donors face the issue of collective action, there are major barriers to their ability to act in the same manner as a state, and this is highlighted by the differences between the two in the monetary network analysis.

Building Network and Node Resilience

The four cases examined in this study have utilized theories of social network analysis to infer greater depth into ways to create resiliency against changing structures of humanitarian aid. First, the cases have shown that more clustering leads to a greater resilience against cascading network failure because it allows other nodes and their connections to support the network in the case of a hub's collapse. Second, the European case has brought about the importance of nodes—not just the overall network structure—exemplifying resilient characteristics, such as collectivism, to support the overall resilience of the network by having nodes that are more resistant to collapse by nature. This research showed how resilience and cascading failure observations from the physical sciences could be applied to understand the network vulnerability of humanitarian assistance in the condition of 'new humanitarianism' where funding can shift in ways that reflect state power and influence more than the actual humanitarian need in a migrant receiving country.

Clustering for Resilience

This study has utilized two different areas of network science—cascading failure and creating more robust network structures—to provide a more computational understanding of the international relationships between donors and recipients of aid, and the vulnerability these networks face based on the composition and reliance of their primary donors. First, it has shown that power-law distributions and scale-free networks, while generally stable against multiple shocks to small nodes, can also create a situation where, if the most prominent node with the most connections comes under attack, the network is left extremely vulnerable to cascading failures. In the case of humanitarian aid networks, these "attacks" may not necessarily be an action taken against the node itself, but a decision made by the actor the node is represented by to reduce their presence or leave the network entirely. Despite the idea of the withdrawal of a actor like the United States potentially being an intentional foreign policy decision by the administration, the results of this study still apply.

As shown in the case of the Venezuelan refugee situation, the removal of the U.S. —the absolute most prominent actor in the network based on both measures of centrality and degree distribution—caused a complete breakdown of network structure and connectivity. While the network is relatively stable to small disruptions because it is scale-free, the removal of this specific node was catastrophic to the network. These results are similar to those presented in other network studies, though they specifically relate to power grids or Internet networks, not to networks of social science (Albert, Jeong, & Barabási, 2000; Crucitti, Latora, & Marchiori, 2004; Motter & Lai, 2002).

Especially in the Venezuelan network, there was an immense presence of clustering around a single node (the U.S.), rather than having multiple clusters across a variety of nodes, and because of this, the United States and its reach across the whole network caused much more

damage when it was removed when compared to less clustered networks (Motter & Lai, 2002). The other three cases showed that when there were more nodes and a more even share of influence between actors across the network, the removal or collapse of the United States was much less detrimental, despite it still being a major donor. This was because other actors in the other networks upheld the scale-free degree distribution, even in the absence of the U.S.

The second topic of network robustness this study contributes to is the importance of clustering in building more resilient networks, specifically as it relates to social science networks. By drawing on studies of physical sciences and complex network attacks and the way these networks develop resilience, I am able to understand how social science networks have the potential to rearrange themselves to reflect these forms of robustness displayed in other types of networks to prevent instances of cascading failures (Albert et al., 2000). As it relates to humanitarian aid networks, this ties in with the discussion above regarding the importance of a more even distribution of connections. Because creating more even degree distributions—such as those in the Syrian and Rohingya networks—creates more instances of clustering, and hence, more hubs, networks are less vulnerable to cascading failures with the removal of a single prominent node, such as the U.S. This was upheld when comparing the original and theoretical networks and the differences in their degree distributions when the U.S. node was removed. However, network resilience itself may not be enough in the case of humanitarian aid networks that are so reliant on single state actors that are subject to constantly changing global conditions. As discussed in the case of Venezuela, it may prove to be nearly impossible to restructure networks in a way that reflects a more diverse donor typology that is less reliant on a single source, especially in scenarios that are already chronically underfunded (UNHCR, 2019).

Node Vulnerability and Network Impact

As the European case has shown, not all nodes are equally resistant to instances that may lead to failure or collapse. Even when considering the network of nodes, some actors are not as stable as others in the real-world, and hence may not be stable sources of funding to be at the center of a humanitarian aid network. In this light, it is important to take into consideration the construction of network actors and donor typologies, and how this plays a role in generating node resilience as well as network resilience more generally. For example, networks which rely heavily on a single actor cause the brokers of the humanitarian response—typically, the UNHCR or IOM—to be much more beholden to the wishes of that donor, and more vulnerable to shocks to that single donor. Whereas, in a more diverse network with a wider variety of donors—governmental, intergovernmental, nongovernmental, and private—there is a more limited influence of any single actor, and hence, a more limited influence of shocks to a major donor. While these insights apply specifically to the actors involved in humanitarian aid networks, they may also have implications for other networks that involve an exchange of some other type of resource.

The European case was much different from the other networks not because of its structure—which did support the findings discussed above—but because of the types of nodes that drove the presence of the scale-free distribution. The two most influential nodes in the network—private donors and the European Commission's Humanitarian Aid and Civil Protection Department—were not single state entities, such as the United States, but were collectives of states, organizations, or individuals. As discussed in the previous chapter, this may be preferable to sourcing funding from a single government because a failure of the node is much harder to realize in the real-world. In the case of the United States, the withdrawal of the node would be much simpler because there is only one entity involved to alter, whether it be via

changes in policy, economic environment, or interstate relationships. In the case of the European Commission or private donors nodes, a shock to cause the node to collapse would be much more complex because multiple actors would need to fail—politically or economically—in order to cause a shock large enough to result in the failure of the entire node.

While there is a high degree of clustering around these two nodes in the European network, shock to one of the entities involved would not constitute the loss of all of the edges to all of the recipient nodes in the cluster. In this case, the vulnerability of hubs to cascading failures are much more limited than those in the Venezuelan case, making it much more robust to a major shock that could lead to total collapse of the node. When taking this into account and considering the implications this may have for networks of humanitarian aid, it also becomes important to recognize the real-world implications that collective actors have on humanitarian assistance and humanitarian response. Overall, these predictions, both as they are related to network structure and robustness against cascading failure, as well as the usage of aid in the humanitarian response, may be much more positive than the traditional aid network that is centric to a singular governmental source.

Implications for International Networks of Humanitarian Aid

The analysis of state relations in IR has centered around the state as the primary actor. This "traditional" system reflects in the humanitarian aid network of the Venezuelan case, where the US, with its primary foreign policy-related interests, features as the singular primary actor. As illustrated in the final case, however, the European refugee and migration response illustrates the rise of another actor in the realm of global humanitarian affairs: that of private donors. This network, while still remaining largely dependent on traditional state actors, represents a network with increased diversity. Clusters of actors in the network form communities that insulate the network against shocks to other major nodes. The results of my study point to the inherent

instability of networks of humanitarian aid that are heavily reliant on a single government for financing humanitarian response operations. Additionally, my findings illustrate the growing influence of private donors and the potential network resiliency these actors have to offer. Not only do these clusters insulate against shocks, but they also tend to donate funds with little to no earmarking, allowing humanitarian donations to flow more directly to organizations addressing emergent needs on the ground. Rather than funding that is beholden to foreign policies of other states and their priorities, private donors may offer a solution for direct, fully humanitarian aid more efficiently reaching needs when and how they arise on the ground.

Aid Effectiveness

Each chapter in this study discusses the implications of politicized humanitarian aid and the negative impacts it has on aid effectiveness, especially in regard to aid being sent from the United States. Largely, U.S. aid often comes with a political intent or foreign interest motivation (Drury, Olson, & Van Belle, 2005; Lebovic, 1988). This type of politicized aid is less effective than those with fewer strings attached by the donor state (Bearce & Tirone, 2010). In each of the cases I presented, the U.S. is a primary donor, but it also "earmarks" its funds based on its own foreign policy goal. This, I argued, may result in aid that is not meeting the emergent needs of the host government and refugee and migrant population because it is tied to specific initiatives or humanitarian sectors. Earmarking of politicized funds is thus another vulnerability of a humanitarian network structured around preferential attachment to a singular influential donor. This is the case with the U.S. in three of the four cases studied here; the Venezuela, Syria, and Rohingya humanitarian aid networks may fall victim to less effective forms of aid because of their heavy reliance on a single government for the financing of a humanitarian response. However, in a stark contrast, the European case showed that the role of the United States, at least

in some cases, may be reduced as other sources of humanitarian aid begin to expand their presence.

While IGOs such as the European Union maintain an important role in international humanitarian aid operations, private donorship is also on the rise. The presence of private donors has increased significantly in recent years, and also provides an important source of largely un-earmarked aid that is more effective in responding to the changing needs of an ongoing refugee and migrant situation (Executive Committee of the High Commissioner's Program, 2018). Büthe, Major, & de Mello e Souza (2012) suggest that private aid is far less politicized and serves a much more direct, efficient humanitarian purpose than most government earmarked funding. Furthermore, the allocation of private aid is much more efficient because it does not need to go through the administrative procedures and approvals government funding is subject to. In addition, is it much less susceptible to corruption, and more readily available for use in on-the-ground humanitarian response operations (Desai & Kharas, 2008). Overall, this heightened presence of private donors in the European refugee and migrant situation not only helps provide a greater degree of network stability, but also shows that donor diversification and the inclusion of private donors may be preferable, especially in the case of ensuring an efficient response.

Stronger Networks of Humanitarian Aid

My findings show the damage that can be caused by an over reliance on a single source of aid in funding a humanitarian response to a refugee and migrant situation. I argued that improving donor diversification could lead to a more resilient network structure and an on-demand humanitarian response. In diversifying the donor pool, there are greater instances of clustering in the case networks, and hence, more direct connectivity and the ability of funding to flow to recipient nodes through other hubs in the network, rather than emanating from a single government, such as the United States. This may lead to funding that can more directly apply to

needs as they emerge, rather than reflecting the foreign policy interests of donor states or even mediating organizations such as UNHCR and IOM.

As displayed in the European situation, IGOs, NGOs, and other private donors play a large role in diversifying the sources of humanitarian aid, and shift reliance away from the U.S. As more actors come to play larger roles in the network, the entire provision of humanitarian aid becomes more robust to the shock of a major actor, such as the U.S. reducing or eliminating funding to the situation. This not only prevents against instances of cascading failures in the event of a single hub's failure, but also resolves some of the issues of foreign and humanitarian aid more generally. The rise of NGOs and private donors in these networks results in a greater presence of unearmarked aid, which is less subject to the bureaucratic, interest-driven processes of governmental aid, hence making it more rapidly deployable to meet the needs of vulnerable populations (Desai & Kharas, 2008). Shifting away from a reliance on primarily United States' funding would not only help improve network resilience, but could also improve the effectiveness of humanitarian aid response by making it more flexible and less bound to governmental interests (Desai & Kharas, 2008).

Final Thoughts

Overall, this study and the four cases included within it have addressed the importance of creating critical resiliency measures in networks of humanitarian aid. Through donor diversification and the inclusion of nodes that are more robust to failure because they are more resistant to collapse by nature, more resilient networks of humanitarian aid that are resistant to cascading failures can be achieved. While the composition of aid donors and recipients is difficult to control, the rise of private donorship—at least in the case of the European refugee situation—shows that it is possible, and perhaps even preferable to scenarios where aid is sourced almost exclusively from a single state government, such as the Venezuelan case. Though

donor diversification is not a conscious choice or effort, it is important to be mindful of the impact that the over reliance on certain types of donors may have compared to others, especially as it relates to humanitarian giving and aid effectiveness.

Though this study only addresses humanitarian aid as it relates to refugee crises, there may be other instances where the logic derived from these cases can apply. First, similar inferences could be drawn for many other international resource networks, or even domestic networks, where a single source dominates the distribution of money or goods. This monopoly of giving, while stable to a degree, could cause immense damage to network recipients in the unlikely case that the primary hub alters flows of humanitarian aid or defunds humanitarian investment altogether. This was an idea that would likely be replicated in other complex resource networks.

Though major state actors such as the United States provide critical international support to humanitarian issues around the world, the reliance recipients have on the country's role may prove to be catastrophic. As sources of humanitarian aid shift—especially in the wake of a global financial crisis—the inclusion of a more diverse typology of humanitarian donors may prove to be absolutely necessary in maintaining the humanitarian response. This study, overall, has shown the potential fragility of international networks of humanitarian aid, and has brought to light some of the issues regarding the presence of a single state actor as an absolute, prominent hub. While it would be difficult and harmful to humanitarian responses around the world to conform to a specific donor typology, it is important to be mindful of the impact it can have, especially if this donor were to rapidly repeal vast amounts of aid. In an already unstable economic and public health environment, a catastrophic breakdown of a critical humanitarian aid network would only result in further devastation and deterioration of access to critical resources. In an era where

many long-lasting crises increasingly characterize our global landscape—from migration and climate to environmental and human-made disasters—we must be vigilant in understanding the vulnerabilities and risks present in humanitarian aid networks that arise in response to crisis. And, above all, we should aim to understand the impact of these vulnerabilities and risks on creating an effective humanitarian response that is fit to the needs of the populations they intend to serve.

REFERENCES

Albert, R., Jeong, H., & Barabási, A.-L. (2000). Error and attack tolerance of complex networks. *Nature, 406*(6794), 378-382. doi:10.1038/35019019

Annen, K., & Kosempel, S. (2009, 01/12). Foreign Aid, Donor Fragmentation, and Economic Growth. *The B.E. Journal of Macroeconomics, 9*, 33-33. https://doi.org/10.2202/1935-1690.1863

Apodaca, C. (2017). Foreign Aid as Foreign Policy Tool. In: Oxford University Press.

Ash, J., & Newth, D. (2007). Optimizing complex networks for resilience against cascading failure. *Physica A: Statistical Mechanics and its Applications, 380*, 673-683. doi:https://doi.org/10.1016/j.physa.2006.12.058

Atkinson, A. B., Piketty, T., & Saez, E. (2011). Top Incomes in the Long Run of History. *Journal of Economic Literature, 49*(1), 3-71. doi:10.1257/jel.49.1.3

Axtell, R. L. (2001). Zipf Distribution of U.S. Firm Sizes. *Science, 293*(5536), 1818. doi:10.1126/science.1062081

Barabasi, A. L. (2005). The origin of bursts and heavy tails in human dynamics. *Nature, 435*(7039), 207-211. doi:10.1038/nature03459

Barabasi, A. L. (2009). Scale-free networks: a decade and beyond. *Science, 325*(5939), 412-413. doi:10.1126/science.1173299

Barabasi, A. L. (2013). Network science. *Philos Trans A Math Phys Eng Sci, 371*(1987), 20120375. doi:10.1098/rsta.2012.0375

Barabasi, A. L., & Albert, R. (1999). Emergence of scaling in random networks. *Science, 286*(5439), 509-512. doi:10.1126/science.286.5439.509

Barabasi, A. L., & Bonabeau, E. (2003). Scale-free networks. *Sci Am, 288*(5), 60-69. doi:10.1038/scientificamerican0503-60

Barnett, M. (2005). Humanitarianism Transformed. *Perspectives on Politics, 3*(4), 723-740. Retrieved from www.jstor.org/stable/3688176

Bearce, D. H., & Tirone, D. C. (2010). Foreign Aid Effectiveness and the Strategic Goals of Donor Governments. *The Journal of Politics, 72*(3), 837-851. doi:10.1017/s0022381610000204

Bibighaus, D. L. (2015). How Power-Laws Re-Write The Rules Of Cyber Warfare. *Journal of Strategic Security, 8*(4), 39-52. Retrieved from www.jstor.org/stable/26465214

Blanton, T. S. (2000). *Interagency Review of U.S. Government Civilian Humanitarian & Transition Programs*. The National Security Archive: George Washington University Retrieved from https://nsarchive2.gwu.edu/NSAEBB/NSAEBB30/

Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network Analysis in the Social Sciences. *Science, 323*(5916), 892-895. Retrieved from www.jstor.org/stable/20403062

Broido, A. D., & Clauset, A. (2019). Scale-free networks are rare. *Nat Commun, 10*(1), 1017. doi:10.1038/s41467-019-08746-5

Büthe, T., Major, S., & de Mello e Souza, A. (2012). The Politics of Private Foreign Aid: Humanitarian Principles, Economic Development Objectives, and Organizational Interests in NGO Private Aid Allocation. *International Organization, 66*(4), 571-607. Retrieved from www.jstor.org/stable/23279972

Cao, X. (2009). Networks of Intergovernmental Organizations and Convergence in Domestic Economic Policies. *International Studies Quarterly, 53*(4), 1095-1130. Retrieved from www.jstor.org/stable/27735137

Cederman, L.-E. (2003). Modeling the Size of Wars: From Billiard Balls to Sandpiles. *The American Political Science Review, 97*(1), 135-150. Retrieved from www.jstor.org/stable/3118226

Chimni, B. S. (2000). Globalization, Humanitarianism and the Erosion of Refugee Protection*. *Journal of Refugee Studies, 13*(3), 243-263. doi:10.1093/jrs/13.3.243

Clark, I. (1998). Beyond the Great Divide: Globalization and the Theory of International Relations. *Review of International Studies, 24*(4), 479-498. Retrieved from www.jstor.org/stable/20097546

Clauset, A., & Wiegel, F. W. (2010). A Generalized Aggregation-Disintegration Model for the Frequency of Severe Terrorist Attacks. *The Journal of Conflict Resolution, 54*(1), 179-197. Retrieved from www.jstor.org/stable/20684635

Clauset, A., Newman, M. E., & Moore, C. (2004). Finding community structure in very large networks. *Phys Rev E Stat Nonlin Soft Matter Phys, 70*(6 Pt 2), 066111. doi:10.1103/PhysRevE.70.066111

Clauset, A., Shalizi, C. R., & Newman, M. E. J. (2009). Power-Law Distributions in Empirical Data. *SIAM Review, 51*(4), 661-703. Retrieved from http://www.jstor.org/stable/25662336

Clauset, A., Young, M., & Gleditsch, K. S. (2007). On the Frequency of Severe Terrorist Events. *The Journal of Conflict Resolution, 51*(1), 58-87. Retrieved from www.jstor.org/stable/27638538

Crucitti, P., Latora, V., & Marchiori, M. (2004). Model for cascading failures in complex networks. *Physical review. E, Statistical, nonlinear, and soft matter physics, 69*, 045104. doi:10.1103/PhysRevE.69.045104

