Interorganizational Interaction in Disaster Response Networks: A Government Perspective

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ABSTRACT

Governments play important roles as focal organizations in many interorganizational networks. However, the government perspective has largely been overlooked in the literature on supply networks, including research on humanitarian operations and logistics. So far, little attention has been devoted to how government agencies and other actors interact within complex networks. In this study, we use a qualitative research approach to study interorganizational interaction in the context of a major U.S. disaster: Hurricane Sandy. Specifically, we investigate the relatively successful Sandy response effort conducted by the New Jersey state government in interaction with other humanitarian actors. We find that the government took three main roles in interacting with other actors within the disaster response network: organizer, facilitator, and supply network member. Moreover, we develop a grounded model that provides a theoretical explanation of the interaction process and highlights the practices used by the government during the response stage. In addition to contributing to the humanitarian research domain, our study advances the emerging discourse on networks whose focal actors are not for-profit firms.
INTRODUCTION

Hurricane Sandy devastated the East Coast of the United States in October 2012, causing significant financial and material damage (Blake et al., 2012; Eggen & Branigin, 2012). In New Jersey, following Hurricane Sandy, a number of organizations from a wide range of backgrounds came together within a disaster response network to help reduce human suffering and allow most residents to return quickly to their normal lives. Although the state had not been struck by a storm of a similar magnitude in over 50 years, the interorganizational network was steered by the state government with considerable order, and it performed its main response objectives relatively successfully (Bucci et al., 2013; Hall, 2012). The nature of the government’s attempt to conduct the effort with other organizational actors within the complex network forms the core of our study.

Governments all over the world have significant influence over supply chains and other organizational networks. Yet, scholars have so far neglected the government perspective in their studies of supply networks. Although interorganizational relationships and interactions have been a core topic in supply chain management (SCM) (Ellram & Hendrick, 1995; Lambert, Emmelhainz, & Gardner, 1996) and the broader organizational (Oliver, 1990; Ring & Van de Ven, 1994) literature for over twenty years, the extant research has largely been limited to relationships between for-profit firms. It is only recently that studies have started to investigate SCM from alternative actors’ perspectives. For example, Rodríguez, Giménez, Arenas, and Pagell (2016) examine the resources used by a nongovernmental organization (NGO) in managing its suppliers for poverty reduction aims. Longoni, Luzzini, Pullman, and Haiague (2019) study the relationships between a social enterprise and its stakeholders, and propose mechanisms for tension management between them. While these discussions have produced important insights regarding nontraditional actors’ potential to further societal objectives in supply chains (Gualandris & Klassen, 2018), a government perspective is still missing. Exploring how government organizations interact with firms and other humanitarian actors in

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interorganizational networks is important, first, because of the unique roles that that government actors can play, and second, for the varying types of influence they can have within such networks.

Hurricane Sandy offered us a suitable setting in which to study interaction from a government perspective because government agencies have traditionally acted as focal organizations in disaster response networks in the United States. Response efforts often also involve the participation of NGOs and firms, among other participants, but it is generally only when the disaster strikes that the actors will know for certain which players, actions, and interactions may be needed. Building upon studies of interaction in the humanitarian research area (McLachlin & Larson, 2011; Nurmala, de Leeuw, & Dullaert, 2017), we seek to produce a better understanding of how government agencies interact with other actors within complex interorganizational networks.

We conducted a qualitative study of the multi-sector disaster response network for Hurricane Sandy in New Jersey. Choosing the state government as the focal actor in our study, we directed our analysis toward the government’s interactions with other actors from the public, private, and nonprofit sectors. To investigate these issues, we asked the following main research question: How do government agencies interact with other organizational actors within the complex network? Specifically, we examined the roles that government agencies took and the practices they used during the disaster response stage. We employed an inductive approach (Bansal, Smith, & Vaara, 2018; Corbin & Strauss, 2014) to build SCM theory (Saldanha, Mello, Knemeyer, & Vijayaraghavan, 2015). We interviewed 29 individuals from 18 organizations—including leading response nonprofits, government agencies, and businesses—and collected an extensive set of archival and field data (Quarshie & Leuschner, 2018). We used the Gioia method to derive our grounded theoretical model from empirical data (Gioia, Corley, & Hamilton, 2013).

We found that the government took multiple roles in steering the actions of the various organizational actors within the complex network (Kourula, Moon, Salles-Djelic, & Wickert, 2019). More specifically, the state acted as an organizer, facilitator, and supply network member in this context. Furthermore, we identified three sets of practices used by the government during the disaster response stage, and brought them together in a grounded model, which illustrates and explains the overall interaction process.
Our study contributes to SCM research and practice in several ways. First, it advances research and theory on humanitarian efforts and supply chains in a critical area: interorganizational interaction (Day, Junglas, & Silva, 2009). Similar to high-performing sustainable supply chains, during the Sandy effort, the government used novel practices and ways of interacting that were not observed across prior disaster contexts (Rodríguez et al., 2016). In addition, we advance the theoretical knowledge of interactions among different types of actors within complex interorganizational networks and systems (Carter, Rogers, & Choi, 2015; Johnson, Dooley, Hyatt, & Hutson, 2018). Researchers studying interaction in such contexts can benefit from our findings regarding the unique roles played by the government and the identification of three sets of practices that enhanced the Sandy effort. Indeed, a theoretical understanding of roles of the government within the network may inform studies of the roles of powerful actors in more traditional supply chain contexts (Huo, Flynn, & Zhao, 2017; Zacharia, Sanders, & Nix, 2011), as well as interactions between focal and other actors in other complex (e.g., sustainability) networks (Quarshie, Salmi, & Leuschner, 2016). Hence, our findings can advance both mainstream and emerging debates in SCM and additional disciplines. Finally, learning from the Sandy response can help prevent loss of lives and other damage during various types of disasters and emergencies globally.

Our paper is structured as follows. In the next section, we review the relevant humanitarian literature. In the subsequent sections, we present our methodology, findings, and grounded model. Finally, we discuss the study’s implications.

**LITERATURE REVIEW**

**Humanitarian Efforts and Actors**

Several terms are used to describe humanitarian research in the SCM domain (see Abidi, de Leeuw, & Klumpp, 2014; Gupta, Starr, Farahani, & Matinrad, 2016), including humanitarian operations (Pedraza Martinez, Stapleton, & Van Wassenhove, 2011), humanitarian logistics (Tatham & Pettit, 2010), and humanitarian disaster relief supply chain management (Day et al., 2012). In this article, we consider all of these debates as parts of the humanitarian research area.

A disaster is defined as “a disruption that physically affects a system as a whole and threatens its priorities and goals” (Van Wassenhove, 2006, p. 476). This definition includes natural and man-made disasters. Major disasters can involve a combination of hazards, causes, and consequences, and the conditions evolve during the disaster management cycle, which
consists of several stages before, during, and after the event (see e.g., Homeland Security, 2013, 2015).

The overall objective of disaster management is to save lives, reduce human suffering, meet basic needs, protect property and the environment, and stabilize the incident (Gupta et al., 2016; Homeland Security, 2013). Government agencies have been traditionally viewed as the key actors in disaster settings (Homeland Security, 2008; Leiras et al., 2014). However, in order to meet their objectives, governments (operating at various levels) need to interact with additional humanitarian actors. These can include NGOs, private firms, beneficiaries, community groups, donors, the media, intergovernmental organizations, and military forces (McLachlin & Larson, 2011; Pettit & Beresford, 2009). Some of the actors, such as government agencies, have an existing presence in the area and are established actors in disaster settings, while others, such as private companies, may only enter the area after the disaster or be involved in one disaster response (Long & Wood, 1995).

