The Social Value of Corporate Giving and the Economic Costs of Disasters

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Abstract

Almost 85 percent of the deaths from natural disasters have occurred in low-income countries, yet more than 85 percent of relief coming from firms has gone to medium- and high-income economies. Does this mean a socially suboptimal allocation of economic resources? To assess this question, we study donations by corporations from 65 countries to the relief and reconstruction fund of all major disasters that affected the world from 2003 to 2013. Using a novel quasi-experimental method, we provide evidence that business managers’ attention and giving efficiently specializes in low-probability, high-magnitude disasters where the gap between the economic cost and the available sources for financing relief and recovery is the greatest. In such contexts, the firm’s competences and routines generate a comparative advantage for the supply of relief and recovery vis-à-vis traditional public and multilateral donors. Corporate disaster giving increases the speed of relief and recovery and mitigates the loss of social welfare by complementing public and multilateral funding in nations that have been historically deprived of such aid.

Keywords: corporate disaster giving, corporate philanthropy, disaster relief, international aid, synthetic control method
“Everything disappeared…The government was absent for days after the disaster…And when they arrived, they did not know exactly what to do, how to coordinate the aid, what functions to perform...That was the first stage...We coped with it with our own resources and with a lot of help from the private sector that came from other countries” Municipal official describing the aftermath of the 8.8 magnitude earthquake and tsunami in 2010 in Chile (Polanco, 2012).

“Doing well by doing good” has become an often voiced phrase in the literature on company provision of collective goods that benefit external stakeholders—usually termed corporate pro-social behavior or corporate social responsibility (CSR). Studies supporting this precept suggest that shareholder value can be enhanced by a strategic provision of social goods, and much work has been premised on the principle that companies should become more engaged in pro-social behavior—both for their own advantage and for societal benefit (e.g., Henisz, Dorobantu, & Narney, 2013; Lev, Petrovits, & Radhakrishnan, 2010; Madsen & Rodgers, 2014).

However, the academic endeavor has largely concentrated on the business case for, and drivers of, such behavior, rather than on its social value—the doing good part of the equation (cf., Aguinis & Glavas, 2012; Mellahi, Frynas, Sun, & Siegel, 2015). Hence, the idea that stakeholders benefit from corporate social responsibility has generally been assumed rather than directly empirically evaluated (Kaul & Luo, 2015). Moreover, the topic has been subject to significant tensions in the literature. Recent work has shown how CSR initiatives tend to focus more on firm goals than stakeholder demands, symbolically addressing stakeholder interests but not genuinely responding to them (Cuypers, Koh, & Wang, 2015; Marquis & Qian, 2013).

The goal of this paper is to address that gap by identifying the conditions and mechanisms under which firms’ engagement in pro-social behavior enhances social welfare. We use the setting of corporate donations of cash, goods, and labor in post-disaster logistics to support relief and recovery from disasters. Corporate disaster giving provides a useful research terrain for a contribution to the CSR literature for several reasons.

First, the context provides us with clear counterfactual conditionals to the corporate intervention. Hence, we are able to evaluate the value of the company intervention and seek to
establish a causal relationship with social welfare. Although disaster response has traditionally been seen as a role primarily for public actors (White & Lang, 2012), business firms have increasingly come to play a role as well. During the past decade, no other sector has increased its proportional participation in disaster response around the world more than the global business community. For some events, corporate disaster giving has even surpassed the combined value of international public aid and individual charity—a phenomenon without precedent in the history of corporate giving and international aid (Ballesteros, 2015a).

Second, there exists an unambiguous and measurable social need for corporate giving. Financing disaster response is a grand and increasing challenge worldwide given that the costs of disasters have quintupled in the last 40 years. Those costs are particularly great in the wake of low-probability, high-magnitude disasters (Taleb, 2010), and in some cases they have come to exceed the size of the affected economy, as was the case of the 2010 earthquake in Haiti. At the same time, the real value of public and multilateral aid to finance relief and recovery has displayed a modest or even negative growth. In the last four decades, for instance, a 10-percent increase in disaster hardship has been followed by a mere 0.7-percent average increase in disaster aid. In the aggregate, disaster aid has financed only one percent of disaster costs in medium- and high-income countries (Becerra, Cavallo, & Noy, 2014). Additionally, major disaster losses remain highly underinsured even in rich economies (Bevere, Orwig, & Sharan, 2015). And given that the costliest disasters tend to occur in higher-income countries, the grand challenge is evident across all levels of economic development (Guillén, 2002; Munich Re, 2013; Weitzman, 2011).

Third, the social value of corporate disaster giving has not been well established and remains actively debated. On the face of it, business donations might appear to an unmitigated social good, filling in where public agencies could not. And because disasters can constraint economic growth (Barro, 2007; Weitzman, 2011), the recent rise in corporate disaster giving may be all the more important for that growth. If, however, corporate donations are misdirected
for strategic considerations or by other business logics away from the most pressing social needs in the wake of a disaster (e.g., Gao, 2011; Godfrey, Merrill, & Hansen, 2009; Lev et al., 2010; Muller & Kräussl, 2011; Wokutch et al., 2013), corporate behavior may be socially suboptimal, whatever benefits may be accruing to the firm. Moreover, if business donations crowd out assistance from public and multilateral agencies that may be better prepared to address societal priorities, corporate disaster giving may even be a costly misallocation of scare resources (Friedman, 1970).

Reflecting the focus on the corporate side rather than the societal side in the literature on corporate social responsibility (cf., Mellahi, Frynas, Sun, & Siegel, 2015), empirical work has usefully shown that firm ownership (Jia & Zhang, 2011), reputation (Muller & Kräussl, 2011), market dependency (Ballesteros, 2015b), and institutional factors (Tilcsik & Marquis, 2013; Zhang & Luo, 2013) drive corporate disaster giving. Other work provides evidence that disaster giving can enhance firm performance (Crampton & Patten, 2008; Madsen & Rodgers, 2014). Nevertheless, whether societies at large are better off from the increasing intervention of firms in disaster response remains an open empirical question.

Fourth, both corporate disaster giving and its potential societal implications are measurable with objective metrics that facilitate replication. The magnitude and frequency of a firm’s donation to disasters as a CSR decision is a construct that is not subject to endogeneity concerns and measurement issues such as subjectivity and adverse-selection that have affected internal validity in some empirical studies. By drawing on the literature on international aid, we thus develop a measure of national capacity to finance relief and recovery that is indicative of social needs in the aftermath of disasters. This allows us to systematically compare the availability of corporate donations with a nation’s need for disaster financing. Additionally, we calculate the social efficiency of the private intervention by looking at two variables. First, as a short-run measure of efficiency, we analyze the speed of relief supply. Second, as a long-run
measure, we analyze the change in a nation’s social welfare, proxied by the Human Development Index.

We build our analysis around a theoretical line of reasoning on the comparative advantages of corporate philanthropy in the context of large systemic shocks, and we advance two main hypothetical arguments. First, using an attention-based approach we argue that company managers will focus on those disasters that are more likely to disrupt their firm’s income flow (Hoffman & Ocasio, 2001; Lampel, Shamsie, & Shapira, 2009). These tend to be shocks that disrupt countries where firms have significant economic activity – and also where the shortfall in traditional public and multilateral sources to finance relief and recovery is greatest (Ballesteros, 2015b). Because for-profit organization’s objective function centers on financial performance (Sundaram & Inkpen, 2004), their managers are likely to seek fast restoration of market welfare to mitigate their own losses or reduce their income volatility. Consequently, they allocate resources where the need for additional funding is highest (Alessi, 1975; A. Cavallo, Cavallo, & Rigobon, 2013; O’Brien, 2011).

Second, using a resource-based approach, we argue that complementarity between a firm’s market operations and social needs in the wake of a disaster will give a firm a comparative advantage in supplying collective goods (Godfrey, 2005; Hart, 1995; Porter & Kramer, 2002). The firm can leverage its unique resources—market competences and operational routines—to supply disaster goods in a more cost-efficient and more timely fashion than can public and multilateral agencies. Consequently, with company intervention, disaster-relief timeliness and long-run recovery increase. The greater the relative amount of corporate disaster giving, the faster emergency needs are met and the lower the eventual negative effects of a disaster on social welfare.