Desai, R., & Kharas, H. (2008). The California Consensus: Can Private Aid End Global Poverty? *Survival, 50*, 155-168. doi:10.1080/00396330802328982

Dorogovtsev, S. N., Mendes, J. F. F., & Samukhin, A. N. (2000). Structure of Growing Networks with Preferential Linking. *Physical Review Letters, 85*(21), 4633-4636. doi:10.1103/PhysRevLett.85.4633

Drury, A. C., Olson, R. S., & Van Belle, D. A. (2005). The Politics of Humanitarian Aid: U.S. Foreign Disaster Assistance, 1964–1995. *The Journal of Politics, 67*(2), 454-473. doi:10.1111/j.1468-2508.2005.00324.x

Executive Committee of the High Commissioner's Program. (2018). *Private sector fundraiding and partnerships*. UNHCR Retrieved from https://www.unhcr.org/5ba354764.pdf

Faber, J. (1987). Measuring Cooperation, Conflict, and the Social Network of Nations. *Journal of Conflict Resolution - J CONFLICT RESOLUT, 31*, 438-464. doi:10.1177/0022002787031003003

Fajardo, L. E. (2003). FROM THE ALLIANCE FOR PROGRESS TO THE PLAN COLOMBIA: A RETROSPECTIVE LOOK AT U.S. AID TO COLOMBIA. *Crisis State Programme*. Retrieved from https://www.lse.ac.uk/international-development/Assets/Documents/PDFs/csrc-working-papers-phase-one/wp28-from-the-alliance-for-progress-to-the-plan-colombia.pdf

Financial Tracking Service. (2004). *Criteria for inclusion of reported humanitarian contributions into the Financial Tracking Service database, and for donor / appealing agency reporting to FTS* Retrieved from https://fts.unocha.org/sites/default/files/criteria_for_inclusion_2017.pdf

Financial Tracking Service. (2020a). Regional Refugee and Migrant Response Plan (for Refugees and Migrants from Venezuela). Retrieved from https://fts.unocha.org/appeals/726/summary

Financial Tracking Service. (2020b). Total reported funding Retrieved from https://fts.unocha.org/global-funding/overview/2020

Friedman, J. A. (2015). Using Power Laws to Estimate Conflict Size. *The Journal of Conflict Resolution, 59*(7), 1216-1241. Retrieved from www.jstor.org/stable/24546338

Gabaix, X. (2009). Power Laws in Economics and Finance. *Annual Review of Economics, 1*(1), 255-294. doi:10.1146/annurev.economics.050708.142940

Goh, K.-I., Oh, E., Jeong, H., Kahng, B., & Kim, D. (2002). Classification of scale-free networks. *Proceedings of the National Academy of Sciences of the United States of America, 99*(20), 12583-12588. https://doi.org/10.1073/pnas.202301299

Hafner-Burton, E. M., Kahler, M., & Montgomery, A. H. (2009). Network Analysis for International Relations. *International Organization, 63*(3), 559-592. doi:10.1017/S0020818309090195

Hinloopen, J., & Marrewijk, C. (2006). Comparative Advantage, the Rank-Size Rule, and Zipf's Law. *SSRN Electronic Journal*. doi:10.2139/ssrn.943370

Jeong, H., Néda, Z., & Barabási, A. L. (2003). Measuring preferential attachment in evolving networks. *Europhysics Letters (EPL), 61*(4), 567-572. doi:10.1209/epl/i2003-00166-9

Kahler, M. (2009). *Networked Politics: Agency, Power, and Governance* (1 ed.): Cornell University Press.

Kinne, B. J. (2013). Network Dynamics and the Evolution of International Cooperation. *The American Political Science Review, 107*(4), 766-785. Retrieved from www.jstor.org/stable/43654033

Krapivsky, P. L., & Redner, S. (2001). Organization of growing random networks. *Physical Review E, 63*(6), 066123. doi:10.1103/PhysRevE.63.066123

Krapivsky, P. L., Redner, S., & Leyvraz, F. (2000). Connectivity of Growing Random Networks. *Physical Review Letters, 85*(21), 4629-4632. doi:10.1103/PhysRevLett.85.4629

Kuehlhorn Friedman, S. (2019). New Humanitarianism and the Crisis of Charity: Good Intentions on the Road to Help. *Administrative Theory & Praxis, 41*(4), 429-433. doi:10.1080/10841806.2019.1643622

Lebovic, J. H. (1988). National Interests and US Foreign Aid: The Carter and Reagan Years. *Journal of Peace Research, 25*(2), 115-135. doi:10.1177/002234338802500202

Lima-Mendez, G., & van Helden, J. (2009, Dec). The powerful law of the power law and other myths in network biology. *Mol Biosyst, 5*(12), 1482-1493. https://doi.org/10.1039/b908681a

MacFarlane, S. N., & Weiss, T. (2000). Political interest and humanitarian action. *Security Studies, 10*(1), 112-142. doi:10.1080/09636410008429422

Mandelbrot, B. (1963). The Variation of Certain Speculative Prices. *The Journal of Business, 36*(4), 394-419. Retrieved from www.jstor.org/stable/2350970

Maoz, Z. (2006). Network Polarization, Network Interdependence, and International Conflict, 1816–2002. *Journal of Peace Research, 43*(4), 391-411. doi:10.1177/0022343306065720

Maoz, Z. (2012). Preferential Attachment, Homophily, and the Structure of International Networks, 1816–2003. *Conflict Management and Peace Science, 29*(3), 341-369. Retrieved from www.jstor.org/stable/26275301

Morgenthau, H. (1962). A Political Theory of Foreign Aid. *The American Political Science Review, 56*(2), 301-309. doi:10.2307/1952366

Motter, A. E., & Lai, Y. C. (2002). Cascade-based attacks on complex networks. *Phys Rev E Stat Nonlin Soft Matter Phys, 66*(6 Pt 2), 065102. doi:10.1103/PhysRevE.66.065102

Nachmias, E. A. B. N. (1997). *The politics of international humanitarian aid operations*: Greenwood Publishing Group.

Newman, M. (2004). Power Laws, Pareto Distributions and Zipf's Law. *Contemporary Physics - CONTEMP PHYS, 46*. doi:10.1080/00107510500052444

Newman, M. E. (2001). Clustering and preferential attachment in growing networks. *Phys Rev E Stat Nonlin Soft Matter Phys, 64*(2 Pt 2), 025102. doi:10.1103/PhysRevE.64.025102

Program, E. C. o. t. H. C. s. (2018). *Private sector fundraiding and partnerships*. UNHCR Retrieved from https://www.unhcr.org/5ba354764.pdf

Quibria, M. G. (2014). Aid effectiveness: research, policy and unresolved issues. *Development Studies Research, 1*(1), 75-87. doi:10.1080/21665095.2014.922890

Response for Venezuelans. (2020). RMRP 2020 Dashboard. Retrieved from https://r4v.info/en/situations/platform

Richardson, L. F. (1948). Variation of the Frequency of Fatal Quarrels With Magnitude. *Journal of the American Statistical Association, 43*(244), 523-546. doi:10.2307/2280704

Smith, B. H. (1990). *More Than Altruism: The Politics of Private Foreign Aid*: Princeton University Press.

Steinwand, M. C. (2015). Compete or Coordinate? Aid Fragmentation and Lead Donorship. *International Organization, 69*(2), 443-472. http://www.jstor.org/stable/24758121

Stumpf, M. P. H., & Porter, M. A. (2012). Critical Truths About Power Laws. *Science, 335*(6069), 665. https://doi.org/10.1126/science.1216142

The Atlantic Council. (2019). *The Untapped Potential of the US-Colombia Partnership: Creating a Modernized Plan for the Bilateral Relationship*. Retrieved from https://www.atlanticcouncil.org/wp-content/uploads/2019/09/AC_US-COLOMBIA-REPORT-FINAL_Print.pdf

Trump, D. (2017). *National Security Strategy of the United States of America*. Retrieved from https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf

UNHCR. (2019). *Funding Update*. UNHCR Retrieved from https://reporting.unhcr.org/sites/default/files/Global%20Funding%20Overview%2031%20December%202019.pdf

UNHCR. (2020a). Medditerranean Situation. Retrieved from https://data2.unhcr.org/en/situations/mediterranean

UNHCR. (2020b). Refugee Data Finder. Retrieved from https://www.unhcr.org/refugee-statistics/download/?url=R1xq

UNHCR. (2020c). Refugee Response in Bangladesh. Retrieved from https://data2.unhcr.org/en/situations/myanmar_refugees

UNHCR. (2020d). Syria Regional Refugee Response Retrieved from http://data2.unhcr.org/en/situations/syria

Vázquez, A. (2003). Growing network with local rules: Preferential attachment, clustering hierarchy, and degree correlations. *Physical Review E, 67*(5), 056104. doi:10.1103/PhysRevE.67.056104

Vázquez, A., Oliveira, J. G., Dezsö, Z., Goh, K.-I., Kondor, I., & Barabási, A.-L. (2006). Modeling bursts and heavy tails in human dynamics. *Physical Review E, 73*(3), 036127. doi:10.1103/PhysRevE.73.036127

Weiss, T. G. (1999). Principles, Politics, and Humanitarian Action. *Ethics & International Affairs, 13*, 1-22. doi:10.1111/j.1747-7093.1999.tb00322.x

Zhang, L., Small, M., & Judd, K. (2015, 2015/09/01/). Exactly scale-free scale-free networks. *Physica A: Statistical Mechanics and its Applications, 433*, 182-197. https://doi.org/https://doi.org/10.1016/j.physa.2015.03.074

APPENDIX A

Table A.1. *Venezuelan Refugee Situation Node Statistics, with U.S. involvement*

Label	***Weighted In-Degree***	***Weighted Out-Degree***	***Pagerank***	***Eigenvector Centrality***
ACT Alliance / Church of Sweden	1	0	0.00149	0.00019
Action Against Hunger	10	0	0.00425	0.01354
Adventist Development and Relief Agency	6	0	0.00267	0.02286
Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance	1	0	0.00137	0.00381
Aktion Deutschland Hilft	0	2	0.00232	0.00014
American Red Cross	1	0	0.00137	0.00381
American Refugee Committee (Alight)	1	0	0.00137	0.00381
Americares	1	0	0.00137	0.00381
Associazione Volontari per il Servizio Internazionale	1	0	0.00137	0.00381
Australia, Government of	0	1	0.00271	0.00004
Austria, Government of	0	7	0.00332	0.01169
Ayuda en Accion	1	0	0.00141	0.00041
Bloomberg	0	6	0.00315	0.00047
Brazil, Government of	0	8	0.00448	0.01502
Canada, Government of	0	44	0.01813	0.06935
Canadian Food Grains Bank	0	1	0.00210	0.00004
CARE International	7	0	0.00500	0.00834
CARITAS	1	0	0.00137	0.00381
Caritas Brazil	2	0	0.00239	0.00386
Caritas Germany (DCV)	25	0	0.00996	0.00461
Caritas Peru	3	0	0.00199	0.00122
Caritas Switzerland	46	0	0.01594	0.01200
Central Emergency Response Fund	0	47	0.01596	0.05983
Colombia, Government of	0	15	0.00506	0.03604
Colombian Red Cross Society	8	0	0.00636	0.00142
Comitato Internationale per lo Sviluppo dei Popoli	2	0	0.00189	0.00015
Danish Refugee Council	9	0	0.00794	0.00151
Denmark, Government of	0	7	0.00376	0.00414
Diologo Diverso	2	0	0.00376	0.00034
Dubai Cares (UAE)	0	5	0.00265	0.00147
Dutch Relief Alliance	0	2	0.00266	0.00008

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Education Cannot Wait Fund	0	3	0.00221	0.00067
European Commission	0	13	0.00612	0.01612
European Commission EuropeAid Development and Cooperation	0	15	0.00496	0.03942
European Commission's Humanitarian Aid and Civil Protection Department	0	97	0.03364	0.08837
Fondation Caritas Luxembourg	1	0	0.00173	0.00004
Fondation Chanel	0	1	0.00138	0.00226
Food & Agriculture Organization of the United Nations	5	1	0.00314	0.00251
Ford Foundation	0	6	0.00296	0.00177
France, Government of	0	2	0.00240	0.00231
Frantz Hoffman Foundation	0	1	0.00186	0.00005
Fundacion Ayuda en Accion Colombia	1	0	0.00206	0.00005
German Red Cross	6	0	0.00314	0.00146
Germany, Government of	0	34	0.01528	0.00681
Gilead Sciences Inc	0	1	0.00150	0.00017
GOAL	1	0	0.00227	0.00006
HALO Trust	1	0	0.00227	0.00006
Hebrew Immigrant Aid Society	16	0	0.00635	0.04651
Iceland, Government of	0	1	0.00138	0.00226
iMMAP	6	0	0.00267	0.02286
International Committee of the Red Cross	4	0	0.00253	0.00416
International Federation of Red Cross and Red Crescent Societies	11	1	0.00473	0.03845
International Labour Organization	11	8	0.00189	0.01212
International Organization for Migration	279	0	0.07923	0.78355
International Planned Parenthood Federation	1	0	0.00146	0.00030
International Rescue Committee	31	0	0.01238	0.00636
Ireland, Government of	0	6	0.00820	0.00467
Islamic Relief Worldwide	0	2	0.00178	0.00042
Italy, Government of	0	2	0.00166	0.00451
Japan Agency for Development and Emergency	2	0	0.00189	0.00025
Japan, Government of	0	14	0.00640	0.02272
Jersey Overseas Aid	0	1	0.00740	0.00004
Jesuit Refugee Service	3	0	0.00189	0.01143
Johanniter Unfallhilfe e.V.	3	0	0.00226	0.00024

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Korea, Republic of, Government of	0	4	0.00221	0.00902
Latter-Day Saint Charities	0	3	0.00245	0.00038
Luxembourg, Government of	0	7	0.00514	0.00074
Malteser International Order of Malta World Relief	3	0	0.00226	0.00024
Medecins du Monde Canada	1	0	0.00146	0.00030
Medicor Foundation	0	12	0.00560	0.00116
Mercy Corps	12	0	0.00518	0.03127
Netherlands, Government of	0	17	0.00521	0.05023
New Zealand, Government of	0	2	0.00166	0.00451
Norway, Government of	0	13	0.00602	0.00932
Norwegian Refugee Council	76	0	0.02758	0.06047
Novo Nordisk	0	1	0.00186	0.00005
Office for the Coordination of Humanitarian Affairs	2	0	0.00172	0.00411
Ole Kirk,Äôs Foundation	0	1	0.00186	0.00005
OXFAM GB	1	0	0.00149	0.00019
Oxfam Intermon	1	1	0.00215	0.00045
OXFAM International	8	3	0.00440	0.00067
Pan American Development Foundation	14	2	0.00550	0.03482
Pan-American Health Organization (World Health Organization)	4	0	0.00224	0.01173
Pastoral Social	2	0	0.00163	0.00762
Plan International	5	0	0.00302	0.00056
Private (individuals & organizations)	0	37	0.01330	0.04094
Pro Familia Switzerland	1	0	0.00137	0.00381
Queen Silvia Foundation	0	1	0.00570	0.00004
Red Crescent Society of the United Arab Emirates	2	0	0.00740	0.00008
RET International (Former The Foundation for the Refugee Education Trust till 2014)	5	0	0.00287	0.01177
Save the Children	21	0	0.00851	0.03044
Servico Pastoral dos Migrantes	1	0	0.00159	0.00010
Solidarity Response Fund	0	1	0.00141	0.00114
Spain, Government of	0	4	0.00449	0.00239
Spanish Red Cross	0	2	0.00246	0.00010
Start Fund	0	1	0.00148	0.00030
Stichting Vluchteling	0	8	0.00382	0.00062

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Stichting War Child	4	2	0.01079	0.00016
Sweden, Government of	0	36	0.01602	0.03799
Swedish Red Cross	2	0	0.00187	0.00038
Switzerland, Government of	0	21	0.00959	0.00703
TEARFUND	1	0	0.00740	0.00004
Terre des Hommes International	5	0	0.00455	0.00025
Trinidad and Tobago, Government of	0	1	0.00135	0.00295
UN Programme on HIV/AIDS	0	5	0.00248	0.01128
UN Women	14	0	0.00702	0.02014
Undesignated	23	54	0.02751	0.07750
UNICEF Brazil	0	9	0.00382	0.01027
UNICEF National Committee/Canada	0	1	0.00141	0.00114
UNICEF National Committee/Chile	0	1	0.00141	0.00114
UNICEF National Committee/Denmark	0	1	0.00141	0.00114
UNICEF National Committee/Ireland	0	1	0.00141	0.00114
UNICEF National Committee/Japan	0	4	0.00232	0.00456
UNICEF National Committee/Spain	0	1	0.00141	0.00114
UNICEF National Committee/Uruguay	0	2	0.00171	0.00228
United Arab Emirates, Government of	0	2	0.00740	0.00008
United Kingdom, Government of	0	1	0.00145	0.00016
United Nations	0	1	0.00142	0.00028
United Nations Children's Fund	168	21	0.05536	0.28544
United Nations Development Programme	0	1	0.00135	0.00295
United Nations High Commissioner for Refugees	264	15	0.08966	0.58509
United Nations Humanitarian Response Depot	0	0	0.00111	0.00000
United Nations Population Fund	12	6	0.00354	0.00316
United States of America, Government of	0	547	0.16699	1.00000
US Fund for UNICEF	0	10	0.00413	0.01141
WHAM Foundation	0	1	0.00570	0.00004
World Bank	0	1	0.00141	0.00114
World Food Programme	24	4	0.01011	0.06332
World Health Organization	7	0	0.00352	0.00145
World Vision Canada	0	4	0.00258	0.00118
World Vision International	34	1	0.01423	0.06763
World Vision Ireland	1	0	0.00227	0.00006

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
World Vision Korea	0	1	0.00148	0.00030
World Vision USA	0	3	0.00221	0.00089
ZOA	3	0	0.00351	0.00045
United Nations Environment Programme	1	0	0.00150	0.00008

Table A.2. *Venezuelan Refugee Situation Node Statistics, without U.S. involvement*