**Interorganizational Interaction in Disaster Response Contexts**

Extant humanitarian research has focused heavily on topics related to advance preparation, decision-making, and the logistical aspects of disaster efforts (Gupta et al., 2016; Kovács & Spens, 2007; Leiras et al., 2014). This is likely because empirical investigations of interaction in response contexts are complicated by a number of factors. For example, various types of disasters can happen without advance warning in different geographic areas, and once a disaster strikes, the conditions are often stressful, evolving, and uncertain (Oloruntoba & Gray, 2009; Pettit & Beresford, 2009). While studies of interaction have also appeared, a large share of them are based on theoretical approaches (Stewart, Kolluru, & Smith, 2009), modeling or simulation designs (Altay & Pal, 2014), or various expert-led methods (McLachlin & Larson, 2011). Many of the empirical studies have been conducted in crisis areas (Heaslip, Sharif, & Althonayan, 2012) or in (other) developing or emerging countries (Maghsoudi & Pazirandeh, 2016; Noori & Weber, 2016). For example, Rietjens, Goedee, Van Sommeren, and Soeters (2014) study supply chain collaboration in the context of Dutch reconstruction efforts in Afghanistan, and Dube, Van der Vaart, Teunter, and Van Wassenhove (2016) examine fragile host country governments’ stances toward disaster assistance. Studies conducted in Western contexts center heavily around a limited number of European countries (Leiras et al., 2014; Nurmala et al., 2017). Similarly, investigations into major U.S. disaster settings (e.g., Koliba,
Mills, & Zia, 2011) are rare, but include examinations of hindrances to information flows between governmental and other actors in the Hurricane Katrina context (Day et al., 2009), and of information diffusion via tweets in the Hurricane Sandy setting (Yoo, Rand, Eftekhar, & Rabinovich, 2016).

Because investigations of interactions between government agencies and other organizational actors in disaster response and other networks are not common, we also reviewed the broader humanitarian literature to gain insights on how various humanitarian actors interact with one another. Many prior studies suggest that coordination is a key practice used by actors in response settings, which relates to actors dividing efforts, responsibilities, and resources between them (Kovács & Spens, 2007). This should ideally happen in a deliberate and orderly fashion (Balcik et al., 2010; Gulati, Wohlgezogen, & Zhelyazkov, 2012). It has been established that effective coordination can lead to less duplication and turmoil and to more effective efforts (Van Wassenhove, 2006). However, in practice coordination may be complicated by the large number and range of participating actors, their mindsets and behaviors, as well as overlapping coordination mechanisms (Heaslip et al., 2012; Oloruntoba & Gray, 2009).

Additional key practices include the partly overlapping concepts of partnering (Stewart, Kolluru, & Smith, 2009) and collaboration (Maon, Lindgreen, & Vanhamme, 2009; Moshtari & Gonçalves, 2017). As for the differences between these concepts, partnerships can be viewed as involving a contractual agreement or other explicit commitment from each organization to work together and provide resources for the effort, whereas other collaborations do not necessarily entail such commitments (Waddock, 1988). Interactions also include informal engagements between actors, and they generally involve a broader range of relationship dynamics than collaborations and partnerships (Laasonen, Fougère, & Kourula, 2012). However, all collaborations are considered to involve joint reflection and repeated transactions (Brito & Miguel, 2017; Wood & Gray, 1991). Humanitarian scholars have proposed a variety of forms and reasons for collaborations. For example, actors can practice collaborative pre-positioning (Balcik, Silvestri, Rancourt, & Laporte, 2019), develop (collaborative) relationships with logistics service providers (Vega, & Roussat, 2015) or other companies (Kaneberg, 2018), and contract parts of their operations to partners (Pedraza Martinez, Stapleton, & Van Wassenhove, 2011).
Humanitarian scholars also propose practicing relationship building and management, including the building of trust (Tatham & Kovács, 2010). Pettit and Beresford (2009) suggest that actors begin building ties even before an event unfolds and that the engagements are approached as trusting relationships with vested interests. McLachlin and Larson (2011) identify specific relationship-building practices, such as using existing contacts, developing external contacts, establishing pre-agreements, and avoiding the violation of humanitarian principles.

Finally, although much of the focus has been on coordination, collaboration, partnering, relationship building, and information diffusion, the extant literature puts forward additional interaction-related concepts, such as cooperation in procurement (Pazirandeh & Herlin, 2014), logistics (Schulz & Blecken, 2010) or warehousing (Balcik et al., 2010), co-opetition in supply chains (Kovács & Spens, 2013), customer service (Oloruntoba & Gray, 2009), supplier selection (Balcik & Ak, 2014), local procurement (Piotrowicz, 2018), and fundraising (Berenguer et al., 2017). Overall, the previous literature has identified several practices that actors can adopt during their response efforts. However, because a comprehensive view of how government agencies interact with other organizational actors within complex networks is still missing, we used an inductive grounded theory building methodology to investigate these issues in the context of the disaster response effort for Hurricane Sandy in New Jersey.

**METHODOLOGY**

In this study, we rely on inductive theory building (Bansal et al., 2018; Corbin & Strauss, 2014). Qualitative approaches are generally used to study unexplored areas and complex phenomena, such as interaction in challenging contexts (Denk, Kaufmann, & Carter, 2012; Kirchoff, Omar, & Fugate, 2016). We used the Gioia method (e.g., Gioia et al., 2013) to derive our theory from data collected from the Hurricane Sandy disaster setting. Interpretive approaches, such as the Gioia method, are especially suitable for capturing the lived experiences of informants, discovering relevant concepts, and generating theories (Gehman et al., 2018). To mitigate the common criticisms of qualitative work, we carefully considered our methods, made our procedures transparent, and sought to ensure a clear chain of evidence throughout the study (Pratt, 2009).

Qualitative data were collected during the disaster recovery period for Sandy for about five months during the first half of 2014 in the state of New Jersey. The observed combination of severe impacts accompanied by a relatively successful response in the state motivated us to study
interorganizational disaster response efforts in this context (see Supplement 1). The network seemed to represent an ideal case for examining actors’ experiences (Gioia et al., 2013).

Our research design involved the collection of three types of data: interviews, archival material, and field work. We had pre-existing contacts at a leading NGO, which was one of the key response agencies in the state. Based on initial discussions with our contacts, we decided to seek access to the broader Sandy disaster response network within the state, which incorporated various types of actors (Bansal et al., 2018). Our original protocol called for the inclusion of response NGOs, government actors, and firms, but later, we also included other sub-types of nonprofits as well as utility firms, in order to capture sufficient variability in the informants’ perspectives (Gehman et al., 2018). Government agencies have generally held central roles within the preparedness system (Homeland Security, 2008). Therefore, as our study proceeded, we chose to focus on the government as the focal actor within the network, and we analyzed the state government’s interactions with other humanitarian actors during the response stage (Pratt, 2009).

**Interview Sample**

Our entire interview sample (Table 1) was not predetermined (Corbin & Strauss, 2014; Glaser & Strauss, 1967). The response NGO that we had contacts at was chosen as the starting point for our sampling. Its employees facilitated our access to the broader Sandy response network. Informants from all organizations were selected based on suggestions provided by past participants, taking into consideration theoretical sampling criteria (Corbin & Strauss, 2014; Gioia et al., 2013). All informants had experience from Sandy as well as had ties to other actors within the network. We especially included participants who could help us understand the practices employed in the interactions between the various actors within the network. As the focal actors, government agencies were a natural choice for inclusion. We interviewed four senior informants from three state government agencies that play critical roles in response efforts for all major disasters within New Jersey and who had been closely involved in the Sandy operation. Moreover, the participants had been integrally involved in interacting with nonprofit and private sector actors at the state level during and after Sandy. All the individuals we sampled had years—even decades—of disaster response experience.

We also included several sub-types of nonprofits based on suggestions from existing informants. In New Jersey, a nonprofit coalition of voluntary organizations had acted as the
central hub for activities conducted by nonprofits during Sandy. We included three leading response NGOs and three faith-based organizations (FBOs). These six organizations had played critical roles in the response. Several also held official contracts with the state on emergency activities and/or played lead roles in the nonprofit coalition. In addition, we interviewed representatives of three county-level long-term recovery groups (LTRGs) in order to understand interactions trickling down to local levels at later stages in the disaster cycle.