If confirmed, our arguments would suggest that business giving fills a social need underserved by traditional international aid, complementing that assistance. Corporate largesse would thus be seen as assisting economic development by helping nations come back from
unforeseen, highly-costly calamities, in effect doing good by doing well. We test our arguments with a unique dataset comprising all the reported international contributions by firms, foundations, nonprofit organizations, foreign governments, and multilateral agencies to relief and recovery of all major natural disasters worldwide from 2003 to 2013. We use synthetic case study, a novel econometric method that enhances the identification of causality in impact questions of this kind.

In sum, our findings shed light on the mechanisms and conditions under which a specific form of CSR is socially beneficial. Additionally, our study bears on stakeholder-theory research suggesting that firms’ ability to buttress stakeholder’s support through CSR depends on stakeholder perceptions of the social benefits of such behavior (Godfrey et al., 2009). Our study provides causal evidence of a setting where such benefits are not only socially constructed but also economically substantive—that is, stakeholders are indeed better off by the firms’ intervention. And, arguably, the shareholder value of donor companies should also be positively affected (Henisz et al., 2013; McWilliams & Siegel, 2011). Accordingly, our findings would constitute a counter-point to a long-standing contention that corporate pro-social behavior reduces both corporate and societal welfare (Friedman, 1970).

Our study also has practical implications for both company managers and public and multilateral managers responsible for mobilizing disaster aid. The findings developed here can help inform company decisions on allocating their firm’s disaster giving then measure the aid’s social impact, a metric increasingly demanded by both internal and external stakeholders (cf., Eccles, Ioannou, & Serafeim, 2014). And, in developing a method to calculate a country’s financial vulnerability to disasters that arguably captures more efficiently the dynamic and complex nature of large systemic shocks than existing measures, our findings can help guide public and multilateral agencies aid as they work to further stimulate and direct the increasing role that the business community is assuming in relief and recovery around the world.

**A Grand Challenge: Financing Disaster Costs**
The average annual inflation-adjusted economic loss associated with earthquakes, floods, hurricanes and other natural calamities nearly quadrupled between 1980 and 2012, from $54 billion to $200 billion (Bevere et al., 2015) and these phenomena, on average, may be associated with statistically significant drops in economic growth for at least a decade after the shock (E. Cavallo, Galiani, Noy, & Pantano, 2013). That long-term hardship is skewed by large disasters, whose frequency, magnitude, and impact are fat tailed (Taleb, 2010; Weitzman, 2011). These low-probability, high-magnitude disasters have been found to impose much larger societal costs (e.g., 20 percent of annual GDP) compared with average shocks (e.g., 1.5 percent of GDP; Barro, 2007).

National vulnerability in the face of disasters is not necessarily inversely associated with a country’s pre-existing level of economic development (Noy, 2009). The aftermath of Japan’s magnitude 9.0 Tōhoku earthquake in 2011 revealed, for instance, that even a high-income nation can face a grave financial shortfall. The earthquake hit Japan at a moment when public indebtedness had already ballooned to twice the size of Japan’s economy, and that proved a significant constraint to the government’s capacity to cope with the resulting disruption. In the absence of international aid and insurance covering less than 20 percent of total costs (Munich Re, 2013), Japanese policymakers created an emergency-relief budget. Yet the outlay proved woefully inadequate, and the earthquake’s destruction soon morphed into the largest economic crisis for Japan since World War II (Layne, 2011). Producer numbers plummeted, the stock market plunged, and trade deficits soared. The disaster also resulted in disruptions to markets and industries worldwide as a result of their economic interdependencies (A. Cavallo et al., 2013; Olcott & Oliver, 2014).

Using traditional measures of vulnerability to disasters, the Japanese government, presiding over the third largest economy worldwide, would have been seen as relatively resilient. Yet its demonstrated financial fragility in the wake of the Tōhoku earthquake, together with similar shortcoming evident in other countries after their disasters such as the 2009
L’Aquila earthquake in Italy, the 2011 Christchurch earthquake in New Zealand, and the 2012 Superstorm Sandy in the U.S., suggests that even those countries generally seen as reasonably robust in the face of minor setbacks can fall short after major disasters (Taleb, 2010; United Nations, 2016).

Behind such seeming ironies is the focus in traditional models of disaster vulnerability on relatively simple and static indicators such as GDP that limit their ability to capture the extreme and dynamic nature of natural disasters (cf., Graf, 2012). Many of these models build on assumptions that key institutional and macroeconomic variables (e.g., trade) are exogenous even though they themselves are affected by systemic shocks (Cavallo & Frankel, 2008; Schwab, 2014; Taleb, 2010).

**The financing deficit.** A critical issue, then, concerns the factors that help create a country’s resilience against disasters if a nation’s income level is not itself an effective estimator. Studies on disaster management suggest that whether a natural shock morphs into a full-fledged disaster depends much on the rapid provision of relief (Cohen & Werker, 2008; Cutter, Emrich, Webb, & Morath, 2009; Holzmann & Jørgensen, 2001; Klinenberg, 2003; Stromberg, 2007).1 The inadequate response to Hurricane Katrina in New Orleans in 2005 is a case in point, as the storm’s physical destruction was soon overshadowed by the government’s sluggish restoration of essential services for the victims. The crisis evolved even when the U.S. government was, at least on paper, highly capable of acting (Cutter, 2006; Dye, Eggers, & Shapira, 2014).

Broadly, an affected country has three main sources for funding disaster response: local governmental assistance, private schemes (i.e., commercial insurance), and international aid (Becerra et al., 2013; Blaikie, Cannon, Davis, & Wisner, 2014; Noy, 2009).2 Both the magnitude

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1 Specifically, disaster management researchers and practitioners emphasize the importance of fast delivery of essential resources, particularly water, food, housing, medical attention, and quick restoration of the staples of a country’s social and economic infrastructure including communication and transportation (e.g., Benjamin, Bassily-Marcus, Babu, Silver, & Martin, 2011; Day, Junglas, & Silva, 2009; Day, Melnyk, Larson, Davis, & Whybark, 2012).

2 Note that our study considers the phases of relief and reconstruction when referring to disaster response or recovery. International aid is comprises several instruments, mainly humanitarian aid and official development assistance. Our focus is on the resources deployed to fund disaster relief and recovery.
of the shock and the state of the affected economy define how countries finance disaster recovery, as seen in Table 1. For major disasters, high-income nations are found to finance some 25 percent of the losses through commercial insurance and reinsurance, with affected households and local government assuming the rest of the cost. Conversely, less than 3 percent of such losses are insured in low- and medium-income countries (Cummins & Mahul, 2009; Munich Re, 2013; Staib, Puttaiah, & Ronke, 2015). However, even countries with high insurance penetration finance a small portion of disaster costs through insurance. For instance, out of the $210 billion in damage associated with the 2011 Japanese disaster, only $37.6 was insured (Munich Re, 2013). Broadly, in the last 40 years, the annual growth rate of disaster losses has outpaced the growth of insured losses worldwide by over two percentage points (Bevere et al., 2015).

The international channel, whose main funding sources are foreign governments, multilateral agencies, nonprofit organizations, and individual charity, provides only modestly for disaster relief in medium- and high-income countries (Becerra et al., 2013; Cohen & Werker, 2008; United Nations, 2016). Between 1990 and 2015, for instance, 89 percent of their international aid had been directed at low-income countries, such as Haiti and Nepal. By contrast, only eight percent had gone to medium-income countries such as Chile and Mexico, and less than three percent to high-income countries such as Japan and the U.S. (OCHA, 2016). Overall, between 1990 and 2012, international aid is estimated to have covered close to 75 percent of the cost of natural disasters in low-income countries, but just one percent in high-income countries (Becerra et al., 2013; Yang, 2008).

Given the concentration of international aid on low-income economies and the fact that the costliest disasters tend to occur in middle- and high-income countries, the uncovered financial vulnerability to disaster rises with the size of the economy, resulting in large relief and recovery deficits in wealthier nations where traditional aid has rarely been available (Mechler, 2004). Recent studies, for instance, have found that the median increase in international aid in
the aftermath of a disaster is the equivalent of only 0.14 percent of a nation’s GDP and a little less than three percent of the total economic damage of the disaster (Becerra et al., 2014). Even worse, the real value of international aid for disaster financing has declined in recent years (Kellett & Caravani, 2013). While aid covered over four percent of disasters in 2000, this figure dropped to about three percent in 2010. The United Nations estimated in a 2016 study that the aggregate aid deficit had become larger than ever, reaching $15 billion worldwide in 2015, and it urged a loosening of eligibility criteria for international aid to include countries most in need rather than just those that are least developed (United Nations, 2016).