Label	***Weighted In-Degree***	***Weighted Out-Degree***	***Pagerank***	***Eigenvector Centrality***
ACT Alliance / Church of Sweden	1	0	0.00176	0.00516
Action Against Hunger	7	0	0.00495	0.07098
Adventist Development and Relief Agency	0	0	0.00120	0.00000
Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance	0	0	0.00120	0.00000
Aktion Deutschland Hilft	0	2	0.00344	0.00086
American Red Cross	0	0	0.00120	0.00000
American Refugee Committee (Alight)	0	0	0.00120	0.00000
Americares	0	0	0.00120	0.00000
Associazione Volontari per il Servizio Internazionale	0	0	0.00120	0.00000
Australia, Government of	0	1	0.00309	0.00029
Austria, Government of	0	7	0.00506	0.08999
Ayuda en Accion	1	0	0.00166	0.01720
Bloomberg	0	6	0.00426	0.01447
Brazil, Government of	0	8	0.00637	0.08670
Canada, Government of	0	44	0.03176	0.32498
Canadian Food Grains Bank	0	1	0.00240	0.00043
CARE International	5	0	0.00659	0.01254
CARITAS	0	0	0.00120	0.00000
Caritas Brazil	1	0	0.00301	0.00047
Caritas Germany (DCV)	25	0	0.01350	0.17411
Caritas Peru	3	0	0.00258	0.05159
Caritas Switzerland	46	0	0.02468	0.34754
Central Emergency Response Fund	0	47	0.02687	0.45333
Colombia, Government of	0	15	0.00864	0.18927
Colombian Red Cross Society	8	0	0.00913	0.01526
Comitato Internationale per lo Sviluppo dei Popoli	2	0	0.00245	0.00491
Danish Refugee Council	9	0	0.01004	0.03390
Denmark, Government of	0	7	0.00551	0.05292
Diologo Diverso	2	0	0.00444	0.00614
Dubai Cares (UAE)	0	5	0.00360	0.05117
Dutch Relief Alliance	0	2	0.00308	0.00063
Education Cannot Wait Fund	0	3	0.00333	0.02077
European Commission	0	13	0.00896	0.12536

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
European Commission EuropeAid Development and Cooperation	0	15	0.00853	0.18771
European Commission's Humanitarian Aid and Civil Protection Department	0	97	0.05230	1.00000
Fondation Caritas Luxembourg	1	0	0.00214	0.00032
Fondation Chanel	0	1	0.00170	0.01703
Food & Agriculture Organization of the United Nations	5	1	0.00437	0.06437
Ford Foundation	0	6	0.00408	0.06140
France, Government of	0	2	0.00426	0.01722
Frantz Hoffman Foundation	0	1	0.00215	0.00082
Fundacion Ayuda en Accion Colombia	1	0	0.00241	0.00051
German Red Cross	6	0	0.00410	0.05804
Germany, Government of	0	34	0.02032	0.10010
Gilead Sciences Inc	0	1	0.00250	0.00032
GOAL	1	0	0.00258	0.00080
HALO Trust	1	0	0.00258	0.00080
Hebrew Immigrant Aid Society	4	0	0.00521	0.00942
Iceland, Government of	0	1	0.00170	0.01703
iMMAP	0	0	0.00120	0.00000
International Committee of the Red Cross	3	0	0.00288	0.00902
International Federation of Red Cross and Red Crescent Societies	1	1	0.00279	0.00648
International Labour Organization	8	8	0.00120	0.00245
International Organization for Migration	82	0	0.04625	0.46949
International Planned Parenthood Federation	1	0	0.00182	0.00595
International Rescue Committee	31	0	0.01856	0.11252
Ireland, Government of	0	6	0.00969	0.03513
Islamic Relief Worldwide	0	2	0.00342	0.00077
Italy, Government of	0	2	0.00220	0.03406
Japan Agency for Development and Emergency	2	0	0.00235	0.00618
Japan, Government of	0	14	0.00945	0.17217
Jersey Overseas Aid	0	1	0.00801	0.00019
Jesuit Refugee Service	0	0	0.00120	0.00000
Johanniter Unfallhilfe e.V.	3	0	0.00273	0.00645
Korea, Republic of, Government of	0	4	0.00320	0.06811
Latter-Day Saint Charities	0	3	0.00435	0.00120
Luxembourg, Government of	0	7	0.00771	0.00429

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Malteser International Order of Malta World Relief	3	0	0.00273	0.00645
Medecins du Monde Canada	1	0	0.00182	0.00595
Medicor Foundation	0	12	0.00764	0.06309
Mercy Corps	4	0	0.00477	0.00945
Netherlands, Government of	0	17	0.00935	0.14560
New Zealand, Government of	0	2	0.00220	0.03406
Norway, Government of	0	13	0.00865	0.13438
Norwegian Refugee Council	68	0	0.03832	0.59102
Novo Nordisk	0	1	0.00215	0.00082
Office for the Coordination of Humanitarian Affairs	1	0	0.00182	0.00595
Ole Kirk,Äôs Foundation	0	1	0.00215	0.00082
OXFAM GB	1	0	0.00176	0.00516
Oxfam Intermon	1	1	0.00259	0.01768
OXFAM International	8	3	0.00546	0.01416
Pan American Development Foundation	5	2	0.00457	0.00574
Pan-American Health Organization (World Health Organization)	1	0	0.00182	0.00595
Pastoral Social	0	0	0.00120	0.00000
Plan International	5	0	0.00386	0.01470
Private (individuals & organizations)	0	37	0.02124	0.41447
Pro Familia Switzerland	0	0	0.00120	0.00000
Queen Silvia Foundation	0	1	0.00617	0.00023
Red Crescent Society of the United Arab Emirates	2	0	0.00801	0.00040
RET International (Former The Foundation for the Refugee Education Trust till 2014)	2	0	0.00276	0.00648
Save the Children	14	0	0.01017	0.04989
Servico Pastoral dos Migrantes	1	0	0.00188	0.00166
Solidarity Response Fund	0	1	0.00173	0.01518
Spain, Government of	0	4	0.00569	0.01827
Spanish Red Cross	0	2	0.00314	0.00105
Start Fund	0	1	0.00201	0.00104
Stichting Vluchteling	0	8	0.00527	0.01929
Stichting War Child	4	2	0.01169	0.00083
Sweden, Government of	0	36	0.02358	0.28600
Swedish Red Cross	2	0	0.00232	0.01033
Switzerland, Government of	0	21	0.01538	0.12828

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
TEARFUND	1	0	0.00801	0.00019
Terre des Hommes International	5	0	0.00553	0.00550
Trinidad and Tobago, Government of	0	1	0.00168	0.00857
UN Programme on HIV/AIDS	0	5	0.00369	0.08514
UN Women	9	0	0.00828	0.02585
Undesignated	6	54	0.03891	0.22413
UNICEF Brazil	0	9	0.00599	0.13658
UNICEF National Committee/Canada	0	1	0.00173	0.01518
UNICEF National Committee/Chile	0	1	0.00173	0.01518
UNICEF National Committee/Denmark	0	1	0.00173	0.01518
UNICEF National Committee/Ireland	0	1	0.00173	0.01518
UNICEF National Committee/Japan	0	4	0.00333	0.06070
UNICEF National Committee/Spain	0	1	0.00173	0.01518
UNICEF National Committee/Uruguay	0	2	0.00227	0.03035
United Arab Emirates, Government of	0	2	0.00801	0.00040
United Kingdom, Government of	0	1	0.00182	0.00120
United Nations	0	1	0.00178	0.00166
United Nations Children's Fund	106	21	0.05882	0.87178
United Nations Development Programme	0	1	0.00168	0.00857
United Nations High Commissioner for Refugees	123	15	0.08031	0.97852
United Nations Humanitarian Response Depot	0	0	0.00120	0.00000
United Nations Population Fund	12	6	0.00524	0.07271
US Fund for UNICEF	0	10	0.00652	0.15176
WHAM Foundation	0	1	0.00617	0.00023
World Bank	0	1	0.00173	0.01518
World Food Programme	11	4	0.01020	0.08090
World Health Organization	7	0	0.00502	0.03763
World Vision Canada	0	4	0.00443	0.00415
World Vision International	17	1	0.01520	0.04036
World Vision Ireland	1	0	0.00258	0.00080
World Vision Korea	0	1	0.00201	0.00104
World Vision USA	0	3	0.00362	0.00312
ZOA	3	0	0.00421	0.01464
United Nations Environment Programme	1	0	0.00177	0.00245

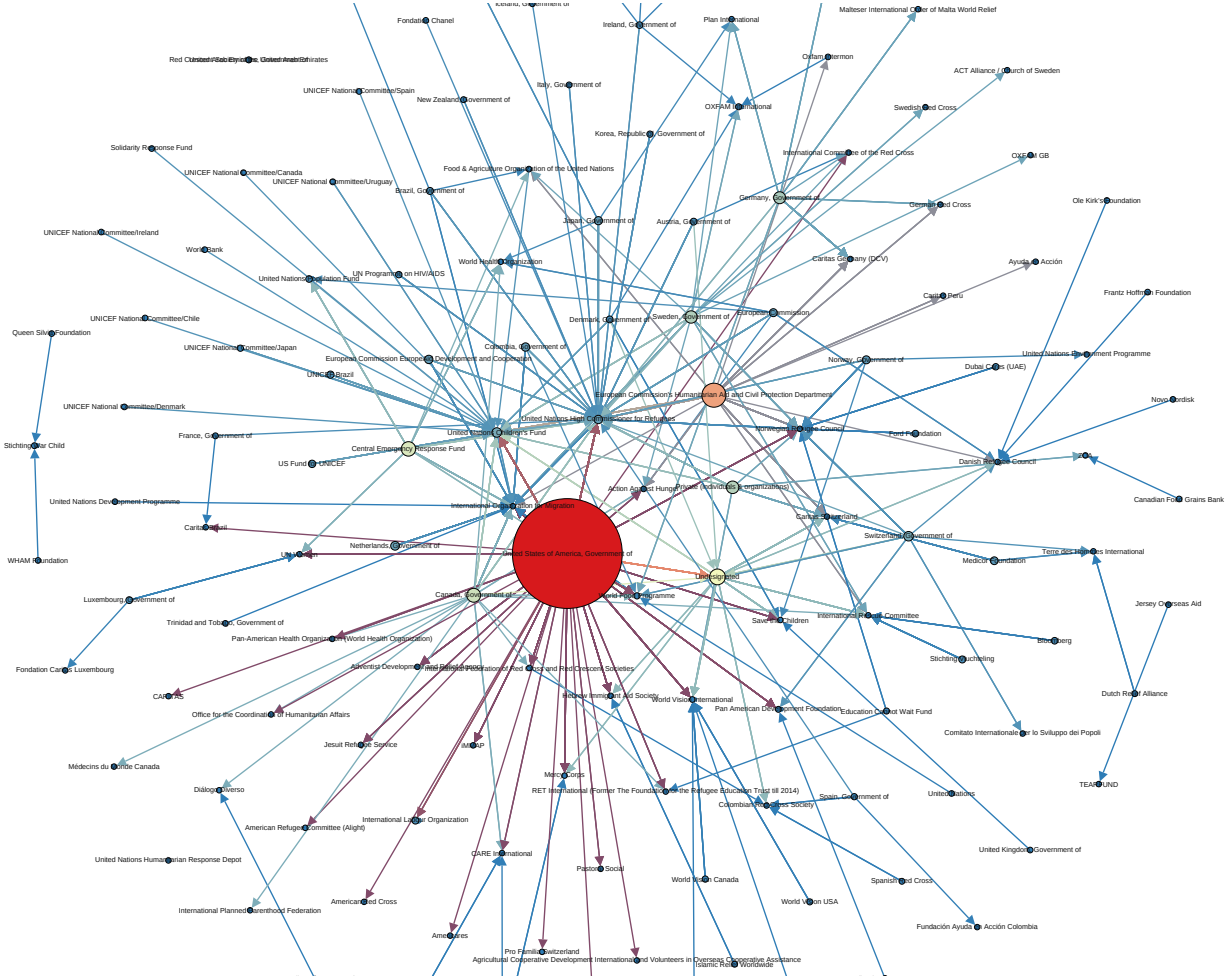

Figure A.1. Venezuelan refugee situation Gephi network visualization, with U.S. involvement included.

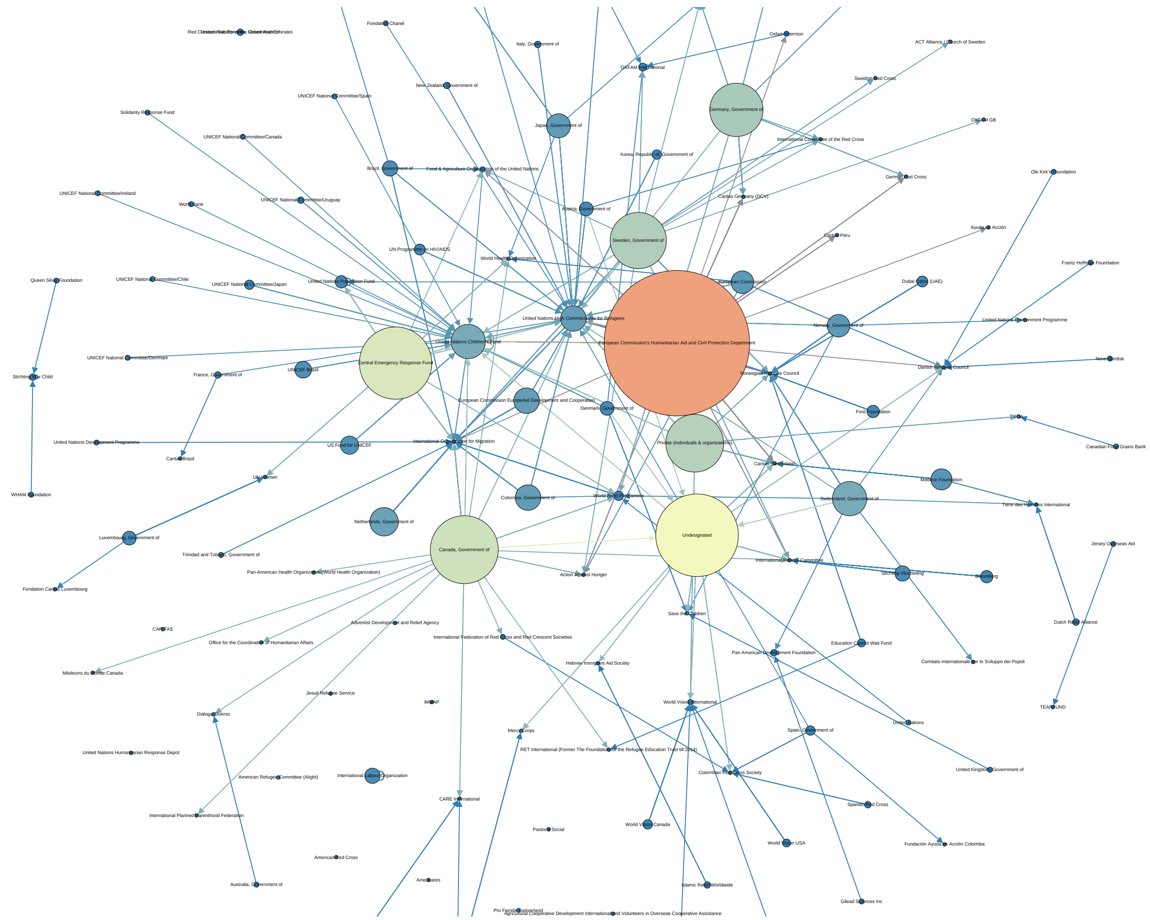

Figure A.2. Venezuelan refugee situation Gephi network visualization, with U.S. involvement excluded.