--- Insert Table 1 approximately here ---

Overall, the majority of nonprofit informants worked in directorial or managerial positions. All of them were involved in interorganizational interactions and were knowledgeable about their agency’s response (e.g., mass feeding, sheltering, and disaster cleanup) and/or recovery (e.g., reconstruction) activities for Sandy. The majority of the informants also had experience from prior disasters, but a few become involved in the disaster response work only after Sandy.

Regarding the private sector, we were urged by our government and nonprofit informants to refine our initial sampling criteria for firms (Gioia et al., 2013; Pratt, 2009). Based on their suggestions, we included five managers or leaders from four utility firms (e.g., communications and electricity/gas) that had been heavily impacted by Sandy and closely involved with the network. Moreover, retail stores were considered by the informants as critical to community resiliency, as well as to have played important roles in the response efforts. Urged by other informants, we included one nation-wide retailer and one regional chain. The participants worked in executive or directorial positions, and both had experience of disaster-related interactions and activities associated with Sandy and other major disasters within and outside New Jersey.

We continued interviewing until we had captured a broad range of perspectives and reached a sufficient theoretical saturation point with regard to the concepts and themes that had started to emerge from our data (Corbin & Strauss, 2014). In total, we interviewed 29 participants from 18 entities: 3 government organizations, 9 nonprofit organizations, and 6 businesses. We interviewed the informants in 20 semi-structured interviews—14 individual and 6 small-group interviews—lasting 74 minutes on average. The majority of the interviews were conducted face-to-face, but three informants representing firms were interviewed over the phone.
Two researchers participated in 17 of the 20 interviews and constantly discussed the insights gained.

While our initial interview protocol provided direction for several themes to be discussed with the participants, flexibility was maintained in the interviews. This was because we wanted to learn what was happening and important in our setting from our informants (Pratt, Kaplan, & Whittington, 2019). The initial themes included: basic information about the organization and informant, their activities during the Sandy response, the organization’s main interorganizational network(s) and interaction partners, interactions with various other actors, comparisons of different types of interactions and relationship dynamics, and the antecedents and outcomes of the interaction (see Table S1 in Supplement 1). We started out with broad questions, but later, we adjusted and narrowed them down based on the insights gained (Corbin & Strauss, 2014). This strategy ensured that while we were open to novel insights, we would eventually be able to saturate the concepts and themes that started emerging from the data (Gioia et al., 2013). For example, as we started to understand that utility firms played roles that differed from those of other private companies, we not only sought to interview the utilities, but also started asking questions related to interacting with them.

**Archival and Field Data**

We also participated in field events and gathered archival materials during the five-month data collection process (see Table S2 in Supplement 1; Quarshie & Leuschner, 2018). We participated in five different field events lasting, in total, over four and a half days. These included a local disaster recovery event, several preparedness conferences where many of our informants were present, and a networking event to which a major utility firm had invited other utility firms, NGOs, and government representatives. During these events, we were able to observe interorganizational interactions and other activities as they took place in an actual humanitarian setting (DeHoratius & Rabinovich, 2011). Simultaneously, our frequent and informal interaction with the study participants facilitated our access to the network because it allowed us to build trust with potential informants. In addition to field events, we were invited to tour the emergency command center of a utility firm after one of the interviews. This helped us understand the utility firms’ response, restoration efforts, and interactions with other actors. Overall, field research helped us to collect further data, and the notes we took allowed us to verify and triangulate our interview and archival data (Pratt, 2009).
Regarding archival material collection (Table S2 in Supplement 1), the lead researcher was invited to subscribe to the email list of the nonprofit coalition. Thus, we received communications targeted at nonprofit members and government partners on almost a daily basis for the five-month data collection period. The emails included invitations to meetings and calls, memos, and various other materials. Our informants also provided us with other documents related to their efforts and interactions, such as a participants list and presentation slides from events. These materials helped us to understand the actors involved in the network, the practices used, and the context. They aided us in the sampling and analysis and provided support to our theory (Pratt, 2009).

**Data Analysis and Theory Building**

We rigorously strove to abide by the relevant inductive research guidelines (Corbin & Strauss, 2014). As our research progressed, we started relying increasingly on the Gioia method for grounded theory building (Gioia et al., 2013; Villena & Gioia, 2018). We had already begun developing emerging concepts and themes based on our learnings from the informants during the data collection, and we continuously reflected on the insights gained (Pratt et al., 2019). At a later stage, we analyzed the 475-page (double-spaced) set of interview transcripts and notes utilizing Nvivo10 software. All but two interviews had been voice-recorded and transcribed. For these two interviews, detailed notes were written by one researcher and verified by another. Throughout the analytical processes, we paid close attention to the links between the research question, data, and analyses (Pratt, 2009). We first focused on identifying recurring patterns and developing concepts related to the participants’ experiences of interacting (Bansal et al., 2018; Gioia et al., 2013). Specifically, we examined the practices employed by the government (and other actors), as well as contextual and processual factors. We compared similar and differing statements made by various groups (Corbin & Strauss, 2014). Consistent with an interpretive approach (Gehman et al., 2018), we sought to capture as much variability in the informants’ experiences as possible throughout the data collection, and we tried to make sense of it through our analyses. For example, we focused on understanding the nuances of how the government steered the various actors.

Consistent with the Gioia method (Gioia et al., 2013), we used our analyses to develop first-order concepts (i.e., practices employed by the government), which give voice to the informants, more abstract second-order themes, and third-order aggregate dimensions, which are
more researcher-centric and theoretical (Gehman et al., 2018). We then constructed a data structure that demonstrates the connections (or the chain of evidence) between the raw data, concepts, and building blocks of the theory (Villena & Gioia, 2018). We added supporting evidence for all the concepts in the form of power quotes in the text and proof quotes in a data table (Pratt, 2009). We also added some descriptions regarding the prevalence of the concepts across the interviews.

We examined the archival and field data and concluded that they corroborated our theory. For example, the conference call and meeting invitations we had received regularly gave us a solid understanding of the communication activities that took place. Moreover, participant lists from calls, meetings, and networking events confirmed that various types of actors were involved in such activities, and the memos provided information regarding the collaboration and cooperation taking place within the network. Finally, the field events (e.g., practitioner conferences) furthered our knowledge of various types of trainings that take place locally.

During the analysis stage, we returned to the extant humanitarian, SCM, and organizational literature, which helped us to refine our concepts, themes, and model. While the concepts and themes were derived from our primary data (see Table 2), many practices had also been discussed in the literature, and the relevant insights were interwoven. We sought theoretical perspectives to provide further explanatory power to our findings. After considering multiple options, we determined that some of our concepts were closely related to existing theoretical understandings of organizing taking place (temporarily or permanently) beyond or outside formal organizations (Bakker, DeFilippi, Schwab, & Sydow, 2016; Ahrne & Brunsson, 2011). These insights were integrated into our findings (e.g., organizing practices employed by the government). Moreover, our findings were consistent with the assertion by Kourula et al. (2019) that governments actually play several overlapping roles in interorganizational settings. Hence, we paid attention to these issues, and eventually refined and rearranged the concepts according to the three main roles that we concluded are played by the state in our study context.

We brought together the concepts, themes, and aggregate dimensions in a grounded model (Gioia et al., 2013), which was constructed according to the disaster cycle. In this article, we mainly explain the practices employed at the response stage (i.e., concepts) and themes (Corbin & Strauss, 2014), but these are presented in the context of the entire cycle, with due consideration to the transition points in the process as well. The model was refined multiple
times until it was well-integrated and explained the phenomenon of interest: interaction between governments and other actors in the complex disaster response network. Finally, we evaluated our theory against the applicability criteria of the grounded theory (see Table S3 in Supplement 1) and concluded that it met these criteria (Quarshie & Leuschner, 2018; Rauer & Kaufmann, 2015).

FINDINGS

Our empirical study focused on how state government agencies interacted with other humanitarian actors within the response network for Hurricane Sandy in New Jersey. Our findings concern the roles taken by the government, as well as the practices employed by it during the response stage. Below, we present the three main themes that emerged from our empirical data. They consist of the practices employed by the government, which correspond with its three main roles within the network: organizer, facilitator, and supply network member (Figure 1). Using the three identified sets of organizing, facilitation, and supply continuity practices, the state government was able to steer and exert some control over the various participants while simultaneously influencing and aiding them in their response efforts and supply chain activities using more subtle means. Overall, the multiple roles and sets of practices adopted by the state government contributed to an effective response effort.