With these issues in mind, we conceptualize the financing deficit of disasters as the difference between the direct and immediate disaster costs (i.e., the value of essential goods to restore status quo) and the value of the available internal and external funding sources of relief (Kousky, 2013).

**The Rise of Corporate Disaster Giving**

If countries prone to disasters cannot expect aid from traditional donors to meet the rising costs, the need is evident for additional sources of financing (Becerra et al., 2014). In recent years, firms have increasingly stepped forward, and as a result, company financing has sometimes reached the scale of traditional assistance (Ballesteros, 2015b; White & Lang, 2012). By way of one example, in the aftermath of the earthquake in Chile in 2010, corporate giving accounted for 51 percent of all aid flowing into the country, more assistance that all of that coming from foreign governments, multilateral agencies, nonprofit organizations, and individuals taken together. Similarly, in the aftermath of the Tōhoku disaster and the 2013 Typhoon Haiyan in the Philippines, firms accounted for 58 percent and 50 percent of the total international aid flow, respectively (Ballesteros, 2015a; OCHA, 2016; White & Lang, 2012).

Because low-frequency, high-magnitude disasters may be a significant constraint on economic growth (Barro, 2007; Weitzman, 2011), and because of the decline in the relative funding capacity of public and multilateral agencies, one can argue that the recent rise in
corporate disaster giving has made business aid a more important driver of economic recovery and growth. Nevertheless, a systematic appraisal of such an argument is not, to the best of our knowledge, available in the empirical literature. A research tradition has emerged around the implications of corporate disaster giving on business performance (e.g., Crampton & Patten, 2008; Muller & Kräussl, 2011; Patten, 2008), but not yet on its actual implications for stakeholder value.

THEORY AND HYPOTHESES

The Comparative Advantage of the Firm during National Disasters

*Business firm attention and economically costly disasters.* The for-profit organization’s objective function gravitates around financial performance (Sundaram & Inkpen, 2004). Systemic shocks, then, are especially like to attract their managers’ attention when they diminish or disrupt their firm’s market welfare and, consequently, their business performance (Hoffman & Ocasio, 2001; Lampel et al., 2009). The larger the share of the company’s income in a given market, the larger such a likelihood (Ballesteros, 2015b). While managers of public and multilateral agencies generally focus on human losses in the wake of a disaster because of the missions and goals of their organizations (United Nations, 2016), managers of business firms focus more on the economic cost.

The focus of business managers on economic recovery is in line with a theoretical expectation that pro-social behavior becomes strategic when it not only helps the society but also the company itself, reducing the real cost of philanthropy to the firm (cf., Godfrey, 2005; Porter & Kramer, 2002; Saiia et al., 2003; Wokutch et al., 2013). In other words, although corporate disaster giving may be driven by social preferences, such as altruism and reciprocity (Muller, Pfarrer, & Little, 2014), business managers strategically are likely to focus their pro-social behavior in disaster-affected nations where the direct and indirect business implications for the firms are greatest (Chamlee-Wright & Storr, 2009; Sandler, 2013). The self-interested premise that a firm’s performance may be weakened if the market is not soon restored may thus
have the unintended effect of driving a firm to invest private resources where the deficit in financial hardship is greatest. By focusing their giving on disasters with the largest economic consequences, firms in effect help cushion their own financial shocks (Alessi, 1975; Hirshleifer, 1963). These lines of reasoning are well captured by a manager at Coca-Cola when explaining his company’s philanthropic engagement in Japan after its 2011 earthquake: “We are part of a system. If the [Japanese] government cannot [effect a recovery], we need to rebuild. We need the market to recover.”

Consequently, business managers’ focus on the economic costs of disasters should be directly proportional to their firm-market interdependencies in the disaster zone (Gavetti, Levinthal, & Ocasio, 2007), and this partly helps explain the rise and allocation patterns of corporate disaster giving at the international level. During the last thirty years, the number of firms with multinational operations and the number of foreign affiliates among the world 10,000 largest firms grew 3-fold and 10-fold, respectively. Given that the exposure to disasters is higher for the average multinational enterprise than for the single-country firm, this internationalization of economic activity has likely increased management attention on disaster risk. And we find that the proportion of firms engaging in annual corporate disaster giving rose from less than 30 to over more than 90 percent between 1990 and 2014.

Also, business managers’ focus on the economic costs of disasters is likely to direct their giving toward middle- and higher-income countries where costs tend to be greater (Cummins & Mahul, 2009). And we find that firms have indeed allocated more than 85 percent of their disaster donations between 1990 and 2013 to those countries (Ballesteros, 2015b). The focus of public and multilateral international aid, by contrast, has been on the least developed countries, where 85 percent of the deaths from major natural disasters have occurred but where the share of

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3 Manager, International Public Affairs, Coca-Cola Company, in interview with one of the authors.
4 Authors’ calculation using data of the Directory of Corporate Affiliates.
5 Largest 2,000 firms at the international level. Authors’ tracking based on news reports from LexisNexis and Factiva (see Appendix for further information).
world industrial production is less than 0.5 percent (UNIDO, 2012). Accordingly, corporate giving may be a more optimally distributed resource for funding economic recovery from disasters than traditional international aid, particularly when human loss is not highly correlated with economic damage (Fink & Redaelli, 2011).

Moreover, because of their greater attention on economic processes that generate market welfare, business managers may also receive better market signals regarding the distress of an affected economy and its financial capacity to comeback than do traditional public and multilateral donors (Alessi, 1975; Ang, Benischke, & Doh, 2014; Friedman, 1970; Husted, Jamali, & Saffar, 2012; Khan & Kumar, 1997; White & Lang, 2012). Thus, business managers would be especially likely to become active providers of social goods after a disaster when they believe that the economic magnitude of a disaster may outstrip the three main sources for a country’s relief and recovery financing. In sum we hypothesize the following:

*hypothesis 1 (H1): Firms allocate corporate disaster giving more frequently and in a higher magnitude to countries that suffer large financing deficits after disasters.*

**Firm resources and the capacity to act during large disasters.** The social value of corporate disaster giving depends not only on whether it helps reduce disaster financing deficits but also on whether society is better off with the corporate intervention than with, for instance, a greater level of traditional public and multilateral assistance. Here we ask if an entity not created for disaster relief might nonetheless help restore social welfare in a more efficient fashion than traditional sources of disaster assistance.

We argue that in conditions of systemic disruption that create dire shortages during which rapid delivery of collective goods becomes essential, the firm’s unique resources generate a comparative advantage for the firm to supply such goods versus traditional givers (Hart, 1995).

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6 Companies gave five times more to Chile after its 2010 earthquake, for instance, than to Haiti a month earlier even though the death toll in Haiti was some 400 times greater. Similarly, Nepal lost one inhabitant for every 3,000 residents after its 7.8-magnitude earthquake in 2015, while Japan one resident for every 10,000 after its disaster of 2011 (Goda et al., 2015). In contrast to an overwhelming business response in Japan, however, corporate giving accounted for less than five percent of Nepal’s international assistance (Ballesters & Useem, 2015).
That is, complementarities between a company’s philanthropy and its market operation drive efficiency in the provision of collective goods (Godfrey, 2005; Porter & Kramer, 2002). Firms draw on their global and local routines and competences to deliver disaster relief in timely fashion. Particularly, these resources generate a comparative advantage in three critical activities: 1) understanding the local needs of those impacted by the disaster, 2) reallocating funds, goods, and services from other locations, and 3) delivering relief and recovery expeditiously.

First, in the aftermath of disasters, business managers’ identification of social need is influenced by the destruction of collective goods that are instrumental to their firm’s financial performance. Government officials by contrast must consider a wide range of competing needs and demands. For instance, electoral factors can affect presidential disaster declarations (Reeves, 2011) and, political considerations may explain as much as 50 percent of the variation in the allocation of federal disaster relief in the U.S. (Garrett & Sobel, 2004). Foreign governments are found to favor oil-exporting countries and countries with similar political systems with their disaster relief (Fink & Redaelli, 2011). Government officials are also reported to respond more favorable to requests for disaster aid when the disasters are widely reported in media (Eisensee & Strömberg, 2007; Franks, 2013). Traditional public aid is thus subject to political and special-interest factors that can hamper effective allocation, and the same is likely to characterize multilateral agency giving as well (Cohen & Werker, 2008; Platt, 2012).