APPENDIX B

Table B.1. *Syrian Refugee Situation Node Statistics, with U.S. involvement*

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
ACT Alliance / DanChurchAid	1	0	0.00061	0.00042
ACT Alliance / Finn Church Aid	15	0	0.00163	0.01085
ACT Alliance / Lutheran World Federation	18	0	0.00193	0.02155
Action Contre la Faim	37	2	0.00306	0.02291
ActionAid International	4	0	0.00099	0.00199
Adventist Development and Relief Agency	9	0	0.00123	0.00968
Agency for Technical Cooperation and Development	38	0	0.00374	0.03186
Al Hussein Society Jordan Center for Training and Inclusion (AHS)	1	0	0.00065	0.00011
AMEL - Lebanese Association for Popular Action	16	0	0.00165	0.01361
American Friends of UNRWA	0	2	0.00067	0.00206
American Near East Refugee Aid	19	0	0.00215	0.02928
Americares	0	2	0.00074	0.00028
Ana Aqra Association	4	0	0.00080	0.00439
Andorra, Government of	0	1	0.00061	0.00272
Arab Gulf Programme for United Nations Development Organizations	0	2	0.00072	0.00024
Arche Nova E.V. - Initiative for People in Need	1	0	0.00061	0.00165
ARCS ARCI Cultura e Sviluppo	2	0	0.00072	0.00176
Argentina, Government of	0	1	0.00061	0.00282
Association for Aid and Relief Japan	1	0	0.00061	0.00124
Association for the Advancement of Democratic Rights-Legal Aid	1	0	0.00063	0.00039
Association pour la Cooperation Technique et au Developpement	5	0	0.00090	0.00346
Associazione Volontari per il Servizio Internazionale	18	1	0.00173	0.01209
Australia, Government of	0	114	0.00897	0.16166
Austria, Government of	0	20	0.00293	0.03214
Bahrain, Government of	0	1	0.00061	0.00272
Belgium, Government of	0	41	0.00368	0.05306
Big Heart Foundation	0	1	0.00061	0.00272
Bill and Melinda Gates Foundation	0	2	0.00067	0.00564
Brazil, Government of	0	2	0.00067	0.00543

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Bulgaria, Government of	0	1	0.00060	0.00246
Canada, Government of	0	288	0.01995	0.43463
CARE Austria	1	0	0.00067	0.00012
CARE International	86	0	0.00645	0.08941
CARITAS	66	0	0.00750	0.03865
Caritas Austria	1	0	0.00067	0.00012
Caritas Lebanon Migrants Center	13	0	0.00144	0.01496
Caritas Switzerland	2	8	0.00154	0.00135
Catholic Relief Services	12	1	0.00137	0.01811
Center for Victims of Torture	7	0	0.00159	0.01149
Central Emergency Response Fund	0	90	0.00645	0.15769
Chaine du Bonheur	0	2	0.00071	0.00029
Chile, Government of	0	1	0.00061	0.00272
China, Government of	0	11	0.00124	0.01281
COFRA	0	3	0.00081	0.00029
Comitato di Coordinamento delle Organizzazione per il Servizio Volontario	1	0	0.00061	0.00048
Comitato Internationale per lo Sviluppo dei Popoli	2	0	0.00070	0.00063
Concern Worldwide	14	0	0.00156	0.01199
Cooperazione Internazionale - COOPI	2	0	0.00068	0.00100
Cyprus, Government of	0	6	0.00092	0.01395
Czech Republic, Government of	0	18	0.00235	0.02810
Danish Refugee Council	122	0	0.00849	0.10694
Denmark, Government of	0	136	0.01015	0.13886
Deutsche Gesellschaft for Internationale Zusammenarbeit	0	2	0.00067	0.00080
Deutsche Welthungerhilfe e.V. (German Agro Action)	2	0	0.00067	0.00330
Disasters Emergency Committee (UK)	0	12	0.00163	0.00193
Dorcas Aid International	1	0	0.00061	0.00051
Ecuador, Government of	0	1	0.00061	0.00032
Education Above All Foundation	0	8	0.00183	0.00288
Estonia, Government of	0	39	0.00308	0.09829
EU Regional Trust Fund in Response to the Syrian Crisis (Madad Fund)	0	1	0.00062	0.00019
European Commission	0	182	0.01454	0.17189
European Commission - EU Facility for Refugees in Turkey	0	29	0.00288	0.05849

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
European Commission Directorate General for Development	0	2	0.00067	0.00324
European Commission Directorate-General External Relations	0	1	0.00061	0.00272
European Commission EuropeAid Development and Cooperation	0	22	0.00218	0.04007
European Commission's Humanitarian Aid and Civil Protection Department	0	294	0.02113	0.28836
Evangelisches Werk for Diakonie und Entwicklung e.V.	1	0	0.00063	0.00019
Finland, Government of	0	59	0.00462	0.10872
Food & Agriculture Organization of the United Nations	35	7	0.00286	0.02521
Ford Foundation	0	4	0.00086	0.00085
France, Government of	0	180	0.01324	0.28606
Friends of UNFPA	0	1	0.00061	0.00051
Fundacion Alianza por Los Derechos, la Igualdad y la Solidaridad Internacional	4	0	0.00084	0.00273
Fundacion Promocion Social de la Cultura	11	0	0.00141	0.00718
Germany, Government of	0	324	0.02504	0.60302
Global Fund to Fight AIDS, Tuberculosis and Malaria	0	14	0.00142	0.00958
Greece, Government of	0	3	0.00074	0.00825
Gruppo Volontariato Civile	14	0	0.00151	0.01054
Handicap International / Humanity & Inclusion	73	0	0.00536	0.07556
Heartland Alliance International	2	0	0.00067	0.00230
HelpAge International	2	0	0.00067	0.00330
HelpAge International UK	1	0	0.00065	0.00011
Hilfswerk Austria International	1	0	0.00062	0.00150
Hilti Foundation	0	2	0.00074	0.00028
Himaya Daee Aataa Association	2	0	0.00069	0.00300
Holy See, Government of	0	3	0.00074	0.00815
Humedica	3	0	0.00076	0.00369
Hungary, Government of	0	8	0.00108	0.01378
Iceland, Government of	0	14	0.00154	0.02119
IKEA Foundation	0	4	0.00080	0.00377
India, Government of	0	2	0.00074	0.00022
Intel	0	1	0.00061	0.00103
International Catholic Migration Commission	19	0	0.00189	0.02677
International Labour Organization	86	6	0.00657	0.08253

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
International Medical Corps	63	0	0.00473	0.08564
International Organization for Migration	171	0	0.01255	0.24417
International Orthodox Christian Charities	24	0	0.00251	0.02811
International Relief and Development	7	0	0.00099	0.01654
International Rescue Committee	86	0	0.00638	0.08844
International Volunteer Center of Yamagata	2	0	0.00068	0.00247
INTERSOS Humanitarian Aid Organization	23	2	0.00230	0.00899
Iraq Humanitarian Fund	0	6	0.00112	0.00416
Iraq, Government of	0	1	0.00061	0.00272
Ireland, Government of	0	66	0.00547	0.10627
Islamic Relief Jordan	1	0	0.00061	0.00040
Islamic Relief Worldwide	41	0	0.00391	0.05272
Isle of Man	0	2	0.00067	0.00543
Italy, Government of	0	118	0.00979	0.16532
Japan Campaign for Children of Palestine	5	0	0.00088	0.00619
Japan Emergency NGO	10	0	0.00127	0.01257
Japan, Government of	0	298	0.02389	0.44252
Jordan Health Aid Society	7	0	0.00113	0.00745
Jordan Humanitarian Fund	15	78	0.01217	0.02231
Jordan paramedic society	6	0	0.00117	0.00204
JORDAN RIVER FOUNDATION	2	0	0.00077	0.00022
Jordan Women Union-Un Ponte Per	1	0	0.00065	0.00011
Jordan, Government of	0	1	0.00061	0.00032
KAFA Enough Violence and Exploitation	2	0	0.00068	0.00072
KFW Development	0	12	0.00136	0.00307
Kokkyo naki Kodomotachi (Children without Borders)	6	0	0.00097	0.00821
Korea, Republic of, Government of	0	47	0.00356	0.10801
Kuwait Foundation for the Advancement of Science	0	1	0.00061	0.00282
Kuwait Fund for Arab Economic Development	0	2	0.00067	0.00305
Kuwait Red Crescent Society	0	1	0.00060	0.00246
Kuwait, Government of	0	141	0.00967	0.27364
Latvia, Government of	0	4	0.00080	0.01061
Leb Relief	3	0	0.00074	0.00364
Lebanese Association for Development Al Majmoua	1	0	0.00062	0.00150

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Lebanese Society for Educational and Social Development	2	0	0.00071	0.00132
Lebanon Humanitarian Fund	45	20	0.00675	0.02718
Leopold Bachmann Foundation	0	4	0.00093	0.00057
Les Amis du Liban	0	0	0.00054	0.00000
Liechtenstein, Government of	0	1	0.00061	0.00272
Lithuania, Government of	0	5	0.00086	0.01307
Luxembourg, Government of	0	39	0.00318	0.06718
Madrasati Initiative	2	0	0.00074	0.00050
Makassed Philanthropic Islamic Association of Beirut	5	0	0.00093	0.00517
Malta, Government of	0	10	0.00119	0.02665
MEDAIR	52	0	0.00508	0.04050
Medecins du Monde	11	0	0.00125	0.01240
Medical Aid for Palestinians	3	0	0.00080	0.00228
Medical Teams International	3	0	0.00075	0.00480
Mercy Corps	66	1	0.00520	0.07728
Mercy Without Limits	1	0	0.00062	0.00150
Mexico, Government of	0	7	0.00097	0.01782
Middle East Children,Äôs Institute	2	0	0.00069	0.00300
Mines Advisory Group	6	0	0.00096	0.00727
Monaco, Government of	0	10	0.00119	0.02017
Movimiento por la Paz, el Desarme y la Libertad	7	0	0.00106	0.00396
Muslim Aid	1	0	0.00063	0.00039
National Commission for Lebanese Women	0	1	0.00061	0.00051
Netherlands, Government of	0	105	0.00831	0.17711
New Zealand, Government of	0	11	0.00178	0.02307
NGOs (details not yet provided)	0	0	0.00054	0.00000
Nippon International Cooperation for Community Development	7	0	0.00103	0.00918
Norway, Government of	0	254	0.01824	0.41309
Norwegian Refugee Council	179	1	0.01340	0.17740
Oak Foundation	0	1	0.00061	0.00035
Office for the Coordination of Humanitarian Affairs	11	1	0.00137	0.01505
OPEC Fund for International Development	0	2	0.00069	0.00050
Operation Mercy	1	0	0.00063	0.00039
OXFAM	57	0	0.00444	0.05100

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
OXFAM GB	24	0	0.00266	0.01399
Partners Turkey	46	0	0.00356	0.05674
Pathfinder International	1	0	0.00060	0.00269
PCPM - Polish Center for International Aid	8	0	0.00135	0.00354
Peace Winds Japan	4	0	0.00082	0.00521
People in Need	2	0	0.00080	0.00018
Philippines, Government of	0	2	0.00067	0.00543
Plan International	12	0	0.00136	0.00651
Poland, Government of	0	17	0.00220	0.02253
Portugal, Government of	0	4	0.00080	0.01071
Premiere Urgence - Aide Medicale Internationale (from 2011 to 2015)	28	0	0.00234	0.03388
Premiere Urgence Internationale	10	0	0.00123	0.00970
Private (individuals & organizations)	0	491	0.04323	0.52517
Qatar Charity	0	2	0.00070	0.00311
Qatar Red Crescent Society	21	1	0.00231	0.01008
Qatar, Government of	0	30	0.00288	0.03593
Questscope	3	0	0.00080	0.00319
REACH Initiative	1	0	0.00061	0.00165
Relief International	21	1	0.00196	0.03087
Restart Center for Rehabilitation of Victims of Violence and Torture	4	0	0.00082	0.00285
RET International (Former The Foundation for the Refugee Education Trust till 2014)	1	0	0.00060	0.00269
Right to Play	1	0	0.00060	0.00115
Romania, Government of	0	4	0.00079	0.01035
Royal Health Awareness Society	1	0	0.00065	0.00011
Rural Initiatives in Sustainability and Empowerment	0	1	0.00063	0.00012
Russian Federation, Government of	0	11	0.00125	0.02921
Samsung Group	0	1	0.00061	0.00051
Saudi Arabia (Kingdom of), Government of	0	32	0.00283	0.06496
Save the Children	117	0	0.00892	0.11615
Search for Common Ground	4	0	0.00082	0.00469
Secours Islamique France	6	0	0.00094	0.00620
Slovakia, Government of	0	8	0.00132	0.01650
Slovenia, Government of	0	3	0.00073	0.00789
Social Humanitarian Economical Intervention for Local Development	3	0	0.00076	0.00205

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Solidar Suisse	1	0	0.00062	0.00150
Solidarites International	16	0	0.00157	0.01293
Solidarity Response Fund	0	2	0.00067	0.00564
Sonbola Group for Education and Development	1	0	0.00074	0.00004
Spain, Government of	0	78	0.00672	0.14095
Sweden, Government of	0	133	0.01041	0.13112
Swiss Solidarity	0	3	0.00082	0.00043
Switzerland, Government of	0	143	0.01071	0.19014
Syria Cross-border Humanitarian Fund	22	0	0.00198	0.01668
Taghyeer	1	0	0.00063	0.00039
Taiwan International Cooperation and Development Fund	0	4	0.00083	0.00077
TEAR Fund New Zealand	1	0	0.00068	0.00009
Technisches Hilfswerk (THW)	2	0	0.00067	0.00330
Terre des Hommes - Italy	26	0	0.00235	0.01593
Terre des Hommes - Lausanne	3	0	0.00080	0.00311
Terre des Hommes International	10	0	0.00130	0.00752
The Asfari Foundation	0	1	0.00061	0.00103
Triangle Generation Humanitaire	4	0	0.00082	0.00431
Turkey, Government of	0	4	0.00078	0.00983
UN Action Against Sexual Violence in Conflict	0	1	0.00061	0.00272
UN Agencies	2	0	0.00068	0.00315
UN Foundation	0	1	0.00063	0.00011
UN Human Security Trust Fund	0	1	0.00061	0.00282
Un Ponte Per	9	0	0.00152	0.00317
UN Voluntary Trust Fund for Technical Cooperation	0	1	0.00074	0.00006
UN Women	21	6	0.00241	0.01943
Undesignated	19	124	0.01467	0.12691
UNICEF National Committee/Andorra	0	2	0.00067	0.00564
UNICEF National Committee/Australia	0	10	0.00120	0.02818
UNICEF National Committee/Austria	0	7	0.00100	0.01972
UNICEF National Committee/Belgium	0	2	0.00067	0.00564
UNICEF National Committee/Canada	0	8	0.00107	0.02254
UNICEF National Committee/Denmark	0	17	0.00166	0.04790
UNICEF National Committee/Finland	0	1	0.00061	0.00282
UNICEF National Committee/France	0	14	0.00146	0.03945

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
UNICEF National Committee/Germany	0	54	0.00408	0.15215
UNICEF National Committee/Hong Kong	0	2	0.00067	0.00564
UNICEF National Committee/Iceland	0	5	0.00087	0.01409
UNICEF National Committee/Indonesia	0	1	0.00061	0.00282
UNICEF National Committee/Israel	0	1	0.00061	0.00282
UNICEF National Committee/Italy	0	14	0.00146	0.03945
UNICEF National Committee/Japan	0	19	0.00179	0.05354
UNICEF National Committee/Korea (Republic of)	0	8	0.00107	0.02254
UNICEF National Committee/Luxembourg	0	3	0.00074	0.00845
UNICEF National Committee/Netherlands	0	30	0.00251	0.08453
UNICEF National Committee/New Zealand	0	8	0.00107	0.02254
UNICEF National Committee/Norway	0	17	0.00166	0.04790
UNICEF National Committee/Portugal	0	2	0.00067	0.00564
UNICEF National Committee/Spain	0	16	0.00159	0.04508
UNICEF National Committee/Sweden	0	18	0.00172	0.05072
UNICEF National Committee/Switzerland	0	3	0.00074	0.00845
UNICEF National Committee/Turkey	0	4	0.00081	0.01127
UNICEF National Committee/United Kingdom	0	26	0.00224	0.07326
Union of Relief and Development Association	1	0	0.00062	0.00150
United Arab Emirates, Government of	0	25	0.00213	0.05644
United Kingdom, Government of	0	303	0.02059	0.38436
United Nations Children's Fund	1110	41	0.08592	1.00000
United Nations Development Programme	105	5	0.00853	0.10653
United Nations Educational, Scientific and Cultural Organization	21	3	0.00229	0.00848
United Nations High Commissioner for Refugees	971	13	0.07523	0.97269
United Nations Human Settlements Programme (UN-HABITAT)	11	0	0.00127	0.00825
United Nations Industrial Development Organization	2	0	0.00068	0.00247
United Nations Joint Programme on HIV/AIDS	0	2	0.00067	0.00543
United Nations Office for Project Services	9	0	0.00116	0.01114
United Nations Office on Drugs and Crime	2	0	0.00068	0.00175
United Nations Population Fund	133	18	0.00974	0.17908
United Nations Relief and Works Agency for Palestine Refugees in the Near East	282	0	0.02106	0.36858

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
United States of America, Government of	0	625	0.04419	0.97805
Uruguay, Government of	0	1	0.00061	0.00069
US Fund for UNICEF	0	70	0.00512	0.19724
Vento di Terra	2	0	0.00069	0.00198
War Child Canada	3	0	0.00075	0.00569
War Child Holland	6	0	0.00096	0.00460
War Child UK	6	0	0.00097	0.00916
World Bank	0	1	0.00061	0.00052
World Food Programme	783	17	0.05495	0.89122
World Health Organization	73	0	0.00546	0.07599
World Rehabilitation Fund	1	0	0.00063	0.00011
World Relief	4	0	0.00082	0.00469
World Relief Deutschland e.V.	4	0	0.00086	0.00296
World Vision International	64	0	0.00604	0.05698

Table B.2. *Syrian Refugee Situation Node Statistics, without U.S. involvement*

Label	***Weighted In-Degree***	***Weighted Out-Degree***	***Pagerank***	***Eigenvector Centrality***
ACT Alliance / DanChurchAid	1	0	0.00062	0.00061
ACT Alliance / Finn Church Aid	15	0	0.00175	0.01558
ACT Alliance / Lutheran World Federation	18	0	0.00208	0.03102
Action Contre la Faim	37	2	0.00333	0.03262
ActionAid International	4	0	0.00103	0.00286
Adventist Development and Relief Agency	9	0	0.00131	0.01368
Agency for Technical Cooperation and Development	36	0	0.00391	0.03784
Al Hussein Society Jordan Center for Training and Inclusion (AHS)	1	0	0.00067	0.00016
AMEL - Lebanese Association for Popular Action	16	0	0.00177	0.01959
American Friends of UNRWA	0	2	0.00069	0.00225
American Near East Refugee Aid	16	0	0.00211	0.03056
Americares	0	2	0.00076	0.00038
Ana Aqra Association	3	0	0.00077	0.00243
Andorra, Government of	0	1	0.00062	0.00310
Arab Gulf Programme for United Nations Development Organizations	0	2	0.00074	0.00037
Arche Nova E.V. - Initiative for People in Need	1	0	0.00062	0.00239
ARCS ARCI Cultura e Sviluppo	2	0	0.00074	0.00254
Argentina, Government of	0	1	0.00062	0.00340
Association for Aid and Relief Japan	1	0	0.00062	0.00173
Association for the Advancement of Democratic Rights-Legal Aid	1	0	0.00065	0.00056
Association pour la Cooperation Technique et au Developpement	5	0	0.00094	0.00494
Associazione Volontari per il Servizio Internazionale	18	1	0.00186	0.01717
Australia, Government of	0	114	0.01002	0.19383
Austria, Government of	0	20	0.00314	0.03730
Bahrain, Government of	0	1	0.00062	0.00310
Belgium, Government of	0	41	0.00401	0.06229
Big Heart Foundation	0	1	0.00062	0.00310
Bill and Melinda Gates Foundation	0	2	0.00069	0.00680
Brazil, Government of	0	2	0.00070	0.00621
Bulgaria, Government of	0	1	0.00062	0.00308