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Theme One: Organizing Practices

The government used several practices that introduced order to the network of organizations. Specifically, we found that the state acted as an organizer within the network, and the first theme consists of five organizing practices employed by the state: “Convening,” “Activating and using hierarchies,” “Commanding government actors,” “Regulating utility-firm actors,” and “Orchestrating nonprofit and voluntary actors” (Table 2 and Figure 2).

--- Insert Table 2 approximately here ---

Overall, these five practices allowed the complex disaster response network to function in a relatively organized manner, even though the network incorporated various types of actors from three sectors and expanded in the response stage, as new actors became involved. Specifically, the first two organizing practices ensured that the key actors knew who was in charge of the efforts in New Jersey, and could get together with and have access to other key actors within the network. Moreover, through the three other practices the state could use
nuanced ways of steering and influencing the different types of humanitarian actors that participated in the response. We will describe all five organizing practices in the following paragraphs.

Convening refers to the government bringing together, or providing connections to, other humanitarian actors (Beck & Plowman, 2014). In the first weeks of the Sandy response, the state government acted as the main convener within the response network (Ahrne & Brunsson, 2011). Specifically, the state had a preexisting emergency operations center (EOC), which could be activated for major disaster operations. As Sandy hit, the state brought the key actors from all three sectors together for a several-week, 24/7 operation. This enabled the group of actors to monitor the evolving conditions and response activities, as well as interact continuously. A large number of our informants from all three sectors who had been invited to participate brought up the operation, and several used the word “convening” to describe the practice. It was considered beneficial that focal or otherwise powerful actors within a network connect others during a crisis because many actors may not know or have worked with one another beforehand:

That was the best decision that [the state] could have made—to have us all at the [state emergency operations center]. (P27, Business P)

Activating and using hierarchies means the state government enacting (pre-developed) organizing structures, such as the incident command system (ICS). The ICS incorporates not only government organizations but also other key actors and responders for the purpose of shaping and enhancing interactions within the response network (Ahrne & Brunsson, 2011; Bakker et al., 2016). In practice, disaster efforts start and end at the local level. This means that local governments are initially “in charge,” but they have the possibility of requesting assistance from the next level up. Due to the magnitude of Sandy, the state government took the lead in New Jersey and was considered by several of our nonprofit and utility firm informants to have “run a tight ship.” Government agencies and utilities primarily used the ICS (and internal hierarchies), but the nonprofit efforts were less structured:

I’m kind of a traditionalist when it comes to incident command. Don’t come to me when it’s supposed to go through someone else, because I’ll send you somewhere else. The system is in place—use the system because it works. (P24, Business M)

The next three concepts are closely related (yet differing) means for the state to control other actors and steer them in a unified direction. Commanding government actors is about the
state controlling (public sector) actors and their actions and/or interactions through formal orders or commands (McLachlin & Larson, 2011; Van Wassenhove, 2006). Most of the utility firm informants and several others referred to commanding (or unified command) within the public sector. Commanding allows government actors to control others based on pre-developed agreements, rules, guidance documents, and chains of command (Ahrne & Brunsson, 2011; Brito & Miguel, 2017):

> [In the public sector,] it’s very easy to order a trooper, “Hey, go do X, Y, and Z.” It’s his job. It’s a completely different animal when it's a [nonprofit] volunteer: “Hey, I’d like you to, and if we could … and I’d like to get that by Tuesday.” With the trooper, it is, “I want this on my desk no later than the close of business Monday 4 pm.” He’ll figure out a way to get it there. (P1, Nonprofit A)

The government is using laws and regulations to control utility firms and their response efforts which is, in effect, regulating utility-firms. Regulating also involves pre-established, explicit rules that must be followed by utility firms (Ahrne & Brunsson, 2011). In the Sandy context, utility firms struggled considerably in their restoration activities and customer communications, and the failures resulted in increases in regulatory requirements, or sanctions (Ahrne & Brunsson, 2011), in the post-disaster stage. According to our informants, regulating is primarily relevant to certain types and ownership forms of utilities, such as power companies:

> Power companies and our competitors are regulated. And they’re told, this is how you’re going to recover; this is how you’re going to put service back up together. (P25, Business N)

Orchestrating nonprofit and voluntary actors is about the government influencing and steering actors other than public agencies and utility firms through softer forms of direction, guidance, norms, and contracts (Ahrne & Brunsson, 2011; Hurmelinna-Laukkanen, Olander, Blomqvist, & Panfilii, 2012). In the Sandy context, orchestrating aimed at getting NGOs and faith-based organizations, in particular, to unify their efforts and to march in the same direction, while only minimal direction was provided to firms. Most of our informants talked about the direction provided by the state, and a few explicitly referred to orchestration in describing the practice:

> [The Sandy response] was orchestrated very well from the state level down through [the NGO association], and we were kept abreast of what other people were doing in other circumstances. (P6, Nonprofit D)
Theme Two: Facilitation Practices

The second theme consists of a set of practices, which relate to the state facilitating the efforts of other actors in the Sandy setting. Thus, we call them facilitation practices (Table 2 and Figure 2). The seven practices are “Coordination,” “Communication,” “Cooperation,” “Collaboration,” “Managing interfaces,” “Training for the current event,” and “Continuous learning of lessons.” The first four practices were referred to by many of our (nonprofit) informants as the four Cs (see Leuschner, Rogers, & Charvet, 2013).

Through these seven facilitation practices, the state government ensured that the overall composition of the network of actors was appropriate to ensure a successful response, that the actors’ respective roles were sufficiently clear, and that the key actors in the three sectors and at various system levels had access to the information, resources, assistance, and skills they needed to respond effectively to the disaster. Although the four Cs in particular are common practices in disaster settings, the manner in which many of the facilitation practices were implemented in the context of Sandy was unique, as the response incorporated and harnessed the resources and capabilities of various private and local community actors, in addition to traditional emergency responders. Below we describe in greater detail the seven facilitation practices and how they were employed by the state.

Regarding coordination, we found that the state aligned its own response efforts closely with those of other actors, especially leading response NGOs, the nonprofit coalition, and utility firms. This coordination involved the actors dividing or sharing responsibilities between them, based on their expertise areas, experience, resources, and/or pre-agreements and plans (Heaslip et al., 2012; Tatham & Kovács, 2010). Although there was little formal coordination between the government and businesses, the state had started building relationships with the food industry and major retailers before Sandy. The state also implemented a response that relied very heavily on large companies’ participation and resources, and even could be considered to have reconceptualized their roles in disaster settings. Overall, most informants seemed to think that the coordination had functioned well enough, and no serious lapses had occurred in New Jersey (FEMA, 2013). The traditional coordination approach is illustrated by the following quote:

[Our mass care coordinator] works with [NGO] and [NGO] and coordinates those mass care efforts that are needed for the initial response and into recovery … And the needs are identified, and those subject matter experts or those [NGOs] with that specialty—whether it’s
debris removal or disaster case management, or feeding—they’re all identified as far as where
to go or where help is needed throughout the state based on their expertise or their subject
matter. (P20, Government J)

The state also engaged in communication, or mutual information gathering and sharing
(Day et al., 2009; Gligor & Autry, 2012), with all of the actor types. In all of our interviews,
communication was explicitly mentioned. The state used multiple channels to transmit
information, including conference calls, meetings, emails, reports, social media, websites, virtual
EOCs, and other electronic channels (Ergun et al., 2014; Huang, Gattiker, & Schwarz, 2008). In
general, interorganizational communication was considered relatively well-functioning during
the Sandy response. In addition to communicating with nonprofits through conference calls,
emails, and meetings, the state took similar measures with private actors. For example, the
government hosted daily calls and meetings with utility firms at the EOC, as well as organized
calls with the major players of other industries. Importantly, to reach large numbers of
businesses, the state approached retail and food industry associations and asked them to facilitate
information exchange with their members (Altay & Pal, 2014), which helped to prevent other
communication channels from getting clogged:

What [the state] originally envisioned—[this] was a way for them to get information out and
to help protect the infrastructure. But it is now a two-way street … And the idea that [industry]
associations are coming in [to transmit information]—I think that helps the companies, too.
(P3, Nonprofit B)

Cooperation emerged from our data as its own concept (as one of the four Cs). Cooperation relates to the government working with, or providing support to, other humanitarian
actors and vice versa. Extant literature conceptualizes cooperation as involving common
intentions (Schulz & Blecken, 2010) or the “joint pursuit of agreed-on goal(s) in a manner
 corresponding to a shared understanding about contributions and payoffs” (Gulati et al., 2012, p.
533). Various types of voluntary and mandated cooperation took place in the Sandy context, and
this cooperation entailed organizations providing one another all kinds of assistance (e.g.,
manpower, money, goods, or services), support, expertise, and guidance. In U.S. disaster
contexts, certain types of cooperation are mandated in the public and utility sectors by mutual aid
agreements. Depending on the scale and severity of the crisis, mutual aid and other types of
cooperation can involve actors from one or more towns, counties, the state, multiple states, or
even other countries:
We certainly have [the government agency’s] requests. Cooperating with the state is easy, and then with the counties. Those are really our three interaction groups. (P24, Business M)

Collaboration is about the government working closely with, or providing in-depth support to, other actors (Gabler, Richey, & Stewart, 2017; Gulati et al., 2012). Collaboration was the most frequently occurring practice in our interview data, but some informants talked about partnerships or working with others to describe their collaborations (Nurmala et al., 2017). The state was involved in various types of formal and informal collaborations in the Sandy setting. Many of the collaborations with the steady players (e.g., government and nonprofit actors) in the response network had been initiated several years before Sandy, but more recently, the state had also begun developing relationships and making agreements with large businesses in the retail and food industries. One of the most extensive collaborations involved setting up a warehouse where in-kind donations by firms could be handled:

We had trucks coming in late at night, 8 o’clock in the morning. They’re sitting outside, waiting for us to come in and open the building. It was unbelievable because I was here almost seven days a week, and [the government agency representative], he was working with the state to get this [warehouse] building that we needed. (P7, Nonprofit D)

Managing interfaces is about the government facilitating interaction with various humanitarian actors at system-level and/or cross-sector interfaces within the network. This can entail maintaining close contact with the relevant actors, facilitating actors’ access across the interface, or enhancing actors’ understanding of happens on the other side (Heaslip et al., 2012; Pettit & Beresford, 2009). During the Sandy effort, to facilitate interaction across the system levels within the public sector, the state assigned emergency management professionals to interact with the 21 counties, which, in turn, were responsible for the 565 municipalities (Sheppard, Tatham, Fisher, & Gapp, 2013). The state also appointed liaisons to manage the public–nonprofit interface (FEMA, 2013). A large number of our nonprofit informants contended that interaction with the government would have been much more difficult and less effective without the liaisons:

[The government representative] is just one of those people who’s very well connected, and he sort of knows who needs to be at various different meetings. And he is a very good diplomat. In terms of really being a good voice for the state, but then being a good voice to the state for
the voluntary organizations. And pulling the strings to make sure that the right people are at the right meetings. (P5, Nonprofit C)

Training for the current event refers to the government providing training to, or training jointly with, other actors (Tatham & Kovács, 2010). Government actors in New Jersey regularly co-organized various types of response conferences, trainings, and drills. According to our interview and field data, larger-scale training events are relevant mostly before and after major disasters. However, a few informants brought up that even during the response stage, many actors received guidance and on-the-job-training for the tasks and actions that they were undertaking:

Then you have to set [the state warehouse] up. So you have a flow chart of how you do warehousing. We do that in our training, as well. We train all our volunteers to go into a warehouse or a mobile distribution or whatever we’re doing and know what to do. Safety is a very key issue. (P6, Nonprofit D)

The continuous learning of lessons refers to government actors learning jointly with or from other actors during the response. Because every disaster is different and many actors are involved for the first time, the disaster experience inevitably becomes a learning process for the participants. Although New Jersey had experienced man-made and natural disasters before, Sandy produced a range of lessons that needed to be internalized and institutionalized by the actors:

And again, if we are fortunate enough to be able to go through this for the next, however long, seven to ten years, to get by without another disaster, once the next disaster hits, it’s putting the pieces in place, so we don’t have to go through this and learn all the lessons again and re-create everything. (P16, Nonprofit H)

**Theme Three: Supply Continuity Practices**

The third theme consists of a set of practices used by the state in its role as a supply network member. Our findings reveal that the government used common as well as original practices in the Sandy context to ensure that the supply chains of various humanitarian actors continued to function. We identified four key practices in our data, which we label supply continuity practices. They are “Bartering, hoarding, and seizing,” “Response procurement,” “Connecting buyers and suppliers,” and “Managing flows” (Table 2 and Figure 2).
Overall, through use of these four practices, the state ascertained the continuity of the supply of critical products and services, even as basic commodities started to run out, and critical infrastructures and transportation routes suffered damage. The first two practices relate to government organizations acting as buyers (or receivers) of goods and services; the latter two practices involve the state acting in a broader and more unusual role within the (supply) network. Specifically, in “Connecting buyers and suppliers” and “Managing flows,” the state government took an interest the supply chains of various types of public, private and nonprofit actors that were critical for the response effort and community resiliency. The state essentially acted as a go-between and a member of the supply networks, although the government did not necessarily buy or supply any goods or services within them. Below, we describe the four supply continuity practices in detail.

The first practice, bartering, hoarding, and seizing, refers to the interactions between the government and other actors during the first hours and days after the disaster, when supply chains disrupt and shortages in basic commodities complicate efforts. Immediately after Sandy struck, the government and other actors were unable to get critical products and services (e.g. food, water, fuel, and electricity) from their usual suppliers and service providers (FEMA, 2013). Multiple informants recounted that government agencies had at times resorted to exchanging or even confiscating the needed items from other actors. One retail informant recalled:

[B]efore the storm, we had contracted generators. You have to pull in the generators to the store, and a couple of our generators were re-deployed to hospitals. When they found out that we had generators, the [government agency] contacted the store and said, “We need a generator.” And the store offered the generator, and it was sent to the hospital. (P29, Business R)

Building on the concept of procurement (Kauffman, 2002; Leenders, Fearon, Flynn, & Johnson, 2001), response procurement refers to the government directly purchasing, buying, or obtaining goods and/or services related to disaster response. The purchased items can include vehicles, generators, fuel, emergency supplies, water, and transportation services (Suzuki, 2012). Response procurement mainly involved government organizations acting as buyers and firms or other government agencies as suppliers. Multiple informants referred to the practice, and explained to us how it had worked in the Sandy context:
[The government agency]—they have a group that acts as our emergency procurement arm. They deploy people from [the agency] to the state emergency operations center to play that [procurement] role—to serve that function and to guide people. (P19, Government J)

Connecting buyers and suppliers refers to government actors assisting other actors in finding potential suppliers of goods or services. During Sandy, the state assisted actors from various sectors in connecting with new suppliers. In disaster contexts, public, private, and nonprofit actors may find their usual suppliers unable to deliver what they need. Multiple informants recalled how various organizations had reached out to the state during and after Sandy, either requesting assistance in finding new suppliers or offering to supply other organizations:

And what [the county emergency managers] will say is, “Help us find a supplier. We sent people to our local [retail store], but they were out. We sent people to the local [retail store], but they were out. Is there another state contract source that we can buy these from?” So the [state government agency] representative will help in that regard by identifying additional suppliers. (P19, Government J)

Managing flows refers to the state ensuring that retailers and other actors are able to keep products, information, and money flowing in their supply networks. All of these flows are likely to break down during disasters because of infrastructure damage, roadblocks, disruptions of utility services, and other reasons. During Sandy, the state put in a significant effort to ensure that businesses and their supply chains stayed operational, by providing them with various types of assistance, including clearing roads, communicating regarding tunnel and bridge closures, and intervening in situations that could delay deliveries. This approach differed considerably from previous responses to major disasters in New Jersey and most other states. Rather than supply the needed goods to the population, the state ensured that businesses remained operational and could continue to serve local communities:

Let’s say I have a lot of trucks on the road that are trying to deliver generators of some kind, emergency-related supply to the store, [having state contacts] eases the frequency of them being delayed significantly. Because a lot of time there are road blocks, or obviously, curfews may be in place … if I encounter that type of thing it is very easy to … call them up and I say, “These response elements at this location, we are encountering some delay there, and we got to watch out, so we [can] take these supplies in as rapidly as possible.” (P28, Business Q)
A THEORETICAL MODEL OF INTERORGANIZATIONAL INTERACTION IN A DISASTER RESPONSE NETWORK

In this section, we propose a grounded theoretical model, which explains how government agencies interact with other humanitarian actors within a disaster response network (see Figure 3). The process model incorporates the three themes, or sets of practices employed by the government in the response stage. In the model, which illustrates the disaster cycle, the practices are situated between two additional dimensions, “Pre-disaster interaction, decision-making, and planning” and “Post-disaster interaction, sanctions, and institutionalization of changes,” which take place before and after the response, respectively.

--- Insert Figure 3 approximately here ---

Specifically, in the pre-disaster stage, the New Jersey state government sought to prepare for various types of disasters by getting to know and interacting with the permanent actors (or steady players) in the network, making decisions, signing agreements and contracts with possible partners and suppliers, developing plans, and writing guidance documents. The sudden transition from preparation to the response was when the pre-developed plans, agreements, structures, and contracts were activated, and they provided a starting point or basis for many of the organizing, facilitation, and supply continuity practices that were used during the response. This is illustrated by the following quote:

A lot of what happens is captured and institutionalized in planning documents. So, you will see information in the state emergency operations plan in the mass care annex, for instance, that will discuss mass feeding. If necessary, mass decontamination types of operations in general terms. It won’t say individual by name go do this, but it will say when necessary and ordered by the state director of emergency management, mass feeding will be conducted through a combined effort of…. (P19, Government J)

Figure 3 also shows the transition points from the response stage to recovery, and eventually to preparation for possible future events. The transition to recovery was less rapid and more opaque than the previous transition from preparation to response, and it started at a different point in time for the various actors. While utility firms were done with response (as well as recovery) within a few weeks, nonprofit organizations were dealing with survivors’ basic needs for an extended period of time, and they expected to remain in the rebuilding and recovery stage for several years. The practices evolved more subtly and gradually during the transition from response to recovery than the earlier transition. The organizational elements (such as
convening at the emergency operations center and the activation and use of hierarchies) employed in the immediate response were dissolved, and the responsibility for recovery started trickling back to the local level, where the disaster cycle would eventually end. The various actors continued interacting, using many of the same practices (e.g., the four Cs), but the composition of the actors evolved, and the local level gradually became the main hub for recovery-related interaction:

And right now, our main task, initially, was to make sure we could sustain recovery when FEMA leaves, when government programs leave. How are we going to do that? And how we’re doing it with Sandy is we’re establishing what are called long-term recovery groups, LTRGs. (P21, Government K)

As recovery proceeded further into preparation for new disasters, the state government began to increasingly examine the lessons learned from the disaster, decide on possible sanctions, make and institutionalize changes in the system, and prepare for possible future disasters.

DISCUSSION AND CONCLUSIONS

Our study sought to explain how the New Jersey state government interacted with other humanitarian actors within the Hurricane Sandy response network. In summary, we found that the government took on three main roles—that of an organizer, a facilitator, and a supply network member. We developed a theoretical framework that explains the interaction process. The model comprises three themes, or sets of practices employed by the government in the response stage, which correspond to the main roles played by the government. Moreover, the model explains the overall interaction process.

Our study contributes to both humanitarian research and to wider conversations on interorganizational interaction in complex networks. First, the contribution to the humanitarian research area is the developed grounded model, which includes a comprehensive set of practices used by the government. Overall, our model can be regarded a step toward a theory of interorganizational interaction in disaster response networks. Similar to previous studies (Heaslip et al., 2012; Nurmala et al., 2017), our results suggest that communication/information diffusion, coordination, collaboration/partnering, and cooperation are key practices for humanitarian actors. However, we were also able to derive novel practices from our data.
For example, in the state’s focal organizer role within the network, the state employed practices that brought greater order to the network for the response stage (Ahrne & Brunsson, 2011; Bakker et al., 2010), and helped to ensure that efforts were not chaotic as typically happens in disaster settings (Van Wassenhove, 2006). The organizing practices we propose have thus far received limited attention in the humanitarian literature. Some scholars (e.g., Beck & Plowman, 2014; McLachlin & Larson, 2011) have referred to governments (or militaries) convening or commanding other actors, but we additionally observed nuanced ways for the government to steer other actors, for example, by regulating utility firms and orchestrating nonprofit and voluntary actors. The government’s use of a combination of organizing practices ensured that the network—which had started expanding post-disaster (Ahrne & Brunsson, 2011; Bakker et al., 2016)—could effectively come together and achieve a successful response effort. Our study advances the understanding of how government agencies within various types of disaster and emergency response networks can organize (and control) other actors within their networks.

Our findings confirm the importance of the four Cs (i.e., communication, coordination, collaboration, and cooperation), which have been explored in the literature (Day et al., 2009; Moshtari & Gonçalves, 2017). However, we also observed that the New Jersey state government’s response operation was not limited to the four Cs. The state also actively managed system-level and cross-sector interfaces, trained various actors for the current event (Goentzel, & Chomilier, 2015), and continuously learned the lessons of the disaster. Some humanitarian scholars have touched on the issue of interfaces (Sheppard et al., 2013; Wilson et al., 2018), but an in-depth understanding of how cross-sector and system-level interfaces can be effectively managed in emergency settings had been lacking until now.

Finally, our study confirms the relevance of previously known humanitarian supply continuity practices, including response procurement (also see Balcik & Ak, 2014). However, because much of the focus in the literature has been on activities done to prepare for disasters (Özdamar, Ekinci, & Kюçükyazıcı, 2004), existing humanitarian or mainstream SCM theories do not always fit response contexts. In particular, the more creative (and ad hoc) practices used by the state are not easy to explain even with mainstream SCM theories (e.g., Carter et al., 2015). It was remarkable that the state helped to ensure that organizations could operate and keep products flowing even as existing supply chains were disrupted or ran out of capacity (Hall, 2012). Thus,
we contribute to the (humanitarian) supply chain literature by proposing three new practices: ‘Bartering, hoarding, and seizing,” “Connecting buyers and suppliers,” and “Managing flows.”

The second main contribution of our study is to interorganizational network research more generally. Thus far, SCM literature has focused on interactions between buyers and suppliers, and more recently, with alternative actors, such as nonprofit organizations and social enterprises (Rodrigues et al., 2016; Longoni et al., 2019). Our study contributes to these streams by taking a government perspective and examining the roles played and practices used by a focal government actor. Especially our identification of organizing practices used by the New Jersey state government within the response network advances existing understandings.

Although supply networks are generally viewed as maintained through relational or market mechanisms, including trust, social capital, and contracts (Wagner, Coley, & Lindemann, 2011), the degree to which networks are organized is rarely discussed in SCM studies (see Ahrne, Aspers & Brunsson, 2015; Ahrne & Brunsson, 2011). We find that networks can also have structures and organizing elements embedded temporarily or permanently within them (Bakker et al., 2016; Choi, Dooley, & Rungtusanatham, 2001). The organizational literature suggests that the five main elements of organizing (hierarchy, membership, rules, monitoring, and sanctions) can also exist outside formal organizations (Ahrne & Brunsson, 2011; Ahrne et al., 2015). Formal organizations typically have all five elements, but fewer can also exist in interorganizational networks and other settings (Ahrne et al., 2015; Bakker et al., 2016). In our setting, for example, hierarchy and rules were used by the state during the response stage, and sanctions could be observed in the post-disaster stage. Therefore, our study provides an example of a focal actor not only using contractual (or market) and relational mechanisms within its network but also (temporarily) relying on organizational elements to bring the various actors together (Bakker et al., 2016). We believe this approach could apply in various network settings, but more evidence is needed.