Another factor favoring the comparative advantage of business giving: Foreign government officials generally operate with a top-down approach, while business managers may draw on their country operations for a bottom-up identification of local needs. Company executives can draw upon their local grass-roots relationships, networks of affiliates, and partner organizations for granular guidance on where assistance is most needed. The can also directly work with disaster victims and other local stakeholders to identify the best actions for restoring economic activity while also, at the same time, better appreciating the preferences of affected
communities (Useem, Kunreuther, & Michel-Kerjan, 2015). Local company managers, for instance, sometimes assume the role of local disaster task-force coordinator and serve as their firm’s main liaison among headquarters, local affiliates, the community, and government authorities. That network centrality is a unique resource that gives the corporation a close-up view of the emergency and local responders that foreign governments and multilateral agencies do not have (Twigg, 2001).

In the aftermath of the 2010 Chilean disaster, for example, the multinational mining company, Anglo American, relied on its local managers and its country vice president for corporate affairs to assess the situation. Just hours after the earthquake, Anglo American’s London-based headquarters received information on the destruction and approved what became one the first major donations for relief and recovery from any source. Among other actions, the company quickly dispatched a fleet of heavy equipment, normally used in its mining operations, to gather street debris and remove rockslides, and it worked directly with displaced residents to erect emergency housing (Useem et al., 2015).

Second, rapid reallocation of resources during large disasters is necessary to mitigate the consequences of the shock. The literature on international aid reports that the delivery of international public and multilateral aid often faces deep-rooted bureaucratic constraints that militate against quick deployment (Cohen & Werker, 2008; Franks, 2013; Lipsy & Takinami, 2013). Hence, when the magnitude of a disaster’s hardship requires donors to swiftly ramp-up their engagement, firms face fewer constraints and are likely to be able to respond more rapidly than foreign governments and multilateral agencies (Friedman, 1970; White & Lang, 2012). For instance, nearly 40 percent of the pledges by international public and multilateral agencies for recovery from the 2010 earthquake in Haiti were still outstanding in 2013—but 100 percent of the corporate pledges had been disbursed (Ballesteros, 2015b; Becerra et al., 2013; OCHA, 2016).
Additionally, firms also benefit from synergies when transferring fungible resources across their network of corporate affiliates (Barney, 1991; Penrose, 1959). Company managers can mobilize resources that have few capacity constraints and are scalable across markets (Kaul & Wu, 2015; Levinthal & Wu, 2006). When Sri Lanka was hit by the 2004 Indian Ocean tsunami, for instance, Coca Cola converted its soft-drink production lines to bottle drinking water and delivered it to victims using its own distribution system (Fritz, 2004). Additionally, market internationalization help business managers diversify their geographically-based risks and thereby improve their ability to rapidly focus their giving on a given in a way that traditional providers often cannot (Andersson, Forsgren, & Holm, 2002; Oetzel & Oh, 2014; Whiteman, Muller, & Voort, 2005). Therefore, firms can provide disaster response at a lower cost than traditional donors.

Third, regarding the provision of disaster relief and recovery, given the narrow objective function of business enterprise, corporate intervention can better target areas that facilitate a faster restitution of market status quo than will public and multilateral agencies. Corporate giving is more likely to go to disaster relief with direct economic payoffs (Cavallo & Daude, 2008; Day, Melnyk, Larson, Davis, & Whybark, 2012). This argument is supported by empirical work on public economics showing that private investment has greater positive effect on growth than does public investment (e.g., Cavallo & Daude, 2008; Khan & Kumar, 1997; Khan & Reinhart, 1990).7

Firms, for example, aim at restoring market distribution when rebuilding roads and bridges; mitigating variance in employee productivity when rebuilding health facilities; and shield consumers’ purchasing power with direct transferences to victims. In this process, companies achieve greater cost-advantages than traditional public and multilateral agencies since they can draw upon their operational routines and market competences to inform and

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7 Khan and Reinhart (1990), for example, found in a sample of 24 countries that, while the contribution of public investment is negative, private investments contributes 43 percent to average economic growth.
innovatively address relief and recovery needs. In the aftermath of the Indian Ocean tsunami, for instance, industrial goods companies helped rebuild schools by drawing on their country-specific experience in large-engineering projects. Though these companies had no special history with school building, they had plenty of expertise with construction materials. Coordinating with makers of mobile buildings, these companies rapidly delivered state-of-the-art structures that might have rimmed a factory but now served as seismic-proof schoolhouses (Fernando, 2010).

At the same time, public and multilateral stakeholders, including the local government, often face significant constraints in providing collective goods rapidly in the aftermath of large disasters (cf., Birkland, 1997; Cutter, 2006; Wokutch et al., 2013). For example, a municipal official in Chile’s Maule region that had been devastated by the 2010 earthquake and a resulting tsunami referenced a painfully modest public response: “the municipal government disappeared…the police was absent…We are too far away from Santiago and the national government was absent for days after the disaster…And when they arrived, they did not know exactly what to do, how to coordinate the aid, what functions to perform… That was the first stage…We coped with it with our own resources and with a lot of help from the private sector that came from other countries” (Polanco, 2012).

Finally, business managers often bring greater expertise than traditional donors for evaluating the cost-benefit impact of relief and recovery initiatives, building relief actions on business competences and as a result delivering relief goods more efficiently than traditional sources (Hart, 1995; Khan & Kumar, 1997; Khan & Reinhart, 1990). When the logistics company TNT assisted the United Nations in redesigning relief warehouses in Italy, for example, TNT applied its operating experience to optimize warehouse storage and train personnel in inventory management, saving the U.N. agency an estimated $450,000 annually

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8 A range of sources have documented the incapacity of Chile’s national agencies to respond (cf., Comisión Especial Investigadora, 2011; GfK, 2011; OPS, 2010). For instance, the Director of ONEMI, the Chilean agency of emergencies, at the time of the catastrophe pointed out: “We were the first ones to recognize that here we do not have as a country, yet, an institution with enough capacities to face an event of this magnitude, the biggest in 50 years. It caught us by surprise and I am being honest to accept it ” (El Mostrador, 2010).
Another example of how companies often base their relief actions on their business competences, providing relief goods more efficiently than would have traditional sources. In sum, we expect a synergy in doing both good and well in corporate disaster giving, and we anticipate that:

*Hypothesis 2 (H2). The speed in providing disaster relief and recovery and the long-run effect on social welfare increase with the proportional participation of corporate giving in international aid.*

The comparative advantage of corporate disaster giving is also sure to vary among firms and across time. The greater the overlap between a firm’s market operation and the social need, the greater the business manager’s capacity in the non-market sphere (Friedman, 1970). In this way, the firm is able to use its routines and competences to supply disaster goods with even greater efficiency than public and multilateral entities (Barney, 1991; Kaul & Luo, 2015; McWilliams & Siegel, 2011; Vogel, 2007). The express-delivery company, DHL, for instance, has often assumed a lead role in coordinating the reception of relief supplies and their distribution after a disaster, drawing on its competences in inventory control and rapid dispatch. Fewer donated good went to waste and less airport congestion resulted than had been evident in other disaster recoveries (Wassenhove et al., 2008).

Moreover, a pre-existing relatedness between market and non-market choices increases the economic efficiency of corporate disaster giving since firms can economize in their allocation of relief resources (McWilliams, Siegel, & Wright, 2006; Porter & Kramer, 2006). Firms faces relatively low costs in reconfiguring or reallocating products and services, further adding to the net social benefit (Friedman, 1970), as could be seen in Ericsson’s provision of mobile phones to humanitarian workers in the aftermath of the 2004 Indian Ocean tsunami (Wassenhove et al., 2008) or FedEx’s delivery of relief goods in the 2008 floods in Mexico (Ballesteros, 2015a).
Corporate disaster giving that is strongly associated with the organization’s market activity is thus likely to optimize the allocating of its largesse. Also, in line with an argument in the literature on strategic corporate social responsibility, when corporate giving is consistent with business objectives, we can expect it to be more disciplined in delivery (cf., Porter & Kramer, 2002; Saiia et al., 2003; Wokutch et al., 2013). Drawing on these several considerations, we offer a final theoretical argument around the moderating role of market-philanthropy relatedness in the comparative advantage of corporate disaster giving:

Hypothesis 2a (H2a). The speed in providing disaster relief and recovery and the long-run effect on social welfare generated by the participation of corporate giving in international aid increase in the degree of relatedness of corporate disaster giving to the firm’s market operations.