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Canada, Government of	0	288	0.02227	0.51948
CARE Austria	1	0	0.00068	0.00016
CARE International	80	0	0.00667	0.10507
CARITAS	63	0	0.00781	0.04380
Caritas Austria	1	0	0.00068	0.00016
Caritas Lebanon Migrants Center	11	0	0.00141	0.01374
Caritas Switzerland	2	8	0.00163	0.00182
Catholic Relief Services	8	1	0.00120	0.01053
Center for Victims of Torture	4	0	0.00156	0.00492
Central Emergency Response Fund	0	90	0.00724	0.18357
Chaine du Bonheur	0	2	0.00073	0.00046
Chile, Government of	0	1	0.00062	0.00310
China, Government of	0	11	0.00134	0.01481
COFRA	0	3	0.00084	0.00044
Comitato di Coordinamento delle Organizzazione per il Servizio Volontario	1	0	0.00063	0.00068
Comitato Internationale per lo Sviluppo dei Popoli	2	0	0.00072	0.00088
Concern Worldwide	14	0	0.00166	0.01717
Cooperazione Internazionale - COOPI	2	0	0.00070	0.00139
Cyprus, Government of	0	6	0.00098	0.01659
Czech Republic, Government of	0	18	0.00250	0.03257
Danish Refugee Council	113	0	0.00875	0.11881
Denmark, Government of	0	136	0.01121	0.17025
Deutsche Gesellschaft for Internationale Zusammenarbeit	0	2	0.00069	0.00107
Deutsche Welthungerhilfe e.V. (German Agro Action)	2	0	0.00069	0.00478
Disasters Emergency Committee (UK)	0	12	0.00172	0.00287
Dorcas Aid International	1	0	0.00062	0.00072
Ecuador, Government of	0	1	0.00063	0.00038
Education Above All Foundation	0	8	0.00191	0.00365
Estonia, Government of	0	39	0.00343	0.11761
EU Regional Trust Fund in Response to the Syrian Crisis (Madad Fund)	0	1	0.00064	0.00029
European Commission	0	182	0.01626	0.20012
European Commission - EU Facility for Refugees in Turkey	0	29	0.00313	0.06950

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
European Commission Directorate General for Development	0	2	0.00069	0.00383
European Commission Directorate-General External Relations	0	1	0.00062	0.00310
European Commission EuropeAid Development and Cooperation	0	22	0.00235	0.04769
European Commission's Humanitarian Aid and Civil Protection Department	0	294	0.02354	0.34094
Evangelisches Werk for Diakonie und Entwicklung e.V.	1	0	0.00064	0.00026
Finland, Government of	0	59	0.00507	0.13072
Food & Agriculture Organization of the United Nations	33	7	0.00299	0.02768
Ford Foundation	0	4	0.00093	0.00082
France, Government of	0	180	0.01467	0.34780
Friends of UNFPA	0	1	0.00063	0.00043
Fundacion Alianza por Los Derechos, la Igualdad y la Solidaridad Internacional	4	0	0.00087	0.00386
Fundacion Promocion Social de la Cultura	11	0	0.00149	0.01021
Germany, Government of	0	324	0.02756	0.73105
Global Fund to Fight AIDS, Tuberculosis and Malaria	0	14	0.00158	0.00740
Greece, Government of	0	3	0.00077	0.00961
Gruppo Volontariato Civile	14	0	0.00163	0.01498
Handicap International / Humanity & Inclusion	68	0	0.00555	0.08906
Heartland Alliance International	2	0	0.00068	0.00329
HelpAge International	2	0	0.00069	0.00478
HelpAge International UK	1	0	0.00067	0.00016
Hilfswerk Austria International	1	0	0.00063	0.00216
Hilti Foundation	0	2	0.00076	0.00038
Himaya Daee Aataa Association	2	0	0.00071	0.00432
Holy See, Government of	0	3	0.00077	0.00931
Humedica	3	0	0.00079	0.00534
Hungary, Government of	0	8	0.00115	0.01591
Iceland, Government of	0	14	0.00165	0.02503
IKEA Foundation	0	4	0.00084	0.00455
India, Government of	0	2	0.00076	0.00033
Intel	0	1	0.00062	0.00113
International Catholic Migration Commission	11	0	0.00151	0.00739

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
International Labour Organization	72	6	0.00626	0.06333
International Medical Corps	49	0	0.00427	0.06882
International Organization for Migration	121	0	0.01047	0.14903
International Orthodox Christian Charities	21	0	0.00250	0.02887
International Relief and Development	1	0	0.00065	0.00056
International Rescue Committee	77	0	0.00641	0.09220
International Volunteer Center of Yamagata	2	0	0.00070	0.00346
INTERSOS Humanitarian Aid Organization	23	2	0.00246	0.01272
Iraq Humanitarian Fund	0	6	0.00117	0.00483
Iraq, Government of	0	1	0.00062	0.00310
Ireland, Government of	0	66	0.00596	0.12848
Islamic Relief Jordan	1	0	0.00062	0.00057
Islamic Relief Worldwide	41	0	0.00424	0.07600
Isle of Man	0	2	0.00070	0.00621
Italy, Government of	0	118	0.01073	0.19507
Japan Campaign for Children of Palestine	5	0	0.00092	0.00866
Japan Emergency NGO	10	0	0.00136	0.01786
Japan, Government of	0	298	0.02634	0.51558
Jordan Health Aid Society	7	0	0.00120	0.01068
Jordan Humanitarian Fund	15	78	0.01313	0.02926
Jordan paramedic society	6	0	0.00123	0.00294
JORDAN RIVER FOUNDATION	2	0	0.00079	0.00031
Jordan Women Union-Un Ponte Per	1	0	0.00067	0.00016
Jordan, Government of	0	1	0.00063	0.00038
KAFA Enough Violence and Exploitation	2	0	0.00070	0.00103
KFW Development	0	12	0.00149	0.00303
Kokkyo naki Kodomotachi (Children without Borders)	6	0	0.00102	0.01168
Korea, Republic of, Government of	0	47	0.00394	0.12911
Kuwait Foundation for the Advancement of Science	0	1	0.00062	0.00340
Kuwait Fund for Arab Economic Development	0	2	0.00069	0.00366
Kuwait Red Crescent Society	0	1	0.00062	0.00308
Kuwait, Government of	0	141	0.01084	0.32045
Latvia, Government of	0	4	0.00084	0.01239
Leb Relief	2	0	0.00070	0.00135
Lebanese Association for Development Al Majmoua	1	0	0.00063	0.00216

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Lebanese Society for Educational and Social Development	2	0	0.00073	0.00188
Lebanon Humanitarian Fund	45	20	0.00723	0.03735
Leopold Bachmann Foundation	0	4	0.00097	0.00075
Les Amis du Liban	0	0	0.00055	0.00000
Liechtenstein, Government of	0	1	0.00062	0.00310
Lithuania, Government of	0	5	0.00090	0.01547
Luxembourg, Government of	0	39	0.00350	0.08030
Madrasati Initiative	2	0	0.00077	0.00072
Makassed Philanthropic Islamic Association of Beirut	4	0	0.00092	0.00356
Malta, Government of	0	10	0.00127	0.03100
MEDAIR	52	0	0.00550	0.05793
Medecins du Monde	10	0	0.00127	0.01399
Medical Aid for Palestinians	3	0	0.00083	0.00328
Medical Teams International	3	0	0.00078	0.00694
Mercy Corps	57	1	0.00510	0.07600
Mercy Without Limits	1	0	0.00063	0.00216
Mexico, Government of	0	7	0.00103	0.02191
Middle East Children,Äôs Institute	2	0	0.00071	0.00432
Mines Advisory Group	6	0	0.00101	0.01044
Monaco, Government of	0	10	0.00128	0.02356
Movimiento por la Paz, el Desarme y la Libertad	7	0	0.00111	0.00557
Muslim Aid	1	0	0.00065	0.00056
National Commission for Lebanese Women	0	1	0.00063	0.00043
Netherlands, Government of	0	105	0.00921	0.20965
New Zealand, Government of	0	11	0.00187	0.02801
NGOs (details not yet provided)	0	0	0.00055	0.00000
Nippon International Cooperation for Community Development	7	0	0.00109	0.01298
Norway, Government of	0	254	0.02029	0.49385
Norwegian Refugee Council	167	1	0.01388	0.20784
Oak Foundation	0	1	0.00062	0.00048
Office for the Coordination of Humanitarian Affairs	7	1	0.00119	0.00602
OPEC Fund for International Development	0	2	0.00072	0.00066
Operation Mercy	1	0	0.00065	0.00056
OXFAM	57	0	0.00489	0.07304

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
OXFAM GB	24	0	0.00283	0.02005
Partners Turkey	40	0	0.00349	0.05805
Pathfinder International	0	0	0.00055	0.00000
PCPM - Polish Center for International Aid	8	0	0.00141	0.00505
Peace Winds Japan	4	0	0.00086	0.00736
People in Need	2	0	0.00082	0.00024
Philippines, Government of	0	2	0.00070	0.00621
Plan International	12	0	0.00145	0.00928
Poland, Government of	0	17	0.00233	0.02623
Portugal, Government of	0	4	0.00084	0.01269
Premiere Urgence - Aide Medicale Internationale (from 2011 to 2015)	22	0	0.00215	0.02532
Premiere Urgence Internationale	9	0	0.00124	0.01004
Private (individuals & organizations)	0	491	0.04784	0.63377
Qatar Charity	0	2	0.00072	0.00367
Qatar Red Crescent Society	21	1	0.00247	0.01400
Qatar, Government of	0	30	0.00310	0.04195
Questscope	2	0	0.00077	0.00072
REACH Initiative	1	0	0.00062	0.00239
Relief International	12	1	0.00152	0.00943
Restart Center for Rehabilitation of Victims of Violence and Torture	4	0	0.00086	0.00408
RET International (Former The Foundation for the Refugee Education Trust till 2014)	0	0	0.00055	0.00000
Right to Play	1	0	0.00062	0.00164
Romania, Government of	0	4	0.00083	0.01237
Royal Health Awareness Society	1	0	0.00067	0.00016
Rural Initiatives in Sustainability and Empowerment	0	1	0.00064	0.00016
Russian Federation, Government of	0	11	0.00134	0.03437
Samsung Group	0	1	0.00063	0.00043
Saudi Arabia (Kingdom of), Government of	0	32	0.00316	0.07665
Save the Children	109	0	0.00924	0.13567
Search for Common Ground	3	0	0.00079	0.00286
Secours Islamique France	6	0	0.00099	0.00895
Slovakia, Government of	0	8	0.00140	0.01914
Slovenia, Government of	0	3	0.00076	0.00929
Social Humanitarian Economical Intervention for Local Development	3	0	0.00079	0.00292

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Solidar Suisse	1	0	0.00063	0.00216
Solidarites International	16	0	0.00169	0.01839
Solidarity Response Fund	0	2	0.00069	0.00680
Sonbola Group for Education and Development	1	0	0.00075	0.00005
Spain, Government of	0	78	0.00733	0.16303
Sweden, Government of	0	133	0.01145	0.15950
Swiss Solidarity	0	3	0.00085	0.00061
Switzerland, Government of	0	143	0.01190	0.22683
Syria Cross-border Humanitarian Fund	22	0	0.00214	0.02390
Taghyeer	1	0	0.00065	0.00056
Taiwan International Cooperation and Development Fund	0	4	0.00087	0.00102
TEAR Fund New Zealand	1	0	0.00069	0.00013
Technisches Hilfswerk (THW)	2	0	0.00069	0.00478
Terre des Hommes - Italy	26	0	0.00255	0.02256
Terre des Hommes - Lausanne	3	0	0.00083	0.00448
Terre des Hommes International	10	0	0.00139	0.01077
The Asfari Foundation	0	1	0.00062	0.00113
Triangle Generation Humanitaire	4	0	0.00086	0.00619
Turkey, Government of	0	4	0.00082	0.01232
UN Action Against Sexual Violence in Conflict	0	1	0.00062	0.00310
UN Agencies	2	0	0.00070	0.00455
UN Foundation	0	1	0.00064	0.00017
UN Human Security Trust Fund	0	1	0.00062	0.00340
Un Ponte Per	9	0	0.00160	0.00453
UN Voluntary Trust Fund for Technical Cooperation	0	1	0.00088	0.00005
UN Women	21	6	0.00262	0.02681
Undesignated	18	124	0.01657	0.15503
UNICEF National Committee/Andorra	0	2	0.00069	0.00680
UNICEF National Committee/Australia	0	10	0.00128	0.03399
UNICEF National Committee/Austria	0	7	0.00106	0.02379
UNICEF National Committee/Belgium	0	2	0.00069	0.00680
UNICEF National Committee/Canada	0	8	0.00113	0.02719
UNICEF National Committee/Denmark	0	17	0.00179	0.05778
UNICEF National Committee/Finland	0	1	0.00062	0.00340
UNICEF National Committee/France	0	14	0.00157	0.04759

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
UNICEF National Committee/Germany	0	54	0.00449	0.18355
UNICEF National Committee/Hong Kong	0	2	0.00069	0.00680
UNICEF National Committee/Iceland	0	5	0.00091	0.01700
UNICEF National Committee/Indonesia	0	1	0.00062	0.00340
UNICEF National Committee/Israel	0	1	0.00062	0.00340
UNICEF National Committee/Italy	0	14	0.00157	0.04759
UNICEF National Committee/Japan	0	19	0.00194	0.06458
UNICEF National Committee/Korea (Republic of)	0	8	0.00113	0.02719
UNICEF National Committee/Luxembourg	0	3	0.00077	0.01020
UNICEF National Committee/Netherlands	0	30	0.00274	0.10197
UNICEF National Committee/New Zealand	0	8	0.00113	0.02719
UNICEF National Committee/Norway	0	17	0.00179	0.05778
UNICEF National Committee/Portugal	0	2	0.00069	0.00680
UNICEF National Committee/Spain	0	16	0.00172	0.05439
UNICEF National Committee/Sweden	0	18	0.00186	0.06118
UNICEF National Committee/Switzerland	0	3	0.00077	0.01020
UNICEF National Committee/Turkey	0	4	0.00084	0.01360
UNICEF National Committee/United Kingdom	0	26	0.00245	0.08838
Union of Relief and Development Association	1	0	0.00063	0.00216
United Arab Emirates, Government of	0	25	0.00233	0.06670
United Kingdom, Government of	0	303	0.02311	0.46600
United Nations Children's Fund	1004	41	0.08675	1.00000
United Nations Development Programme	93	5	0.00850	0.10332
United Nations Educational, Scientific and Cultural Organization	21	3	0.00245	0.01158
United Nations High Commissioner for Refugees	851	13	0.07423	0.91820
United Nations Human Settlements Programme (UN-HABITAT)	11	0	0.00136	0.01169
United Nations Industrial Development Organization	2	0	0.00070	0.00346
United Nations Joint Programme on HIV/AIDS	0	2	0.00070	0.00621
United Nations Office for Project Services	9	0	0.00123	0.01559
United Nations Office on Drugs and Crime	2	0	0.00070	0.00245
United Nations Population Fund	99	18	0.00836	0.11809
United Nations Relief and Works Agency for Palestine Refugees in the Near East	236	0	0.02000	0.33226

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Uruguay, Government of	0	1	0.00062	0.00053
US Fund for UNICEF	0	70	0.00566	0.23793
Vento di Terra	2	0	0.00071	0.00284
War Child Canada	2	0	0.00071	0.00432
War Child Holland	6	0	0.00102	0.00654
War Child UK	5	0	0.00096	0.00931
World Bank	0	1	0.00062	0.00073
World Food Programme	696	17	0.05471	0.93521
World Health Organization	63	0	0.00531	0.06961
World Rehabilitation Fund	1	0	0.00064	0.00017
World Relief	4	0	0.00086	0.00673
World Relief Deutschland e.V.	4	0	0.00090	0.00422
World Vision International	63	0	0.00648	0.07776

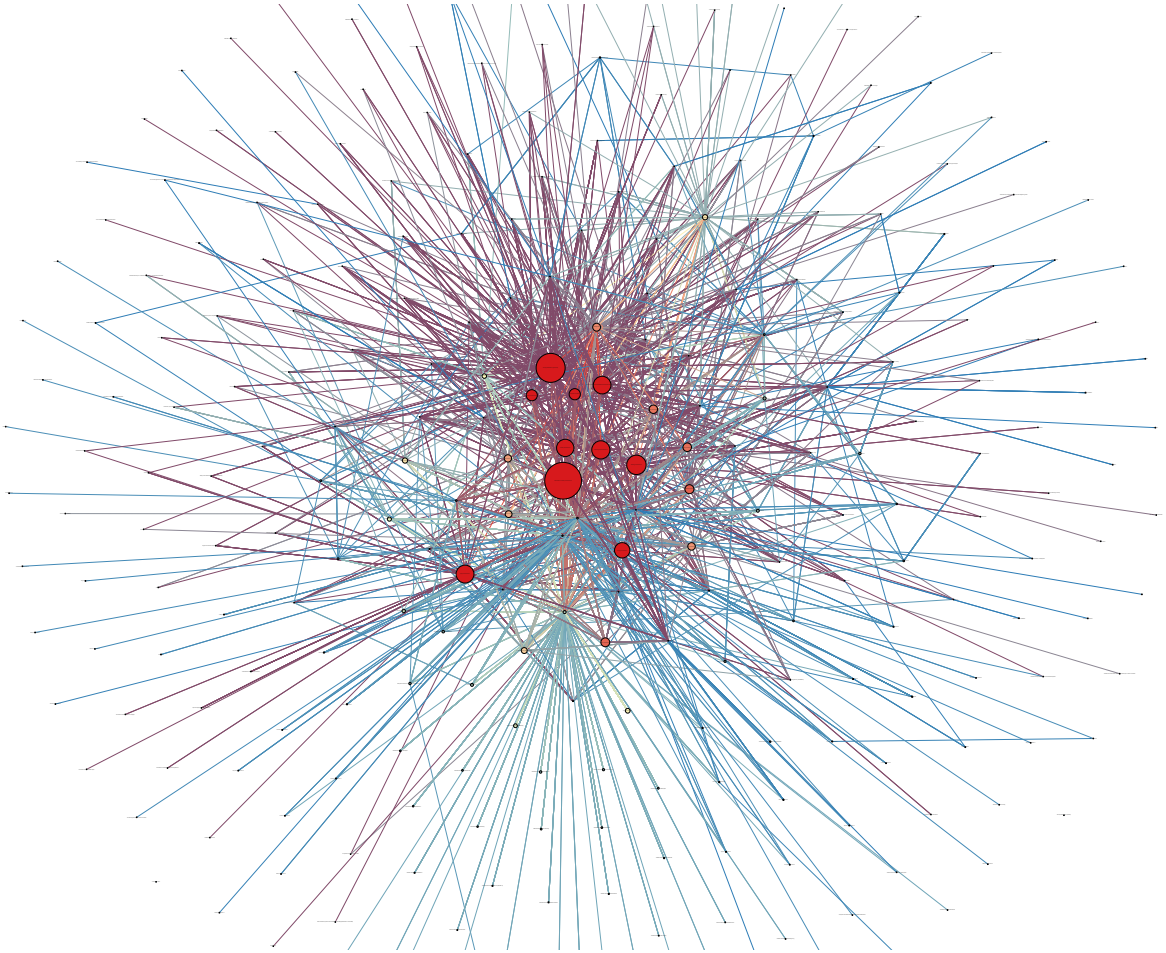

Figure B.1. Syrian refugee situation Gephi network visualization, with U.S. involvement included.