Our results suggest areas for future research both for humanitarian efforts, as well as interaction within other complex networks. Regarding further humanitarian research, our first suggestion is for scholars to use our model and the included practices as a basis for deductive studies. The hypotheses to be tested could for example be related to the organizing, facilitation, and supply continuity efforts of the lead organization within the response network. Based on our study, focal organizations play multiple overlapping roles within networks, which may include
(1) bringing order to the network through organizing practices, (2) facilitating the response efforts of others, and (3) acting as supply network members. However, in different contexts, focal actors may emphasize their roles differently, and adopt differing sets of practices. Testing the applicability of those practices that have received scant attention in the literature would be critical.

Opportunities also exist for humanitarian scholars to elaborate our theory. Qualitative studies conducted in the context of more recent hurricanes as well as other types of disasters could extend our model. For example, the growing role of individuals, businesses, and other whole community actors in the preparedness system in the U.S. after Sandy suggests that interaction should increasingly be studied locally (Homeland Security, 2013, 2015; Sullivan & Holley, 2017). Moreover, disaster efforts sometimes go very wrong, and examining unsuccessful ones, such as the efforts for Hurricane Maria in Puerto Rico (Hernández, Lamothe, & Achenbach, 2017), appears critical. Researchers could compare and contrast the conditions, the networks of actors, and the practices used in successful and unsuccessful responses in various contexts to understand how they may have differed from the response we studied. For example, a different combination of supply continuity (and other SCM) practices is likely needed in establishing mostly new supply chains (Balcik & Ak, 2014; Pazirandeh & Herlin, 2014), as well as in settings where widespread disruptions affect multiple industries or large geographic areas (Zhang, 2020). Finally, our model could be extended based on data collected in other types of emergency contexts, including health and environmental crises, globally.

While our study’s focus was on disaster response, our findings open up new research paths related to complex interorganizational networks in general. Supply networks are typically seen to be maintained through contractual or relational mechanisms (Johnson et al., 2018; Wagner et al., 2011), and existing SCM studies typically have ignored organizing elements within them. What our findings suggest, however, is that especially complex (e.g., multi-level and/or cross-sector) networks may embed hierarchies, structures, or other organizing elements. For example, sustainability-related networks often involve—in addition to buyer and seller firms (Ahrne & Brunsson, 2011; Powell, 1990)—NGOs and/or regulators (Quarshie et al., 2016; Roth, Tsay, Pullman, & Gray, 2008). In reality, such networks may not be entirely self-organizing networks or systems (Ahrne & Brunsson, 2011; Borgatti & Foster, 2003), but may involve so-called meta organizations (e.g., multi-stakeholder initiatives or industry associations) or other
(partially) organized sub-networks (Burt, 2000; Rasche, De Bakker, & Moon, 2013). For example, future studies could examine how governments or otherwise focal or powerful actors within complex climate change and biodiversity protection networks (Quarshie, Salmi, & Wu, 2019) can create a sense of immediacy and steer the efforts of the various participants.

Last, we propose further studying complex supply networks that simultaneously carry varying characteristics. In SCM practice, companies choose suppliers for different reasons and manage their relationships using varying mechanisms. Most supplier relationships are generally arm’s length (market) relationships, but some are a great fit for long-term partnerships, relying on trust, mutuality, and reciprocity (Wagner et al., 2011). However, as the global trade system is undergoing fundamental changes, companies may find themselves operating in environments that do not rely on market or network governance alone (Powell, 1990), but may temporarily or permanently embed elements of organizing (Ahrne et al., 2015; Bakker et al., 2016). The organizational theories used in this research could inform future investigations in such settings.

We conclude by offering our key takeaways for policy makers and managers seeking to address various grand challenges. We observed a number of actions undertaken by the government to steer the Sandy network toward a successful response. First, we have to recognize that the involvement of the state varied from one situation and location to another. However, overall, the state was observed to be stepping into the role of an organizer, and acting as a facilitator and a supply network member. These roles and the practices we identified are likely fitting for other focal organizations and settings as well. For example, actors seeking to deal with ecosystem collapses (Bradstock & Bowman, 2019) and global warming, which are turning into environmental emergencies (Rankin, 2019), may find the practices we identified helpful. Although only government organizations may be able to command or regulate other actors, many of the other organizing and facilitation practices we proposed are available to other actors as well. For example, in situations where governments are not present or are not taking the lead in addressing grand challenges, nonprofit, community-based, or for-profit actors could use some of the practices to organize and facilitate the efforts of others. Moreover, the supply continuity practices we identified may be fitting for additional types of emergencies and supply networks. For example, connecting buyers and suppliers, as well as managing flows, could be employed by government entities or multi-stakeholder initiatives that do not act as buyers or suppliers but may still find themselves participating as supply network members. Overall, various types of actors

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seeking to address disasters and other grand challenges can learn from how the New Jersey state
government, in interaction with other actors, steered the Sandy network toward a relatively
successful outcome.

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| Organization | Organization Type            | Interview Number(s) | Interview Type(s) | Participant(s) |
|--------------|------------------------------|---------------------|-------------------|----------------|
| Nonprofit A  | Response NGO                | 1                   | Individual        | P1             |
| Nonprofit B  | Response NGO                | 2                   | Group             | P2, P3         |
| Nonprofit C  | Response NGO                | 3, 4                | Individual        | P4, P5         |
| Nonprofit D  | Faith-based org.            | 5                   | Group             | P6, P7         |
| Nonprofit E  | Faith-based org.            | 6                   | Individual        | P8             |
| Nonprofit F  | Faith-based org.            | 7                   | Individual        | P9             |
| Nonprofit G  | LTRG                         | 8                   | Group             | P10, P11, P12, P13, P14 |
| Nonprofit H  | LTRG                         | 9                   | Group             | P15, P16       |
| Nonprofit I  | LTRG                         | 10                  | Group             | P17, P18       |
| Government J | Government                   | 11                  | Group             | P19, P20       |
| Government K | Government                   | 12                  | Individual        | P21            |
| Government L | Government                   | 13                  | Individual        | P22            |
| Business M   | Utility firm                 | 14, 15              | Individual        | P23, P24       |
| Business N   | Utility firm                 | 16                  | Individual        | P25            |
| Business O   | Utility firm                 | 17                  | Individual        | P26            |
| Business P   | Utility firm                 | 18                  | Individual        | P27            |
| Business Q   | Retailer                     | 19                  | Individual        | P28            |
| Business R   | Retailer                     | 20                  | Individual        | P29            |

Notes: NGO is an abbreviation for nongovernmental organization and LTRG for long-term recovery group.
### TABLE 2
Practices Employed by the Government