METHODS

Data

Our dataset covers all the major natural disasters that affected the world from 2003 to 2013. Data collection entailed three years of tracking and coding monetary and in-kind donations to the relief and recovery fund of disasters from all organizations—firms, governments, multilateral agencies, and nonprofit organizations—reported in news media. We gathered data on donations rendered up to one year after a country-designed time of a disaster’s occurrence. Hence, the data reflect donations that include disaster relief, giving that addresses immediate life-threatening concerns, and disaster recovery, giving that focuses on reconstruction, restitution, resettlement, and rehabilitation. The Appendix has a description of the Boolean procedure for identifying disaster donations and coding using differential language analysis; it also has a description of the strategy to assess for measurement error using third-party sources. The main

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9 We covered newspapers, trade publications, magazines, newswires, press releases, television and radio transcripts, digital video and audio clips, corporate websites and reports, institutional websites and reports, and government websites and reports, among other sources.

10 For robustness purposes, we run all the tests with 3-month and 6-month windows.
corporate dataset is comprised by the more than 10,000 international parent corporations of the Lexis Nexis’ Directory of Corporate Affiliates (DCA).\textsuperscript{11}

We have restricted this study to sudden phenomena such as earthquakes and hurricanes. These are disasters whose range between the time of occurrence (i.e., trigger) and the time of disruption (i.e., peak) is clearly identified and no longer than 30 days. We excluded slowly-emerging disasters, such as famines, that are long-lived events without a single sharp and readily identifiable source or whose trigger comes long before 30 days of the peak of the disaster.

Slowly-emerging disasters may be accompanied by a complex set of ex-ante and ex-post social and political factors that could be correlated with the likelihood of receiving disaster aid. For similar reasons, we did not include human-caused disasters, such as 9/11 or the financial crisis of 2008-09 (Birkland, 1997; Klinenberg, 2003; Platt, 2012).

We obtained disaster data from the International Disaster Database (EM-DAT) of the Centre for Research on the Epidemiology of Disasters (CRED), and we complemented that information with data from the United Nations Office for Disaster Risk Reduction (UNISDR). In our sample, a disaster event is a country-year-month-day observation for which there is record in the EM-DAT database under the criteria outlined above. We found 3,523 sudden natural disasters in the EM-DAT during the 2003-2013 period.\textsuperscript{12} To apply econometric specifications with country-fixed effects, we did not include 19 countries struck by only a single disaster. We also excluded 119 disasters that had imprecise start- and end-dates, and we dropped 191 disasters that did not meet the 30-day rule. This process produced a list of 3,115 disasters.

\textsuperscript{11} This is an international directory of corporate structure of public and private companies. The DCA’s criteria for content inclusion are the following. U.S. Public firms: all major publicly traded companies with U.S. located headquarters traded on one of the three major U.S. exchanges: NYSE, NASDAQ and NYSEAMEX. Also included are significant companies traded on smaller U.S. exchanges. Also included are outside service firms attached to the parent companies. Included are the parent companies and their subsidiaries, no matter where the subsidiaries are located. International companies listed generally have revenues of US$10 million or greater, in excess of 300 employee totals or substantial assets/net worth.

\textsuperscript{12} These observations are country-event pairs. These disasters can affect more than one country (e.g., the 2004 Asian Ocean tsunami affected at least six nations).
Because we use data on economic damage, we dropped disasters with missing values. The final list comprises 1,118 disasters estimated to have affected over 836 million people and generated over $1.3 trillion in damage in 129 countries. Note that our study is thus concerned with large disasters worldwide. Considering the additional national and international level control variables, our specifications account for global factors that affect the endogenous variables of national social welfare.

**Dependent variables.** We study two sets of dependent variables. First, regarding the scope of giving, we used a binary variable that takes value “1” if the firm donated or made a pledge to a given disaster country and a continuous variable for the total dollar amount of the donation. These two variables measure the frequency and magnitude of corporate disaster giving. See Appendix for the procedure we followed to monetize in-kind donations and convert donations amounts reported in a currency different than the U.S. dollar.

Second, regarding the social efficiency of corporate disaster giving, as discussed in previous sections, national disaster recovery is arguably a function of the short-run provision of essential products and services. Accordingly, we used the proportion of total disaster aid provided during the first four post-disaster weeks as a proxy for speed of relief provision (c.f., Blaikie et al., 2014; Day, Melnyk, Larson, Davis, & Whybark, 2012; Jackson, 2014; Kellett & Caravani, 2013; O’Donnell, 2009). Additionally, we used the Human Development Index (HDI) as a proxy of a long-run measure of aggregate social welfare. The HDI is calculated by the United Nations Development Program (UNDP) and measures three dimensions of social development: health and longevity; knowledge and education; and standard of living.

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13 We run specifications with the 3,115 disasters by completing data using multiple over-imputation. Early versions of this paper reported such specifications. Given the nature of our study and the fact that, regardless of the efficiency of the imputation method, it is difficult to capture all the dynamic variables associated with the cost of a disaster, we decided to use a more conservative approach. Therefore, we are reporting results with the 1,118 disasters and use the list with imputed data as robustness tests, particularly, to mitigate the risk of adverse selection.  
15 This composite statistic suffered a change in its method of calculation in 2010 that affects the 2011 HDI report onwards. Given the observation years of the present study, we used the values of HDI calculated with the old method.
Independent variables. To construct a measure of the financing deficit of disasters, we calculated a single ratio indicator, with independent betas, using proxies of the financial capacity of the state to fund systemic shocks and the estimated economic cost of the disaster. The first variable comprises the three main internal and external sources of disaster financing:  

i) *Local government assistance* is a composite measure of the main public-policy instruments that the government can use to secure liquid resources during systemic shocks: debt, deficit, and interest rates. We calculate this measure following recent studies on public finance (e.g., Ostry, Ghosh, Kim, & Qureshi, 2010; The Economist, 2015; and Zendi, Cheng, & Packard 2011).

ii) *International aid* is the surge in net official development and aid associated with the disaster. It is computed as the difference between the average aid flows from foreign governments and multilateral agencies in the two post-disaster years, including the disaster year, minus the average aid flows in the two years preceding the disaster.

iii) *Private schemes* includes all commercial insurance payments on claims made during a the two post-disaster year, including the disaster year, minus the inflation-adjusted average of all gross insurance payments on claims made during the previous two non-disaster years.  

We restricted our analysis to direct immediate damages (i.e., the dollar amount of damage to property, crops, and livestock at the moment of the event) reported by external sources as a measure of estimated economic cost to mitigate report biases and measurement error.  

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16 We obtained these data from the KPMG Africa Limited (2014), Swiss Re (Staib, Puttaiah, & Ronke, 2015), Munich Re (2013), OECD (2015), The World Bank (2014), and the International Monetary Fund (2014).

17 For some countries and/or years only data on insurance premiums could be obtained. In these cases, we calculated the inflation-adjusted average ratio of claims to premiums in the region of the country with the missing data (e.g., in South America for Uruguay). We then used the ratio to estimate the missing data. Industry reports show that neighboring countries of similar level of development (proxied by GDP) tend to have significantly similar insurance penetration (e.g., Staib, Puttaiah, & Ronke, 2015).

18 There are important considerations regarding the economic cost. Particularly, this cost is commonly self-reported by the disaster government and may be subject to accuracy issues such as overstatement (i.e., some government may have more incentives to exaggerate damages to receive international resources) or measurement errors (i.e., some governments may have better institutions to process data and calculate damages). According to CRED, the data is compiled from various sources, including UN agencies, non-governmental organizations, insurance companies,
using the affected country’s GDP of the previous disaster year. In other words, we consider that the magnitude of disaster hardship is relative to the size of the economy. Additionally, given than more than one disaster may affect the same country in the same year, we weighted our measures by month of occurrence. In sum, the disaster financing deficit of country \( i \) at time \( t \) can be now formalized as follows:

\[
d^t_i = \frac{h^t_i}{p^t_{i,t-1}} = \left( \frac{\text{estimated economic cost}^t_i}{\text{internal and external sources of disaster financing}^t_i} \right)
\]  

For testing H2, we calculated the ratio of corporate intervention, which is the proportion of total disaster aid that was furnished by firms. For H2a, using the four-digit SIC code, we first coded when the donation comprised firm’s market products, services, or an activity that was relevant for the firm’s market operation (e.g., removing debris in the case of a mining company). We computed the variable relatedness as the dollar amount of such type of giving. Then, we calculated the degree of relatedness of corporate disaster giving as the ratio of relatedness to total corporate giving, also in current U.S. dollars.