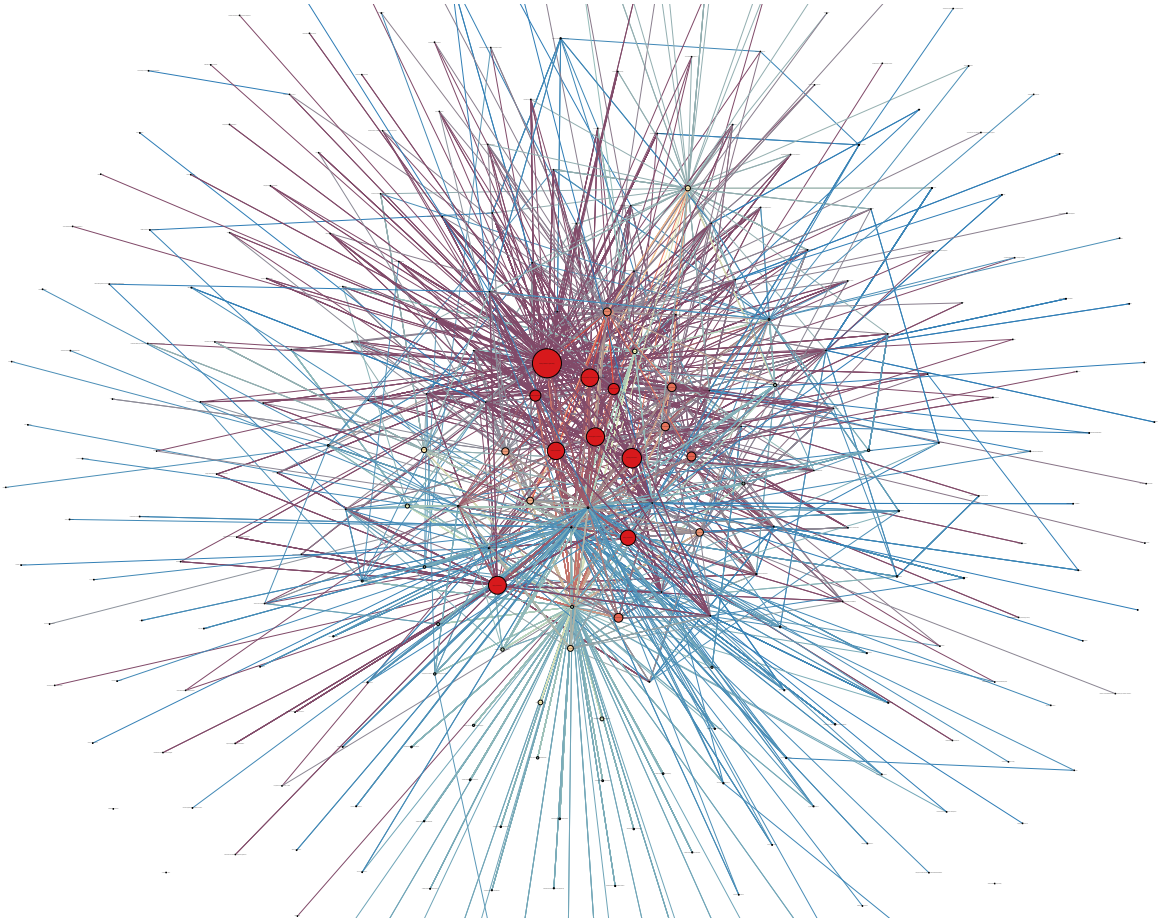

Figure B.2. Syrian refugee situation Gephi network visualization, with U.S. involvement excluded.

APPENDIX C

Table C.1. *Rohingya Refugee Situation Node Statistics, with U.S. involvement*

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
ACT Alliance / Christian Aid	2	0	0.00146	0.00250
ACT Alliance / DanChurchAid	2	0	0.00160	0.00042
ACT Alliance / Norwegian Church Aid	1	0	0.00131	0.00026
Action Against Hunger	14	0	0.00431	0.00851
Action Contre la Faim	19	0	0.00649	0.01475
Adventist Development and Relief Agency	1	0	0.00155	0.00010
Agency for Technical Cooperation and Development	1	0	0.00132	0.00037
Aktion Deutschland Hilft	0	2	0.00173	0.00045
Asian Development Bank	0	1	0.00125	0.00216
Association for Aid and Relief Japan	1	0	0.00126	0.00070
Australia, Government of	0	66	0.01737	0.09296
Austria, Government of	0	2	0.00142	0.00824
Bangladesh Red Crescent Society	1	0	0.00150	0.00009
Bangladesh, Government of	0	9	0.00299	0.01763
BBC Media Action	2	0	0.00151	0.00165
Bill and Melinda Gates Foundation	0	1	0.00149	0.00016
BRAC	23	0	0.01267	0.02356
Canada, Government of	0	72	0.02078	0.09380
CARE Bangladesh	1	0	0.00132	0.00037
CARE International	22	0	0.00907	0.03911
CARE Luxembourg	0	1	0.00138	0.00023
CARE USA	1	0	0.00124	0.00114
CARITAS	1	0	0.00155	0.00010
Caritas Bangladesh	3	0	0.00286	0.00021
CBM International (formerly Christian Blind Mission)	4	0	0.00307	0.00063
Central Emergency Response Fund	0	56	0.01407	0.09257
Children on the Edge	0	1	0.00474	0.00005
COAST Trust	4	0	0.00263	0.00026
Concern Worldwide	1	0	0.00149	0.00011
Conrad N. Hilton Foundation	0	1	0.00149	0.00016
COVID-19 Humanitarian Thematic Fund	0	1	0.00125	0.00216
Czech Republic, Government of	0	1	0.00124	0.00071

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Danish Emergency Relief Fund	0	2	0.00173	0.00045
Danish Refugee Council	8	0	0.00317	0.00293
Denmark, Government of	0	29	0.00973	0.03133
Dhaka Ahsania Mission	1	0	0.00171	0.00005
Disasters Emergency Committee (UK)	0	5	0.00275	0.00069
Education Above All Foundation	0	6	0.00482	0.00085
Education Cannot Wait Fund	0	3	0.00165	0.01040
Estonia, Government of	0	2	0.00142	0.00824
European Commission	0	22	0.00573	0.06497
European Commission's Humanitarian Aid and Civil Protection Department	0	77	0.02405	0.06544
Finland, Government of	0	1	0.00122	0.00412
Food & Agriculture Organization of the United Nations	10	0	0.00327	0.00630
France, Government of	0	13	0.00581	0.02021
Friends of UNFPA	0	3	0.00183	0.00054
Friendship	3	0	0.00236	0.00037
Friendship Luxembourg	1	0	0.00159	0.00008
Frontiers Ruwad Association	0	1	0.00132	0.00013
GAVI Alliance	0	2	0.00148	0.00432
Germany, Government of	0	33	0.01159	0.06487
Global Fund to Fight AIDS, Tuberculosis and Malaria	0	1	0.00149	0.00016
Global Partnership for Education	0	1	0.00125	0.00216
Handicap International / Humanity & Inclusion	8	0	0.00329	0.00405
HelpAge International UK	3	0	0.00168	0.00375
Helvetas Swiss Intercooperation	1	0	0.00172	0.00005
HumaniTerra International	1	0	0.00141	0.00014
International Federation of Red Cross and Red Crescent Societies	1	0	0.00127	0.00052
International Organization for Migration	152	5	0.03898	0.11854
International Rescue Committee	5	0	0.00222	0.00393
Ireland, Government of	0	7	0.00381	0.01297
Islamic Development Bank	0	6	0.00238	0.01296
Italy, Government of	0	4	0.00187	0.00875
Japan Platform	2	3	0.00244	0.00187
Japan, Government of	0	76	0.02125	0.13308
King Abdullah Foundation	0	1	0.00125	0.00216

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Korea, Republic of, Government of	0	17	0.00479	0.03235
Kuwait Red Crescent Society	2	0	0.00140	0.00897
Kuwait, Government of	0	7	0.00388	0.00989
Latter-Day Saint Charities	0	2	0.00165	0.00032
Luxembourg, Government of	0	9	0.00603	0.00636
Malteser International Order of Malta World Relief	1	0	0.00132	0.00037
Mukti Cox's Bazar	3	0	0.01312	0.00014
Netherlands, Government of	0	7	0.00256	0.01371
New Zealand, Government of	0	15	0.00924	0.01142
Norway, Government of	0	27	0.00899	0.04502
Norwegian Refugee Council	7	4	0.00519	0.00242
Office for the Coordination of Humanitarian Affairs	4	0	0.00231	0.00078
OXFAM	9	0	0.00347	0.00497
OXFAM GB	3	0	0.00208	0.00090
Peace Winds Japan	3	0	0.00174	0.00210
Peace Winds Japan	0	0	0.00103	0.00000
Plan International	5	0	0.00281	0.00139
Plan International Bangladesh	2	0	0.00153	0.00110
Portugal, Government of	0	1	0.00125	0.00216
Private (individuals & organizations)	0	315	0.06905	1.00000
Qatar, Government of	0	2	0.00144	0.00608
Radiohjelpen (Radio Aid Sweden)	0	2	0.00165	0.00032
Relief International	4	0	0.00203	0.00233
Russian Federation, Government of	0	2	0.00146	0.00392
Saudi Arabia (Kingdom of), Government of	0	12	0.00362	0.02096
Save the Children	55	2	0.01945	0.01604
Sheikh Thani bin Abdullah Foundation for Humanitarian Services (RAF)	0	1	0.00125	0.00216
Solidaridad Internacional	1	0	0.00124	0.00114
Solidarites International	10	0	0.00360	0.00476
Spain, Government of	0	6	0.00249	0.02066
Street Child Organization	0	1	0.00474	0.00005
Sweden, Government of	0	30	0.00866	0.03416
Swiss Solidarity	0	6	0.00493	0.00053
Switzerland, Government of	0	49	0.01319	0.08117

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
TEARFUND	1	0	0.00155	0.00010
Terre des Hommes - Lausanne	9	0	0.00374	0.00338
Thailand, Government of	0	6	0.00236	0.01081
Thani Bin Abdullah Bin Thani Al-Thani Humanitarian Fund	0	3	0.00173	0.00840
Turkey, Government of	0	1	0.00122	0.00412
UBS	0	1	0.00149	0.00016
UN Action Against Sexual Violence in Conflict	0	1	0.00124	0.00071
UN Foundation	0	0	0.00103	0.00000
UN Women	4	1	0.00220	0.00296
Undesignated	1	18	0.00625	0.02294
UNICEF National Committee/Australia	0	12	0.00373	0.02593
UNICEF National Committee/Austria	0	1	0.00125	0.00216
UNICEF National Committee/Belgium	0	12	0.00373	0.02593
UNICEF National Committee/Canada	0	10	0.00328	0.02161
UNICEF National Committee/Denmark	0	7	0.00261	0.01512
UNICEF National Committee/France	0	10	0.00328	0.02161
UNICEF National Committee/Germany	0	19	0.00531	0.04105
UNICEF National Committee/Hong Kong	0	11	0.00351	0.02377
UNICEF National Committee/Iceland	0	5	0.00215	0.01080
UNICEF National Committee/Italy	0	5	0.00215	0.01080
UNICEF National Committee/Japan	0	14	0.00419	0.03025
UNICEF National Committee/Korea (Republic of)	0	1	0.00125	0.00216
UNICEF National Committee/Luxembourg	0	7	0.00261	0.01512
UNICEF National Committee/Mexico	0	1	0.00125	0.00216
UNICEF National Committee/Netherlands	0	6	0.00238	0.01296
UNICEF National Committee/New Zealand	0	7	0.00261	0.01512
UNICEF National Committee/Portugal	0	5	0.00215	0.01080
UNICEF National Committee/Spain	0	14	0.00419	0.03025
UNICEF National Committee/Switzerland	0	4	0.00193	0.00864
UNICEF National Committee/Turkey	0	1	0.00125	0.00216
UNICEF National Committee/United Kingdom	0	35	0.00893	0.07562
United Arab Emirates, Government of	0	8	0.00269	0.02432
United Kingdom, Government of	0	136	0.03481	0.24075

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
United Nations Children's Fund	488	1	0.12988	0.40438
United Nations Development Programme	4	0	0.00191	0.00264
United Nations High Commissioner for Refugees	333	0	0.07720	0.92443
United Nations Office for Project Services	0	2	0.00149	0.00430
United Nations Population Fund	42	2	0.01267	0.02305
United States of America, Government of	0	140	0.03467	0.21274
US Fund for UNICEF	0	44	0.01096	0.09506
Viet Nam, Government of	0	1	0.00124	0.00196
Voluntary Service Overseas	0	1	0.00474	0.00005
World Bank	0	5	0.00219	0.00874
World Food Programme	268	2	0.06897	0.40576
World Health Organization	17	0	0.00531	0.00979
World Vision Bangladesh	11	0	0.00335	0.02562
World Vision International	8	0	0.00384	0.00588
World Vision New Zealand	0	1	0.00143	0.00008

Table C.2. *Rohingya Refugee Situation Node Statistics, without U.S. involvement*

Label	***Weighted In-Degree***	***Weighted Out-Degree***	***Pagerank***	***Eigenvector Centrality***
ACT Alliance / Christian Aid	2	0	0.00152	0.00242
ACT Alliance / DanChurchAid	2	0	0.00165	0.00042
ACT Alliance / Norwegian Church Aid	1	0	0.00135	0.00026
Action Against Hunger	12	0	0.00415	0.00606
Action Contre la Faim	19	0	0.00690	0.01451
Adventist Development and Relief Agency	1	0	0.00159	0.00011
Agency for Technical Cooperation and Development	1	0	0.00136	0.00036
Aktion Deutschland Hilft	0	2	0.00191	0.00040
Asian Development Bank	0	1	0.00129	0.00200
Association for Aid and Relief Japan	1	0	0.00130	0.00068
Australia, Government of	0	66	0.01890	0.08553
Austria, Government of	0	2	0.00147	0.00841
Bangladesh Red Crescent Society	1	0	0.00154	0.00009
Bangladesh, Government of	0	9	0.00322	0.01636
BBC Media Action	2	0	0.00157	0.00159
Bill and Melinda Gates Foundation	0	1	0.00153	0.00017
BRAC	23	0	0.01322	0.02369
Canada, Government of	0	72	0.02294	0.08803
CARE Bangladesh	1	0	0.00136	0.00036
CARE International	17	0	0.00869	0.03396
CARE Luxembourg	0	1	0.00148	0.00020
CARE USA	0	0	0.00105	0.00000
CARITAS	1	0	0.00159	0.00011
Caritas Bangladesh	3	0	0.00296	0.00021
CBM International (formerly Christian Blind Mission)	4	0	0.00317	0.00063
Central Emergency Response Fund	0	56	0.01535	0.08721
Children on the Edge	0	1	0.00483	0.00005
COAST Trust	4	0	0.00272	0.00026
Concern Worldwide	1	0	0.00153	0.00011
Conrad N. Hilton Foundation	0	1	0.00153	0.00017
COVID-19 Humanitarian Thematic Fund	0	1	0.00129	0.00200
Czech Republic, Government of	0	1	0.00129	0.00043
Danish Emergency Relief Fund	0	2	0.00191	0.00040
Danish Refugee Council	8	0	0.00336	0.00284

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Denmark, Government of	0	29	0.01032	0.02995
Dhaka Ahsania Mission	1	0	0.00175	0.00005
Disasters Emergency Committee (UK)	0	5	0.00286	0.00070
Education Above All Foundation	0	6	0.00497	0.00087
Education Cannot Wait Fund	0	3	0.00172	0.01041
Estonia, Government of	0	2	0.00147	0.00841
European Commission	0	22	0.00615	0.06362
European Commission's Humanitarian Aid and Civil Protection Department	0	77	0.02607	0.06030
Finland, Government of	0	1	0.00126	0.00421
Food & Agriculture Organization of the United Nations	10	0	0.00352	0.00560
France, Government of	0	13	0.00613	0.01915
Friends of UNFPA	0	3	0.00191	0.00054
Friendship	3	0	0.00245	0.00036
Friendship Luxembourg	1	0	0.00164	0.00008
Frontiers Ruwad Association	0	1	0.00135	0.00013
GAVI Alliance	0	2	0.00154	0.00399
Germany, Government of	0	33	0.01231	0.06164
Global Fund to Fight AIDS, Tuberculosis and Malaria	0	1	0.00153	0.00017
Global Partnership for Education	0	1	0.00129	0.00200
Handicap International / Humanity & Inclusion	8	0	0.00349	0.00392
HelpAge International UK	3	0	0.00175	0.00363
Helvetas Swiss Intercooperation	1	0	0.00177	0.00005
HumaniTerra International	1	0	0.00145	0.00014
International Federation of Red Cross and Red Crescent Societies	1	0	0.00132	0.00050
International Organization for Migration	105	5	0.03143	0.06285
International Rescue Committee	5	0	0.00235	0.00380
Ireland, Government of	0	7	0.00400	0.01258
Islamic Development Bank	0	6	0.00252	0.01197
Italy, Government of	0	4	0.00198	0.00827
Japan Platform	2	3	0.00255	0.00185
Japan, Government of	0	76	0.02325	0.12663
King Abdullah Foundation	0	1	0.00129	0.00200
Korea, Republic of, Government of	0	17	0.00520	0.03020
Kuwait Red Crescent Society	2	0	0.00145	0.00914