| Second-Order Theme | First-Order Concept | Proof Quote |
|--------------------|---------------------|-------------|
| **I. Organizing Practices** | A. Convening | A1. “[The state] knows how we operate and they call us in. They had a room in Trenton on [street], which was also where all the agencies of government came together.” (P6, Nonprofit D)  
A2. “…we have to leverage [our brand] in this role of convener. To get people around the table to have the dialogue…” (P2, Nonprofit B) |
| | B. Activating and using hierarchies | B1. “Some of the towns would not go through the County and they called us. I told them that they need to go through the County … The [government agency] loved it. We followed the incident command structure.” (P27, Business P)  
B2. “When they put the incident command structure in place and they have the emergency service functions within that.” (P25, Business N) |
| | C. Commanding government actors | C1. “With the case of Sandy, obviously the state of New Jersey was the lead agency on that. And everybody else falls into line with that.” (P26, Business O) |
| | D. Regulating utility-firm actors | D1. “[The government agency] is our regulatory body because we’re a regulated [utility].” (P24, Business M)  
C2. “The big thing that we’re able to do is answer a lot of questions that come from above. Literally, above; on the second floor of the state EOC is where the governor’s executive workroom is—where he and the cabinet level people hold court.” (P19, Government J) |
| | E. Orchestrating nonprofit and voluntary actors | D2. “We have no axe to grind [with the private sector], with the exception of the utilities. There’s that regulatory axe that gets held over their heads, over their necks.” (P19, Government J)  
E1. “[Government official] is the orchestrator. He runs everything and makes sure that everything is flowing smoothly among the multitude of agencies. If everybody were trying to do it independently, it probably wouldn’t work well.” (P1, Nonprofit A)  
E2. “[Individual], retired general, put it this way: ‘In the government you have unity of command; in the private sector, the best you can hope for is unity of effort.’ That is because…in [nonprofit organizations] I will do that thing if I want to, and I’ll get you that report if I have time.” (P9, Nonprofit F) |
| 2. Facilitation Practices |  |
|--------------------------|--------------------------|
| F. Coordination           | F1. “[NGO] is one of the key players in emergency support function number six, which is the mass care. Them, along with [NGO] and [government agency], they’re the lead, and [NGO] and [NGO] are the supporting agencies for sheltering and feeding.” (P21, Government K) |
|                          | F2. “The [NGO] has been given a huge amount of responsibility [by the state] for sheltering. The [NGO] is extremely important in feeding the first responders…” (P22, Government L) |
| G. Communication         | G1. “[Government agency] started doing conference calls, and although they are a little long, we got to hear information…. I found them extremely beneficial during [Hurricane] Irene, and then they started doing them for Sandy.” (P27, Business P) |
|                          | G2. “We went into [private sector interaction] with the prime objective of working with them and them working with us to share whatever we could in terms of information and assistance to help them either keep their stores open or get them re-opened as quickly as possible to lessen the impact on the local community.” (P19, Government J) |
| H. Cooperation           | H1. “[In the public sector], if you call for mutual aid, everybody who’s available will show up—they’re required to. When an emergency event occurs, it’s basically on the state side. If it’s a smaller emergency, if it’s one town or one county, mutual aid is called. Everyone from the surrounding counties, the surrounding towns, comes and reports to the command center: ‘Hey, this is what I have; this is what I can bring to the table.’” (P1, Nonprofit A) |
|                          | H2. “We don’t have any formal agreements in place [with those companies], but they’ve reached out to us. There’s been some dialogue. They want to work with us.” (P20, Government J) |
| I. Collaboration         | I1. “We rely on our partners, the [NGO], [NGO], and [government agency], to help us with these plans and be our supporting entities. Not just [our agency] but many others that help us out. We can’t do it alone.” (P21, Government K) |
|                          | I2. “Well, it was [government agency] that we worked with…. Of course, the nonprofits that we worked with, churches, [NGO], later on [NGO], there were a host of people that we collaborated with.” (P29, Business R) |
| J. Managing interfaces   | J1. “They’re primarily lobbyists. They’re industry associations. Nobody makes any bones about it, but they have been willing to take on the additional role of interface. That’s a good way to put it.” (P19, Government J) |
| K. Training for the current event | J2. “The FEMA liaison who had a lot of experience in this—[individual name]—he had done a lot of disasters. He played a key role, and then [the state liaison] had a lot of experience with organizing and logistics and getting things going. He was very involved.” (P17, Nonprofit I) |
| L. Continuous learning of lessons                                                                 |
|--------------------------------------------------------------------------------------------------|
| **K1.** “[Government official] is really the one who has been, and she has a partner in the south, [government official], who…the two of them have divided up the state. [She] has just been the biggest champion in terms of some of the training and things along those lines.” (P5, Nonprofit C) |
| **K2.** “…and that’s the very basic difference between the two [government agencies]. The [agency] is more geared towards the training and quick reactions.” (P26, Business O) |
| **L1.** “… whatever we learned at the [state emergency operations center], we brought it to our own company.” (P27, Business P) |
| **L2.** “The one hurdle we had to overcome was—and we learned this on calls—fire code issues. If you’re going to have ten people staying in a church, how are you going to make that happen?” (P21, Government K) |

| 3. **Supply Continuity Practices**                                                                 |
|--------------------------------------------------------------------------------------------------|
| **M. Bartering, hoarding, and seizing**                                                          |
| **M1.** “What we did is, we went to local gas stations and we made a deal with them. We provided them with generation; we would send our vehicles in there and refuel. But at the same time, we had to have law enforcement there and we also had to fill law enforcement and public safety’s vehicles, too. But it works out.” (P25, Business N) |
| **M2.** “So [government agency] had fuel but no food. [Government agency] had the [NGO] and [NGO] there, so they had food but no fuel. So, a kind of medieval hoarder period went on for about 12 or 24 hours until [they] were able to get the supply chains moving.” (P1, Nonprofit A) |

| **N. Response procurement**                                                                     |
|--------------------------------------------------------------------------------------------------|
| **N1.** “A good example of that is [the state] ran out of diapers at some point and we didn’t have them, [NGO] didn’t have them. The state of New Jersey has to order them from FEMA. They have to put in a mission-scoping assignment and all these little pieces of paper and then they pay 25% of that when the bill comes. But you’re right; the state is ultimately responsible for buying whatever resource that they need.” (P3, Nonprofit B) |
| **N2.** “He actually works exclusively for [government agency] on…procurement. Actions, procurements, items—not just in a disaster but ongoing day to day.” (P19, Government J) |

| **O. Connecting buyers and suppliers**                                                          |
|--------------------------------------------------------------------------------------------------|
| **O1.** “We were getting those same calls from the private sector. ‘We don’t want the state to give us fuel oil, but our regular supplier is telling us he can’t get to us for whatever reason. Our generators have 8 hours of fuel left; 350,000 will go without water in 8 hours if we can’t keep our generators going—help us. Help us find somebody.’ The [government agency] representative’s function of identifying sources and putting—almost going back to your original model—putting buyer and seller together became a valuable function.” (P19, Government J) |
| P. Managing flows | O2. “Our warehouses, our drivers, and our trucks delivered [food] and delivered water. Whenever we got a call, we pulled whatever we had out of the warehouses to supply to the towns that needed it or made a request.” (P29, Business R)  

P1. “And some of [the information we provide to retailers] is operational stuff that helps their truck drivers be on the right roads, not go down the wrong roads, let them know what’s open, what’s closed, where they can go, when they can go. Assist them with curfews in order to keep the wheels of business…the wheels turning.” (P19, Government J)  

P2. “Again, [the state agencies will] ensure that our stores are able to supply a community…and don’t let the people down in the community.” (P29, Business R) |
FIGURE 1
Government Roles

- Organizer
- Facilitator
- Supply network member
FIGURE 2
Data Structure

| First-Order Concepts               | Second-Order Themes          | Aggregate Dimensions                        |
|-----------------------------------|------------------------------|---------------------------------------------|
| Convoking                         | ORGANIZING PRACTICES         | PRACTICES EMPLOYED BY THE GOVERNMENT        |
| Activating and using hierarchies  |                              |                                             |
| Commanding government actors      |                              |                                             |
| Regulating utility-firm actors    |                              |                                             |
| Orchestrating nonprofit and voluntary actors | |                                             |
| Coordination                      | FACILITATION PRACTICES       |                                             |
| Communication                     |                              |                                             |
| Collaboration                     |                              |                                             |
| Cooperation                       |                              |                                             |
| Managing interfaces               |                              |                                             |
| Training for the current event    |                              |                                             |
| Continuous learning of lessons    |                              |                                             |
| Bartering, hoarding, and seizing  | SUPPLY CONTINUITY PRACTICES  |                                             |
| Response procurement              |                              |                                             |
| Connecting buyers and suppliers   |                              |                                             |
| Managing flows                    |                              |                                             |

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FIGURE 3
Interaction Process

Before: blue skies
Pre-disaster interaction, decision-making, and planning

Interaction Context
During: overwhelming conditions
Practices Employed by the Government
- Organizing Practices
- Facilitation Practices
- Supply Continuity Practices

After: gradual return to normalcy
Post-disaster interaction, sanctions, and institutionalization of changes

Transition from preparation to response
Transition from response to recovery

Preparation for future events