**Control variables.** The estimation vector contains disaster, organization, country, month, and year fixed effects to control for unobserved time-invariant factors. To account for potential trends in the availability of disaster aid and risk, we included year and month dummies to capture potential seasonal patterns. Regarding other time-variant characteristics, we controlled at the firm level for industry (four-digit SIC code) and one-year lags of longevity (logged number of years), logged values of employees, revenue, market capitalization, advertising, and R&D intensity (in U.S. dollars) because prior research has suggested that these factor correlate with corporate philanthropic behavior (e.g., Marquis et al. 2007, Muller and

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\(^{19}\) Disasters that occurred in the first months of year will have a greater toll on the measure of social welfare of that year than disasters occurring the last months.

\(^{20}\) Two members of the research team carried out an independent coding. An additional member solved discrepancies. The Appendix has a description of the procedure to assure data quality.
Kräussl 2011, Servaes and Tamayo 2013). We controlled for customer orientation because firms with an end-user focus (i.e., business-to-customer) may have a higher propensity to engage in pro-social behavior than firms with an industry focus (i.e., business-to-business). We also conducted sub-sample tests dividing the data according to the customer or industry orientation.

Regarding country-specific variables, we controlled for level of institutional quality using scale indicators based on the World Bank Worldwide Governance Indicators (WGI).\textsuperscript{21} One may argue that the quality of national institutions may drive the allocation and efficiency of corporate disaster giving. Countries with more developed institutions may be more ready to absorb, manage, and account for aid flows. Less corruption and higher agency accountability may increase the willingness of firms to donate. Additionally, greater government effectiveness should be associated with a stronger capacity to match relief aid with victim needs. Additionally, we accounted for the disposition of the disaster country to receive international aid because it also explains the dispersion of disaster relief across countries. Openness to aid is a binary variable that takes value “1” if the national government appealed for aid or accepted aid. We obtained these data from our Boolean search in news media using Factiva and Lexis. We also controlled for logs of the total land area ($\text{km}^2$) and total population since they may affect disaster risk, the size of market systems, and the likelihood of disaster giving. On event-specific controls, we applied dummies for disaster types as some of them may prompt response and aid more effectively than others (Birkland, 1997). The impact of the disaster was also controlled using the relative magnitude of the number of people killed and number of people affected (i.e., killed/total population and affected/total population, respectively).\textsuperscript{22} We obtained these data from the EMDAT, World Bank, and the International Monetary Fund.

\textsuperscript{21} According to the World Bank, the WGI is a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. The six broad dimensions of governance that comprise the WGI are rule of law, voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, and control of corruption. For further information, please refer to (Kaufmann, Kraay, & Mastruzzi, 2011).

\textsuperscript{22} Note that endogeneity may be an issue when regressing measures of disaster hardship. Arguably, the magnitude of the hardship is a function of disaster relief.
We accounted for the fact that firms allocate scarce resources to multiple calamities, and early disasters may crowd out company response to subsequent shocks. To measure donor fatigue and the geographical distribution of shocks, we accounted for the number of disasters at the international level and by country (disasters same country) in a period of one year before the focal disaster date, both logged. Finally, we accounted for the possibility that other major social, political, or economic events may have crowded out company interest and financial capacity to provide collective goods (Eisensee & Strömberg, 2007; Franks, 2013). Newsworthy events is the average of “the median number of minutes a news broadcast devotes to the top three news segments in a day” over the forty days after the disaster [see Eisensee and Strömberg (2007)]. The study’s hypotheses, variables, indicators, and sources are summarized in Table 2.

Estimation Strategy

As earlier outlined, we are investigating two distinct sets of empirical questions. The first one centers on the association between the allocation of corporate disaster giving and the size of the social need; the second assesses the effect of variance in business giving on relief speed and social welfare.

Firm’s Attention and Economically Costly Disasters. For the first empirical question, we relied on multilevel modeling (MLM) that fits the nature of the studied relationship [see Peterson, Arregle, & Martin (2012) for a discussion]. In this case, our unit of analysis is the firm-country-disaster triad, and we account for the characteristics of the organizational decision maker (i.e., the firm), the characteristics of the choice (i.e., the disaster country), which are nested at the level of the country. Firm $i$ chooses to donate to the disaster-country dyad $m$, $m \neq n$, given that $P^d_m = \Pr(u^d_m > u^d_n)$. That is, the probability that utility of donating to disaster $m$ ($u^d_m$) is higher than the utility of donating to disaster $n$ ($u^d_n$). We estimated two-level mix-effects linear regressions of the following type:
\[ \text{corporate giving}_{im}^{t} = \alpha_{\text{disaster financing deficit}} + (\theta_{i} + \varepsilon_{i}) \]  
\[ \alpha_{\text{disaster financing deficit}} = \beta_{1}(\text{government assistance}) + \beta_{2}(\text{international aid}) + \beta_{3}(\text{insurance}) + \beta_{4}(\text{damage}) \]

Additionally, for estimating the probability of donating, we used specifications of the following form:

\[ (P_{ij}) = \prod_{t=1}^{T} \prod_{j=1}^{J} \frac{\exp(x_{ij}a_{jt} + z_{ij}f_{jt})}{\sum_{k=1}^{K} \exp(x_{ij}a_{jt} + z_{ij}f_{jt})} f(\theta | \theta) d\beta \]

In both cases the random intercept \( \theta_{i} \) shifts the regression line up or down according to each disaster-country pair. The control vector contains firm-, country-, and event-specific variables and the standard errors of all specifications are clustered at the disaster country level. For studying the allocation patterns of corporate disaster giving, our firm sample covered the largest 2,000 multinational organizations by firm value at the international level, representing 65 countries of origin (Capital IQ).

One may argue that the geographical (and, thus, political, and socioeconomic) heterogeneity of disaster risk worldwide may generate endogeneity issue. For instance, an unobserved factor (e.g., level of market development) may affect both corporate disaster giving and the financial capacity of the country to fund disasters. To address this issue, we applied coarsened exact matching (CEM; Iacus, King, & Porro, 2008, 2011) using as treatment a binary variable that takes value “1” if the firm has a subsidiary in the disaster country. In this way, we abide to our argument that engagement in pro-social behavior is endogenous to market operation. See Ballesteros (2015b) for a discussion.

**Firm resources and the capacity to act during large disasters.** Regarding the second empirical question, identification of the causal effect of corporate disaster giving on the speed of relief and, ultimately, social welfare is significantly more complex. First, the associated impact of natural disasters on social welfare is likely to be drastically biased downward because, ceteris paribus, the economic magnitude of natural shocks is greater among upper-income economies. Second, the organizational decision to donate is arguably endogenous to the national context. And more importantly, third, the efficiency of relief is arguably endogenous to disaster giving. Applying a stratification of the analysis by country-income level may mitigate the omitted
variable bias, but it would not solve the identification problem. The assumption of cross-country variability in disaster management efficiency, but homogeneity in everything else, is clearly difficult to satisfy. Alternatively, controlling for country-specific variables in the econometric model imposes the strong assumption of extrapolating *ex ante* disaster trends to *ex post* conditions. Moreover, standard difference-in-differences and fixed-effect models impose unobservable heterogeneity to be constant over time.

The use of panel data to account for time-invariant heterogeneity represents an econometric advantage regarding the observation of causality if two conditions are achieved: 1) there are groups of disaster countries whose *ex ante* trends of efficiency of disaster management are statistically similar, and 2) they would have had statistically similar secular trends in the absence of corporate disaster giving. Because the level of analysis for hypotheses 2 and 2a takes place at the disaster country, we are interested in a tool that facilitates the estimation of the effect of interventions taking place at an aggregate level and affecting aggregate entities.

To satisfy these conditions, we applied a novel quasi-experimental method to study impact questions: *synthetic case study*. This method relies on constructing counterfactual cases and to comparatively evaluate a synthetic case with the actual observed path. The methodological argument is that a combination of units from multiple comparison cases is more effective in mimicking the characteristics of the case of interest than any single case (Abadie, Diamond, & Hainmueller, 2015). The synthetic case study facilitates quantitative inference without excluding the level of granularity of case studies. Moreover, it controls biases in observational studies and accounts for time-series variance in unobserved heterogeneity in a fashion that widespread methods in the extant literature—including differences-in-differences—cannot (Abadie, Diamond, & Hainmueller, 2010).