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Kuwait, Government of	0	7	0.00407	0.00919
Latter-Day Saint Charities	0	2	0.00170	0.00032
Luxembourg, Government of	0	9	0.00634	0.00592
Malteser International Order of Malta World Relief	1	0	0.00136	0.00036
Mukti Cox's Bazar	3	0	0.01336	0.00014
Netherlands, Government of	0	7	0.00273	0.01273
New Zealand, Government of	0	15	0.00959	0.01147
Norway, Government of	0	27	0.00960	0.04406
Norwegian Refugee Council	7	4	0.00543	0.00237
Office for the Coordination of Humanitarian Affairs	4	0	0.00241	0.00077
OXFAM	9	0	0.00367	0.00480
OXFAM GB	3	0	0.00216	0.00087
Peace Winds Japan	3	0	0.00182	0.00205
Peace Winds Japan	0	0	0.00105	0.00000
Plan International	5	0	0.00293	0.00136
Plan International Bangladesh	2	0	0.00159	0.00107
Portugal, Government of	0	1	0.00129	0.00200
Private (individuals & organizations)	0	315	0.07527	1.00000
Qatar, Government of	0	2	0.00150	0.00602
Radiohjslpen (Radio Aid Sweden)	0	2	0.00170	0.00032
Relief International	3	0	0.00191	0.00115
Russian Federation, Government of	0	2	0.00153	0.00364
Saudi Arabia (Kingdom of), Government of	0	12	0.00395	0.01929
Save the Children	55	2	0.02057	0.01560
Sheikh Thani bin Abdullah Foundation for Humanitarian Services (RAF)	0	1	0.00129	0.00200
Solidaridad Internacional	0	0	0.00105	0.00000
Solidarites International	10	0	0.00382	0.00462
Spain, Government of	0	6	0.00261	0.02109
Street Child Organization	0	1	0.00483	0.00005
Sweden, Government of	0	30	0.00938	0.03185
Swiss Solidarity	0	6	0.00509	0.00054
Switzerland, Government of	0	49	0.01429	0.07749
TEARFUND	1	0	0.00159	0.00011
Terre des Hommes - Lausanne	9	0	0.00395	0.00327
Thailand, Government of	0	6	0.00253	0.01017

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Thani Bin Abdullah Bin Thani Al-Thani Humanitarian Fund	0	3	0.00180	0.00857
Turkey, Government of	0	1	0.00126	0.00421
UBS	0	1	0.00153	0.00017
UN Action Against Sexual Violence in Conflict	0	1	0.00129	0.00043
UN Foundation	0	0	0.00105	0.00000
UN Women	4	1	0.00232	0.00286
Undesignated	1	18	0.00673	0.02138
UNICEF National Committee/Australia	0	12	0.00399	0.02395
UNICEF National Committee/Austria	0	1	0.00129	0.00200
UNICEF National Committee/Belgium	0	12	0.00399	0.02395
UNICEF National Committee/Canada	0	10	0.00350	0.01996
UNICEF National Committee/Denmark	0	7	0.00276	0.01397
UNICEF National Committee/France	0	10	0.00350	0.01996
UNICEF National Committee/Germany	0	19	0.00571	0.03792
UNICEF National Committee/Hong Kong	0	11	0.00375	0.02195
UNICEF National Committee/Iceland	0	5	0.00227	0.00998
UNICEF National Committee/Italy	0	5	0.00227	0.00998
UNICEF National Committee/Japan	0	14	0.00448	0.02794
UNICEF National Committee/Korea (Republic of)	0	1	0.00129	0.00200
UNICEF National Committee/Luxembourg	0	7	0.00276	0.01397
UNICEF National Committee/Mexico	0	1	0.00129	0.00200
UNICEF National Committee/Netherlands	0	6	0.00252	0.01197
UNICEF National Committee/New Zealand	0	7	0.00276	0.01397
UNICEF National Committee/Portugal	0	5	0.00227	0.00998
UNICEF National Committee/Spain	0	14	0.00448	0.02794
UNICEF National Committee/Switzerland	0	4	0.00203	0.00798
UNICEF National Committee/Turkey	0	1	0.00129	0.00200
UNICEF National Committee/United Kingdom	0	35	0.00964	0.06984
United Arab Emirates, Government of	0	8	0.00286	0.02410
United Kingdom, Government of	0	136	0.03778	0.22648
United Nations Children's Fund	454	1	0.13134	0.36317
United Nations Development Programme	4	0	0.00201	0.00256
United Nations High Commissioner for Refugees	323	0	0.08096	0.92693

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
United Nations Office for Project Services	0	2	0.00155	0.00439
United Nations Population Fund	42	2	0.01351	0.02259
US Fund for UNICEF	0	44	0.01184	0.08780
Viet Nam, Government of	0	1	0.00129	0.00182
Voluntary Service Overseas	0	1	0.00483	0.00005
World Bank	0	5	0.00233	0.00807
World Food Programme	236	2	0.06693	0.37225
World Health Organization	14	0	0.00500	0.00619
World Vision Bangladesh	10	0	0.00335	0.02442
World Vision International	5	0	0.00350	0.00241
World Vision New Zealand	0	1	0.00164	0.00006

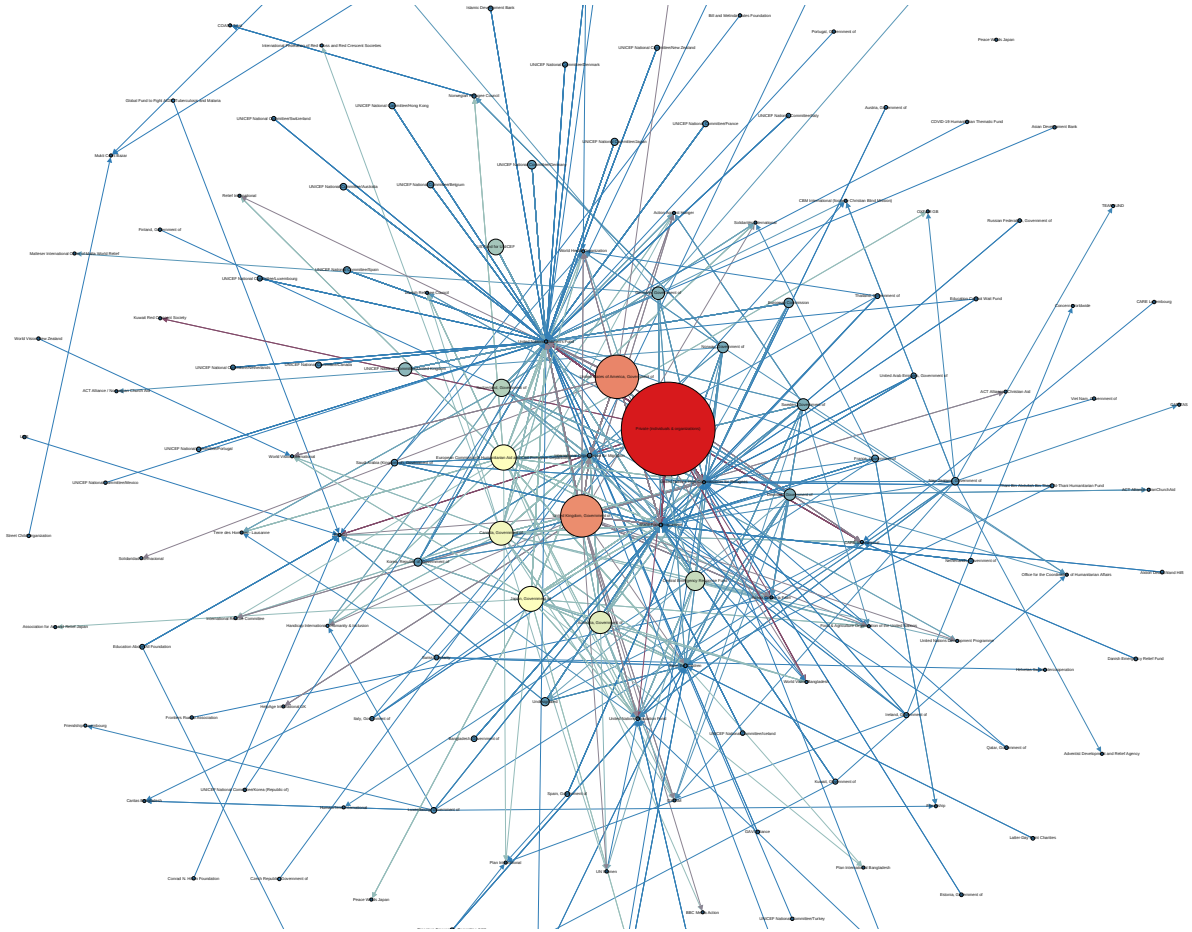

Figure C.1. Rohingya refugee situation Gephi network visualization, with U.S. involvement included.

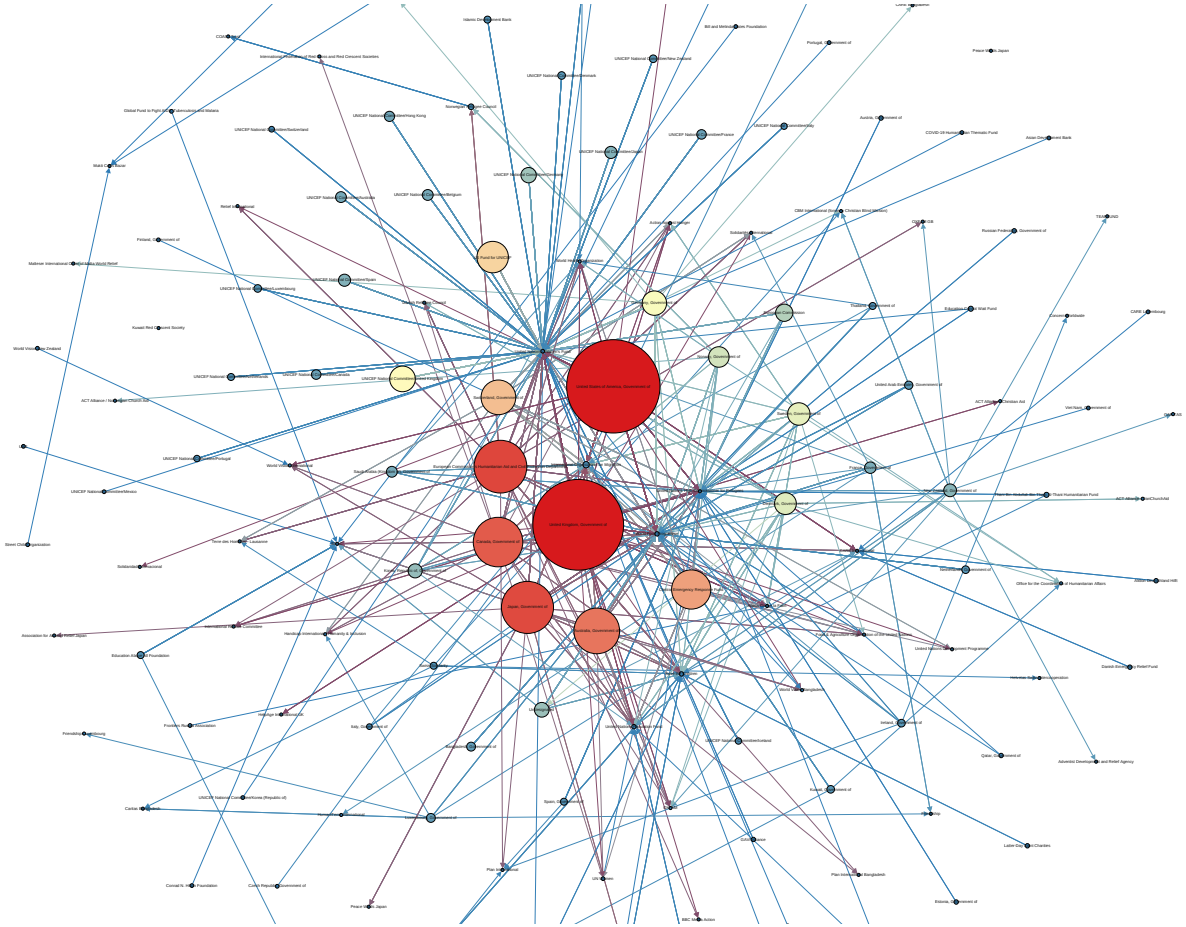

Figure C.2. Rohingya refugee situation Gephi network visualization, with U.S. involvement excluded.

APPENDIX D

Table D.1. *European Refugee Situation Node Statistics, with U.S. involvement*

Label	***Weighted In-Degree***	***Weighted Out-Degree***	***Pagerank***	***Eigenvector Centrality***
ACT Alliance / Diakonie Katastrophenhilfe	0	1	0.00234	0.00127
ACT Alliance / Finn Church Aid	1	0	0.00207	0.01878
ACT Alliance / Norwegian Church Aid	10	0	0.00910	0.16975
ActionAid International	9	0	0.00824	0.10154
Adventist Development and Relief Agency	16	0	0.01416	0.19632
Arbeiter-Samariter-Bund Deutschland e.V	5	1	0.00501	0.00826
ArmandoAid	1	0	0.00207	0.01878
ARSIS Association for the Social Support of Youth	4	0	0.00489	0.04066
Austria, Government of	0	3	0.00464	0.01592
Canada, Government of	0	2	0.00297	0.01683
Care Germany	1	0	0.00222	0.00382
CARE International	13	0	0.01621	0.08726
CARE Luxembourg	1	0	0.00303	0.00029
CARITAS	2	0	0.00315	0.00517
Caritas Athens	2	0	0.00281	0.03756
Caritas Germany (DCV)	1	0	0.00226	0.00135
Caritas Hellas - Caritas Greece	17	0	0.01396	0.31928
Council of Europe Development Bank	0	5	0.00514	0.00816
Danish Refugee Council	17	3	0.01313	0.10480
Denmark, Government of	0	3	0.00372	0.00656
DIOTIMA Centre of research on Women's Issues	5	1	0.00430	0.07669
Dorcas Aid International	2	0	0.00281	0.03756
Emergency Response Centre International	2	0	0.00281	0.03756
Estonia, Government of	0	1	0.00207	0.01384
European Commission	0	23	0.02048	0.13862
European Commission - EU Facility for Refugees in Turkey	0	3	0.00598	0.01437
European Commission Directorate-General External Relations	0	1	0.00229	0.00097
European Commission's Humanitarian Aid and Civil Protection Department	0	48	0.05058	0.18340
Faros Organizaton	1	0	0.00207	0.01878
Filoxenia International	1	0	0.00207	0.01878

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
France, Government of	0	5	0.00699	0.00758
Friends of UNFPA	0	2	0.00402	0.00065
German Red Cross	1	0	0.00226	0.00135
Germany, Government of	0	24	0.02627	0.05179
Greece, Government of	0	2	0.00311	0.00548
Help - Hilfe zur Selbsthilfe e.V.	6	0	0.00672	0.02553
HSA Humanitarian Support Agency	14	0	0.01231	0.24445
Human Appeal International (UAE)	3	0	0.00356	0.05634
Initiative for Development and Cooperation	1	0	0.00219	0.00197
International Aid Network	2	0	0.00554	0.00092
International Federation of Red Cross and Red Crescent Societies	3	0	0.00439	0.00810
International Medical Corps	3	0	0.00355	0.04010
International Organization for Migration	27	0	0.02424	0.06574
International Rescue Committee	25	3	0.01813	0.32156
Internews	1	0	0.00207	0.01878
Japan, Government of	0	9	0.00974	0.04039
Jesuit Refugee Service	2	0	0.00357	0.00183
Korea, Republic of, Government of	0	2	0.00280	0.02768
KSPM-ERP Integration Centre for Migrant Workers ‚Äì Ecumenical Refugee Program	6	0	0.00712	0.05898
La Strada International / Open Gate	9	0	0.00895	0.11556
Latter-Day Saint Charities	0	1	0.00239	0.00184
LEGIS	6	0	0.00579	0.11269
Libraries without Borders	2	0	0.00326	0.01915
Luxembourg, Government of	0	3	0.00603	0.00388
Macedonia Centre for International Cooperation	1	0	0.00207	0.01878
Macedonian Red Cross	6	0	0.00579	0.11269
Macedonian Young Lawyers Association (MYLA)	3	0	0.00426	0.03788
Medecins du Monde	23	0	0.02079	0.21376
Medecins du Monde Belgium	1	0	0.00222	0.00382
Mercy Corps	5	0	0.00534	0.04773
METAdrasi ‚Äì Action for Migration and Development	3	0	0.00415	0.02296
Netherlands, Government of	0	4	0.00679	0.00520
Network for Children's Rights	1	0	0.00207	0.01878

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
Network on Humanitarian Assistance	1	0	0.00222	0.00382
NGO Atina - Citizens Association for Combating Trafficking in Human Beings and all Forms of Gender-based Violence	3	0	0.00355	0.04010
Norway, Government of	0	9	0.01149	0.02554
Norwegian Refugee Council	8	0	0.00909	0.03960
NOSTOS - Organisation for Social Integration	3	0	0.00532	0.00176
Nun Kultura	8	0	0.00727	0.15025
Nurture Project International	1	0	0.00207	0.01878
Operation Mercy	1	0	0.00277	0.00032
OXFAM	2	0	0.00341	0.00338
Oxfam Italia	1	0	0.00222	0.00382
OXFAM Netherlands (NOVIB)	1	0	0.00222	0.00382
Private (individuals & organizations)	0	207	0.18118	1.00000
Salvation Army	2	0	0.00281	0.03756
Samaritan's Purse	1	0	0.00266	0.00059
Save the Children	9	0	0.00831	0.12286
Secours Islamique France	1	0	0.00207	0.01878
Slovakia, Government of	0	0	0.00133	0.00000
Slovenia, Government of	0	2	0.00283	0.01547
Solidarites-France	1	2	0.00450	0.01457
Solidarity Now	4	0	0.00489	0.05693
SOS Children's Villages	2	0	0.00300	0.02013
Spain, Government of	0	9	0.00913	0.10122
Spanish Red Cross	1	1	0.00313	0.00680
Sweden, Government of	0	1	0.00210	0.00412
Swiss Solidarity	0	1	0.00266	0.00059
Switzerland, Government of	0	12	0.01117	0.05279
Terre des Hommes International	4	1	0.00371	0.04234
Translators without Borders	2	0	0.00281	0.02132
UN Women	2	0	0.00340	0.01937
Undesignated	3	10	0.02035	0.01394
UNICEF National Committee/Denmark	0	2	0.00314	0.00598
UNICEF National Committee/France	0	1	0.00223	0.00299
UNICEF National Committee/Germany	0	5	0.00586	0.01494
UNICEF National Committee/Hellenic	0	2	0.00314	0.00598
UNICEF National Committee/Italy	0	4	0.00495	0.01195