In our setting, we are interested in analyzing what would have happened to the speed of relief and social welfare in a disaster country in the absence of a given level of corporate disaster giving. To address the methodological issues commonly found in traditional case-study analysis
employed in the literature, we followed a rigorous data-driven procedure to construct efficient comparison groups. We compared disasters that prompted a ratio of corporate disaster giving to total disaster aid of at least the mean of all events (i.e., intervention) to a weighted combination of a control events with a lower proportion of business response (i.e., the synthetic control). The Appendix has the formal description and application of our method.

RESULTS

Firm’s Attention and Economically Costly Disasters

We found a positive and significant association between the magnitude of the disaster financing deficit and corporate disaster giving (Table 3). As predicted by H1, these results suggest that donations from the corporate community go more frequently and in a greater magnitude to disasters when traditional international aid is relatively low or absent, and the combination of private schemes and readily available government funds for assistance are not sufficient. Ceteris paribus, an increase of one standard-deviation unit in the degree of financing deficit raises the contribution of the average firm by about 19 percent and the probability of donation by about 26 percent (model 4). This finding is robust to the inclusion of a number of disaster-, country-, and firm-specific, time-variant and invariant controls and hold after CEM is implemented.

[Insert Table 3 about here]

We have suggested that firms are more willing to allocate relief resources to countries hit by disasters when their profitability is a function of the affected market. That is, firm’s performance is endogenous to pro-social behavior (Godfrey, 2005; Porter & Kramer, 2002; Wang, Choi, & Li, 2008), and firms seek to restore local welfare to bolster their own earnings. The highest degree of social efficiency in corporate disaster giving is thus likely to be achieved when firms give to markets where their greatest economic stakes are located and whose financing deficit is largest. To test this mediating relationship, we used a Chebyshev
approximation on subsidiaries, sales, and employees at the national level. We found that the baseline finding is stronger when the endogeneity of economic affiliation is considered (Model 2 in Table 3). The effect of financing deficit in the magnitude and frequency of the donation increases in the firm’s economic reliance on the affected market by about 28 percent.

**Does corporate giving complements or substitutes international aid?** Corporate disaster giving will increase social welfare if it does not crowd out international aid, or put differently, if the rise in corporate giving in recent decades has resulted in a private substitution for multilateral aid, the net social benefit could be nil (Yildirim, 2013). To test this argument, we limit our sample to events where the available financial resources cover at least the economic cost of the disruption. We run a linear specification using international aid as dependent variable and the dollar amount of corporate disaster giving as main dependent variable. We found support for the argument that corporate disaster giving is a complementary good to traditional sources of international aid. An increase of one standard-deviation unit in corporate disaster giving spurs the magnitude of financing coming from foreign governments and multilateral agencies by about 24 percent on average. This finding bears on theories that analyze the crowding-out effect of public investment and private philanthropy (Andreoni, 1993; Roberts, 1984), and we extend the previous argument in H1 by suggesting that firms furnish essential disaster relief to become a Pareto-improvement resource in disaster countries where traditional entities do not direct sufficient funding for relief and recovery (Hochman & Rodgers, 1969).

Taken together, these results suggest that corporate disaster giving acts a stop-loss mechanism in the case of costly disasters. More specifically, we observe that business donations focus on the gap between the financing provided by the traditional sources of international aid and the economic hardship resulting from a disaster.

**Firm resources and the capacity to act during large disasters**

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23 See Ballesteros, (2015b) for a discussion on the method.
Table 4 and Table 5 show the values of the matching variables. The differences between the treatment and the control groups capture the quality of the pretreatment fit achieved by the synthetic control method algorithm. We found that disaster countries associated with a relatively higher level of corporate disaster giving (i.e., at least five percent of total international aid) receive aid faster than disaster countries with lower levels of business participation. Specifically, treated disaster countries receive almost three times more aid during the first four post-disaster weeks than the control disasters, supporting H2.24

Figure 2 and 3 are a graphic representation of the time series of relief speed for the treated unit and the synthetic control group. Regarding the role of relatedness of corporate disaster giving in relief efficiency, hypothesis 2a, we found that the proportion of aid received during the first four post-disaster weeks increases with the fraction of in-kind giving. The likelihood of observing such increases by pure chance is close to zero for each of the first four weeks when the ratio of in-kind corporate donation to total corporate giving is at least 30 percent. For example, such countries received disaster aid on average about 65 percent faster than counterfactual cases, ceteris paribus (see Figure 3). This suggests that when disaster giving is arguably a comparative advantage for the firm—the company is able to relate its giving to its market operations—the size of the positive social effect is significantly larger.

On the other hand, we found a meaningful difference between the HDI – Human Development Index – of control and treatment disaster countries when the proportion of corporate disaster giving is at least 25 percent (see Table 5). In those cases, the loss in HDI one year after the disaster is 5.14 percent for the treatment group and 7.92 percent for the synthetic control group. In other words, we observed an enduring negative effect of large disasters on

24 Note that our findings do not imply that countries exposed to business intervention received more aid than control countries, as one can confirm by looking at the differences in the magnitude of the response from the three sources of disaster relief. Rather, our study indicates that the former states were able to satisfy essential needs of their population faster than the latter.
social welfare, but a significant participation of the business community in disaster relief mitigates such effect. Ceteris paribus, a country with HDI of .597 in 1990 was expected to have a value of .711 by the beginning of 2015. If the country experienced a large disaster in 2005 and the proportion of corporate disaster giving is lower than 25 percent, its value it is adjusted down to .678. Conversely, when corporate disaster giving is at least 25 percent, its HDI in 2015 would be .706. Finally, Figure 4 shows the differences in the trajectory of the Human Development Index between control and treatment disaster countries. These results provide support of hypothesis 2 with the caveat that relatively low levels of participation of corporate disaster giving have negligible effects on the long-run measure of social welfare.

[Insert Table 5. Predictor of and Figure 4 about here]

Robustness

The effect of economic growth. If firms prefer for strategic considerations to target high-income nations regardless of their social need in the aftermath of disasters (Muller & Kräussl, 2011), business disaster giving may unintendedly be increasing the income gap between countries. To test this possibility, we stratified the analyses for H1 by income level. We followed the World Bank method and grouped low-income countries (GNI per capita of $1,045 or less) in group 1, medium-income countries (GNI per capita between $1,045 and $12,736) in group 2, and high-income countries (GNI per capita of $12,736 or more) in group 3. Regarding our arguments on the attention of corporate disaster giving, if the argument on the confounding role of economic growth is correct, we would expect that the lower the income level the weaker the relationship between the financing deficit and corporate disaster giving. However, after running the analyses within each sub-sample, we found no statistically significant differences across groups.

The effect of geographical proximity. According to the neo-institutional literature, firms are embedded in institutional arrangements that create a sense of membership in a local community (Berry, Guillén, & Zhou, 2010; Galaskiewicz, 1997; Marquis et al., 2007; Powell,
that may create a normative pressure to act pro-socially (DiMaggio & Powell, 1983; Patten, 2008). The embeddedness affects stakeholder expectations and, hence, drives the organizational choices (Uzzi, 1996). Consequently, the effect of disaster financing deficits on corporate disaster giving could be captured by the firm-community geographical distance. To test this argument we stratified our sample of firms based on their physical presence using a binary variable that takes value “1” when the firm has a subsidiary in the disaster country in the time of the disaster. We found no indication that the relationship between the financing deficit and the allocation decisions of corporate giving is spurious. All robustness checks can be found in the Appendix.

**DISCUSSION**

Our study aimed at inferring the effect of corporate giving in the aftermath of disasters on social welfare, a relationship that had not yet been established in the empirical literature on corporate social responsibility (Kaul & Luo, 2015). To the best of our knowledge, this is the first study that provides causal evidence of the social value, not just business performance, of CSR and provides information of the mechanisms and conditions for pro-social behavior being a win-win investment (Lyneis & Sterman, 2015).

Analyzing our two sets of research questions has led us to the findings that, first, business managers’ attention centers on economically costly disasters that can disrupt the financial profitability of the corporation—those extreme events that hit countries where the corporation has economic interdependencies and where there is a significant deficit in the traditional public and multilateral sources of funding for relief and recovery. This finding contributes to the attention-based literature by identifying conditions that can trigger managers’ strategic considerations and, consequently, focus corporate attention on external events (Hoffman & Ocasio, 2001). We show that firms play a socially beneficial role in helping the international community cope with the economic consequences of natural disasters. Corporate disaster giving comes as a complementary good to traditional international aid and helps
mitigate a local government’s incapacity to finance disaster relief and recovery, particularly in nations traditionally deprived of that traditional aid. With our second finding, we confirm that corporate disaster giving helps drive timely delivery of disaster assistance, thereby lessening the adverse impact of natural disasters on social welfare. Thus, we contribute to the resource-based literature by illuminating the mechanisms that generate a comparative advantage of firms to supply collective goods after national disruptions vis-à-vis public and multilateral stakeholders (Godfrey, 2005; Hart, 1995; Porter & Kramer, 2002).