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
UNICEF National Committee/Netherlands	0	3	0.00405	0.00896
UNICEF National Committee/Spain	0	6	0.00677	0.01793
UNICEF National Committee/Sweden	0	1	0.00223	0.00299
UNICEF National Committee/Switzerland	0	1	0.00223	0.00299
UNICEF National Committee/United Kingdom	0	1	0.00223	0.00299
United Kingdom, Government of	0	30	0.02605	0.11875
United Nations Children's Fund	60	0	0.06397	0.12275
United Nations Development Programme	2	0	0.00317	0.00200
United Nations High Commissioner for Refugees	77	0	0.06688	0.74403
United Nations Population Fund	7	1	0.00949	0.00369
United Nations Voluntary Fund for Victims of Torture	0	1	0.00368	0.00023
United States of America, Government of	0	8	0.00840	0.04272
US Fund for UNICEF	0	4	0.00495	0.01195
World Health Organization	1	0	0.00266	0.00059
World Vision Netherlands	1	0	0.00302	0.00046
Zaporizhzhia Region Charity Fund "Child Smile"	1	0	0.00222	0.00382

Table D.2. *European Refugee Situation Node Statistics, without U.S. involvement*

Label	***Weighted In-Degree***	***Weighted Out-Degree***	***Pagerank***	***Eigenvector Centrality***
ACT Alliance / Diakonie Katastrophenhilfe	0	1	0.00236	0.00127
ACT Alliance / Finn Church Aid	1	0	0.00209	0.01880
ACT Alliance / Norwegian Church Aid	10	0	0.00926	0.16995
ActionAid International	9	0	0.00835	0.10163
Adventist Development and Relief Agency	16	0	0.01439	0.19652
Arbeiter-Samariter-Bund Deutschland e.V	5	1	0.00508	0.00823
ArmandoAid	1	0	0.00209	0.01880
ARSIS Association for the Social Support of Youth	4	0	0.00495	0.04069
Austria, Government of	0	3	0.00470	0.01590
Canada, Government of	0	2	0.00302	0.01672
Care Germany	1	0	0.00225	0.00381
CARE International	13	0	0.01640	0.08733
CARE Luxembourg	1	0	0.00306	0.00029
CARITAS	2	0	0.00319	0.00515
Caritas Athens	2	0	0.00284	0.03761
Caritas Germany (DCV)	1	0	0.00228	0.00134
Caritas Hellas - Caritas Greece	17	0	0.01414	0.31966
Council of Europe Development Bank	0	5	0.00523	0.00802
Danish Refugee Council	17	3	0.01331	0.10484
Denmark, Government of	0	3	0.00376	0.00657
DIOTIMA Centre of research on Women's Issues	5	1	0.00435	0.07678
Dorcas Aid International	2	0	0.00284	0.03761
Emergency Response Centre International	2	0	0.00284	0.03761
Estonia, Government of	0	1	0.00209	0.01382
European Commission	0	23	0.02081	0.13802
European Commission - EU Facility for Refugees in Turkey	0	3	0.00631	0.01432
European Commission Directorate-General External Relations	0	1	0.00232	0.00097
European Commission's Humanitarian Aid and Civil Protection Department	0	48	0.05130	0.18277
Faros Organizaton	1	0	0.00209	0.01880
Filoxenia International	1	0	0.00209	0.01880
France, Government of	0	5	0.00707	0.00757
Friends of UNFPA	0	2	0.00447	0.00060

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
German Red Cross	1	0	0.00228	0.00134
Germany, Government of	0	24	0.02665	0.05146
Greece, Government of	0	2	0.00315	0.00550
Help - Hilfe zur Selbsthilfe e.V.	6	0	0.00681	0.02552
HSA Humanitarian Support Agency	14	0	0.01246	0.24474
Human Appeal International (UAE)	3	0	0.00360	0.05641
Initiative for Development and Cooperation	1	0	0.00221	0.00196
International Aid Network	2	0	0.00566	0.00092
International Federation of Red Cross and Red Crescent Societies	3	0	0.00444	0.00808
International Medical Corps	3	0	0.00359	0.04014
International Organization for Migration	26	0	0.02378	0.06460
International Rescue Committee	25	3	0.01837	0.32188
Internews	1	0	0.00209	0.01880
Japan, Government of	0	9	0.00992	0.04004
Jesuit Refugee Service	2	0	0.00361	0.00183
Korea, Republic of, Government of	0	2	0.00284	0.02763
KSPM-ERP Integration Centre for Migrant Workers ‚Äì Ecumenical Refugee Program	6	0	0.00721	0.05904
La Strada International / Open Gate	9	0	0.00906	0.11569
Latter-Day Saint Charities	0	1	0.00241	0.00184
LEGIS	6	0	0.00586	0.11282
Libraries without Borders	2	0	0.00329	0.01917
Luxembourg, Government of	0	3	0.00609	0.00389
Macedonia Centre for International Cooperation	1	0	0.00209	0.01880
Macedonian Red Cross	6	0	0.00586	0.11282
Macedonian Young Lawyers Association (MYLA)	3	0	0.00430	0.03792
Medecins du Monde	22	0	0.02016	0.21289
Medecins du Monde Belgium	1	0	0.00225	0.00381
Mercy Corps	5	0	0.00541	0.04775
METAdrasi ‚Äì Action for Migration and Development	3	0	0.00420	0.02298
Netherlands, Government of	0	4	0.00686	0.00521
Network for Children's Rights	1	0	0.00209	0.01880
Network on Humanitarian Assistance	1	0	0.00225	0.00381

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
NGO Atina - Citizens Association for Combating Trafficking in Human Beings and all Forms of Gender-based Violence	3	0	0.00359	0.04014
Norway, Government of	0	9	0.01208	0.02543
Norwegian Refugee Council	8	0	0.00921	0.03956
NOSTOS - Organisation for Social Integration	3	0	0.00539	0.00175
Nun Kultura	8	0	0.00736	0.15043
Nurture Project International	1	0	0.00209	0.01880
Operation Mercy	1	0	0.00280	0.00032
OXFAM	2	0	0.00346	0.00337
Oxfam Italia	1	0	0.00225	0.00381
OXFAM Netherlands (NOVIB)	1	0	0.00225	0.00381
Private (individuals & organizations)	0	207	0.18355	1.00000
Salvation Army	2	0	0.00284	0.03761
Samaritan's Purse	1	0	0.00269	0.00058
Save the Children	9	0	0.00842	0.12297
Secours Islamique France	1	0	0.00209	0.01880
Slovakia, Government of	0	0	0.00134	0.00000
Slovenia, Government of	0	2	0.00287	0.01542
Solidarites-France	1	2	0.00455	0.01455
Solidarity Now	4	0	0.00495	0.05699
SOS Children's Villages	2	0	0.00303	0.02015
Spain, Government of	0	9	0.00924	0.10105
Spanish Red Cross	1	1	0.00318	0.00671
Sweden, Government of	0	1	0.00212	0.00411
Swiss Solidarity	0	1	0.00269	0.00058
Switzerland, Government of	0	12	0.01134	0.05260
Terre des Hommes International	4	1	0.00375	0.04238
Translators without Borders	2	0	0.00284	0.02134
UN Women	2	0	0.00344	0.01939
Undesignated	3	10	0.02068	0.01377
UNICEF National Committee/Denmark	0	2	0.00320	0.00581
UNICEF National Committee/France	0	1	0.00227	0.00290
UNICEF National Committee/Germany	0	5	0.00599	0.01452
UNICEF National Committee/Hellenic	0	2	0.00320	0.00581
UNICEF National Committee/Italy	0	4	0.00506	0.01162
UNICEF National Committee/Netherlands	0	3	0.00413	0.00871

Label	*Weighted In-Degree*	*Weighted Out-Degree*	*Pagerank*	*Eigenvector Centrality*
UNICEF National Committee/Spain	0	6	0.00693	0.01742
UNICEF National Committee/Sweden	0	1	0.00227	0.00290
UNICEF National Committee/Switzerland	0	1	0.00227	0.00290
UNICEF National Committee/United Kingdom	0	1	0.00227	0.00290
United Kingdom, Government of	0	30	0.02646	0.11830
United Nations Children's Fund	57	0	0.06241	0.11938
United Nations Development Programme	2	0	0.00321	0.00199
United Nations High Commissioner for Refugees	75	0	0.06609	0.74254
United Nations Population Fund	6	1	0.00920	0.00263
United Nations Voluntary Fund for Victims of Torture	0	1	0.00374	0.00023
US Fund for UNICEF	0	4	0.00506	0.01162
World Health Organization	1	0	0.00269	0.00058
World Vision Netherlands	1	0	0.00312	0.00046
Zaporizhzhia Region Charity Fund "Child Smile"	1	0	0.00225	0.00381

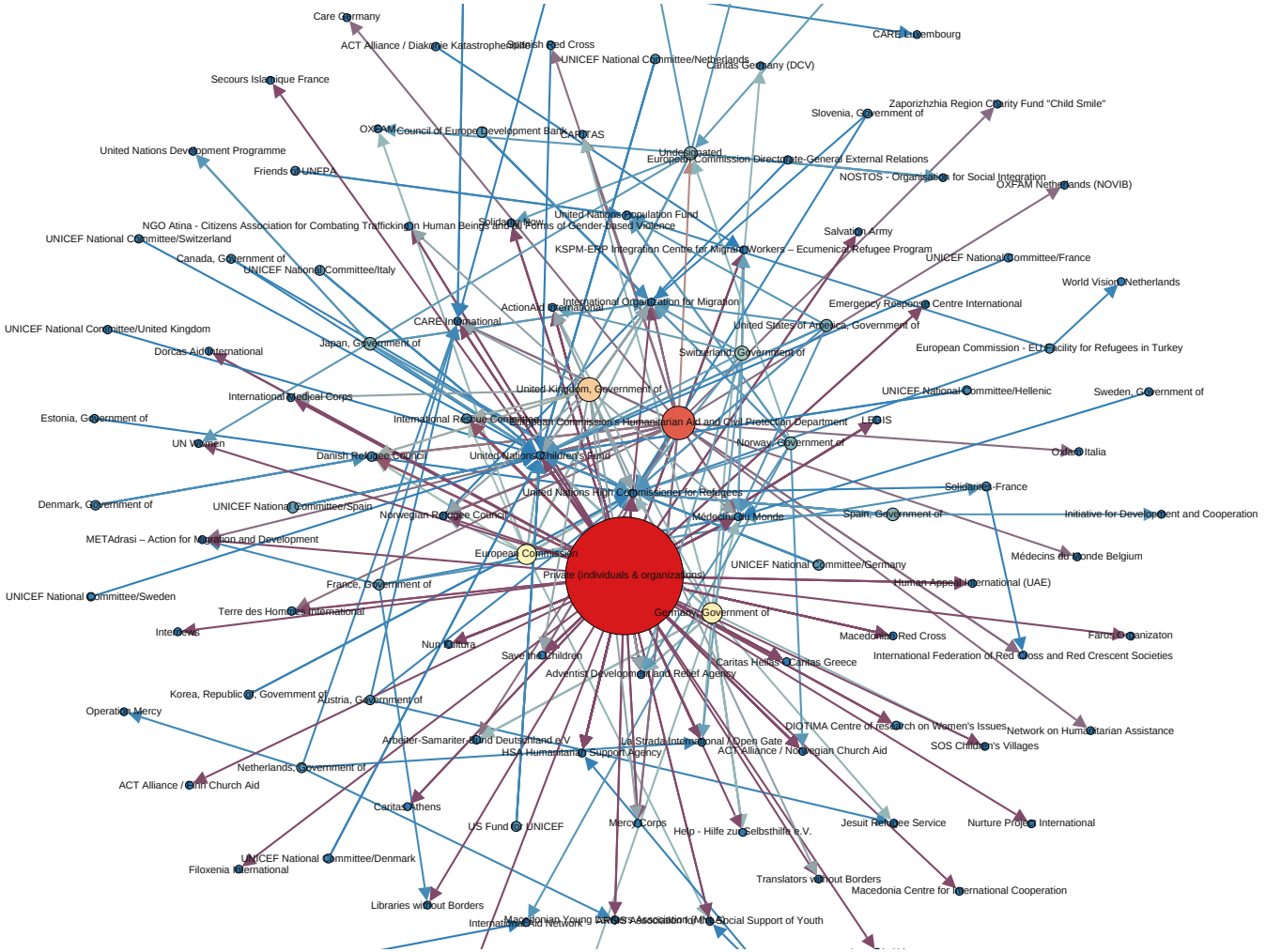

Figure D.1. European refugee situation Gephi network visualization, with U.S. involvement included.

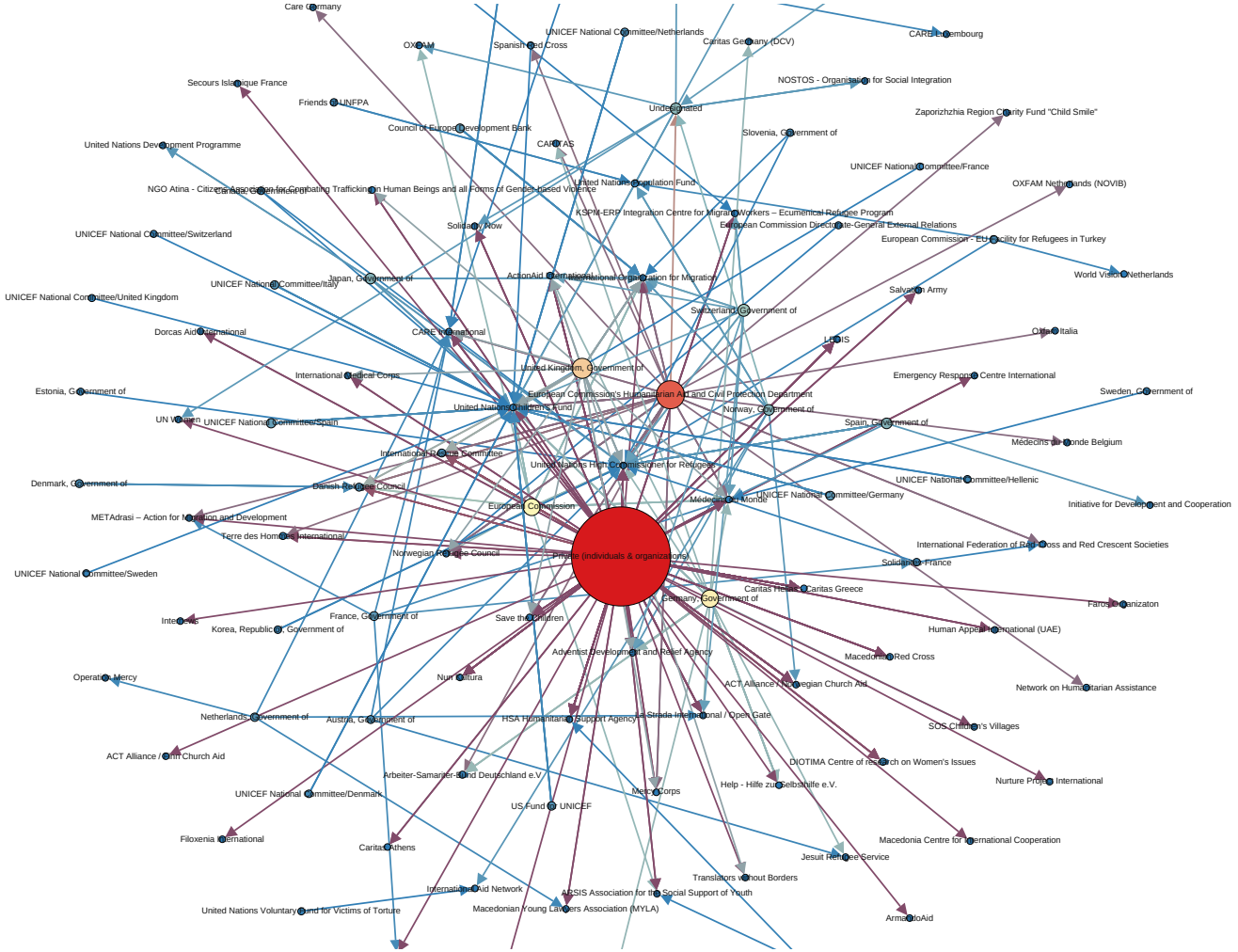

Figure D.2. European refugee situation Gephi network visualization, with U.S. involvement excluded.

VITA

Mackenzie Marie Clark
Graduate Program in International Studies
7045 Batten Arts & Letters
Norfolk, VA 23529

EDUCATION

Bachelor of Arts (May 2019) in Political Science and International Studies, Old Dominion University, Norfolk, VA.

ACADEMIC EMPLOYMENT

Graduate Research Assistant, Virginia Modeling, Analysis, and Simulation Center, Old Dominion University, May 2020 – Present.

Graduate Research Intern, Virginia Modeling, Analysis, and Simulation Center, Old Dominion University, January 2020 – May 2020.

Graduate Research Assistant to Dr. Austin Jersild, Graduate Program in International Studies, Old Dominion University, August 2019 – May 2020.

PRESENTATIONS

Mackenzie Clark, Erika Frydenlund, and Jose Padilla. The Social Networks of Humanitarian Aid: Power Laws, Political Interests, and Political Economy. Content Meets Structure – Integrating Different Perspectives on Social Networks. Heidelberg Academy of Science and Humanities, Heidelberg, Germany, September 2020.

Mackenzie Clark, Erika Frydenlund, and Jose Padilla. Diversification of Humanitarian Aid: Emphasizing donor dependency to increase network resilience. 92nd Annual SPSA Conference. January 2021.

PROFESSIONAL MEMBERSHIP

Graduate Society in International Studies.