We also found that a higher ratio of corporate disaster giving to total disaster aid enhances social welfare. A question in light of this finding is whether social optimality is reached when firms supply the totality of disaster aid. Our setting centers on cases where there is a significant disaster financial gap, and corporate aid is an unmitigated social good. However, a plausible argument is that the marginal productivity of corporate giving will decrease as its magnitude increases. This is because the productivity of the business giving is likely a product of complementarities with public investment—as suggested by work in public economics (Cavallo & Daude, 2008; Khan & Kumar, 1997). Private giving, for instance, may well stimulate public giving in areas or on a scale where firms are not willing or able to full achieve themselves.

Moreover, philanthropy requires an institutional framework that is difficult to substitute through private mechanisms or externalize via markets. That is, a lack of public goods makes the costs of supplying disaster relief and recovery unbearable for any average firm. Finally, it is likely that some of the strategic factors that motivate corporate philanthropy may be only salient when there is also a meaningful opportunity for enhancing firm-government relations. Managers may expect to bolster corporate legitimacy in the local market by donating to disasters (Marquis & Qian, 2013), but that depends in part on a parallel interest and giving by traditional donors.

Another open question concerns the association among efficiency in disaster relief, economic growth, and institutional development. Recalling that low-income countries also tend
to have relatively low institutional capacities (The World Bank, 2014), an interesting paradox arises. Corporate disaster giving constitutes a scarcer resource in low-income countries and, hence, its marginal value may be higher than in high-income countries. At the same time, lower levels of local institutional capacities may result in a lower marginal productivity the business giving. For instance, high levels of corruption increase the inefficiently of recovery funding since governments are less likely to enforce building codes and infrastructure quality (Kahn, 2005), and more likely to engage in rent seeking (Cavallo & Daude, 2008). Hence, from the perspective of global welfare, is it efficient to allocate private giving to lower-income countries that may have a higher marginal utility for its victims but lower utility for productivity? Further empirical work may help clarify this paradox.

Our study also suggests that the greater focus of corporate giving on economic recovery and the greater focus of public and multilateral giving on human relief is socially efficient—a win-win investment (Lyneis & Sterman, 2015)—from the perspective of global welfare. The lower economic footprint of corporations in poorer countries makes corporate giving more a function of social preferences and, arguably, a less strategic resource for the corporation (Ballesteros, 2015b). The fact that traditional international aid concentrates on countries such as Nepal and Haiti and corporate aid on countries such as Chile and Japan is an appropriate allocation of global resources. The rise of corporate disaster giving is a Pareto-improvement mechanism in disaster countries lacking enough international aid for disaster funding (Hochman & Rodgers, 1969). Moreover, if the corporate donor obtains private benefits from such giving and the private gains are not misdirected from business purposes (e.g., philanthropy is not subject to moral hazard, Jensen & Meckling, 1976; Salomon, 2013), the effect is to enhance shareholder value (Porter & Kramer, 2002) and no other sector of society is worse off.  

However, one can argue that firms obtain other forms of benefits such as higher employee motivation (Flammer & Luo, 2015).
corporate disaster giving can thus be seen as a Pareto optimal choice—a subject worthy of further exploration.

We have started in this study to elucidate the characteristics of corporate donors and their giving that may have larger implications for social welfare. We have found that a high degree of relatedness between a firm’s market operations and its disaster donations enhances the comparative advantages of its disaster response. Firms are more likely to step forward with both cash and in-kind contributions where they operate, and an important subsequent question concerns whether in-kind giving is, on average, more impactful than monetary donations. Arguably, affected communities might well receive in-kind goods more quickly than monetary donations that must undergo a time-consuming execution process through public and nonprofit actors. At the same time, however, disaster-management practitioners have often recommended the provision of more liquid resources since in-kind donations cannot be repurposed as local needs evolve and they can burden or even clog the aid-delivery process (Fritz, 2004). A more punctual analysis may focus on the role of the industry, for instance, in interaction with disaster specifics, in the capacity of the firm to help communities recover.

On a related issue, studies of corporate social responsibility have at times distinguished between business giving that is largely symbolic versus primarily substantive. Scholars have relied on the characteristics of CSR to assume the substantiveness of giving (Cuypers et al., 2015). Consequently, the context of corporate disaster giving may help scholars in stakeholder and organization theory enhance construct validity when studying the substance of corporate pro-social behavior and increase the accuracy of the prediction regarding the implications on firm performance.

It should be noted that our findings do not imply that other forms of CSR are necessarily socially beneficial. Large disasters affect significantly the capacity of public national and foreign agencies to provide collective goods. One may hypothesize that under chronic conditions, such as poverty, the competitive advantage of business organizations may be lower. We believe,
however, that our research has broader implications than the setting of corporate disaster giving and the social-welfare enhancing capacity of corporate pro-social behavior may be generalized to contexts of events that cause sudden changes in the status quo. We are hopeful that the framework set forward here may prove useful to other investigators as they set out to explore the implications of business behavior on other non-market arenas.

We believe that this paper may also have practical implications. The economic hardships associated with disasters are expected to continue to grow because of expanding human settlement in regions exposed to extreme natural risks (von Peter, von Dahlen, & Saxena, 2012). If traditional sources of humanitarian aid and insurance schemes continue to be insufficient to cover disaster losses, particularly in large markets (Kellett & Caravani, 2013; Noy, 2012; United Nations, 2016; Weitzman, 2011), the social value of corporate disaster giving is thus likely to rise over time. That points to two managerial implications. First, managers in public and multilateral agencies may want to make greater effort to focus the attention of business leaders on where the greatest financial deficits exist. They may also want to draw upon our findings on the comparative advantages of the firm to guide their decisions on how best to stimulate and coordinate corporate disaster giving in a socially optimal fashion. Second, with increasing investments in international funds that rely on measures of corporate responsible performance, and with stakeholders demanding better information on such performance, the request for clear, objective, and measurable indicators of social impact has never been greater (UNCTAD, 2008). Our study provides one tool for company managers to better meet such informational needs in one of the fastest growing areas of corporate pro-social behavior.
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**APPENDIX**

**Tracking Disaster Donations**

We used a combination of manual and automated procedures to collect the data. The following is a description of these procedures:

1. We created automated codes that identified disaster donations in the body of news reports using Factiva and Lexis Nexis. The search window is one year after the official time of occurrence of the disaster according to EM-DAT. For example, the 2010 earthquake in Chile had the range from February 27, 2010 to the February 26, 2011. A story is relevant for our database if the headline or body is in the results of a Boolean search that has the combination of the affected country, the type of the disaster, and in some cases, the name of the disaster.

   a. The disasters that passed the criterion of a sudden shock were identified as follows:

      i. Mass movement: “landslide” or “avalanche” or “rockfall” or “subsidence”
      ii. Earthquake: “seismic” or “quake” or “earthquake” or “tsunami”
      iii. Flood: “flood”
      iv. Storm: “storm” or “wave” or “typhoon” or “cyclone” or “hurricane” or “tornado”
v. Volcano: “volcano” or “volcanic” or “eruption”

b. Corporate giving was identified with these terms: “donation” or “donate” or “donated” or “donating” or “pledge” or “pledged” or “pledging” or “give” or “gave” or “given” or “giving.” An example of the Boolean search is:

i. [03/11/2011-03/11/2012]; (“Japan” or “Japanese” or “Japan’s” or “Japans”26) and (“tsunami” or “earthquake” or “quake” or “disaster”) and (“donation” or “donate” or “pledge” or “pledging” or “give” or “gave” or “given” or “giving”).

2. In order to make over 2,310,000 electronic reports computationally tractable, differential language analysis was applied using JavaScript Object Notation (i.e., JSON and AJAX) to parse the data. The following fields were coded per article:

a. Entity making the donation

b. Actual donation.

i. In case of in-kind donations, the characteristics of the product or service were recorded (e.g., 1,000 bottles of water; a team of nine technicians) and monetized using either current prices applicable in the affected country (e.g., the average price of one litter of bottled water, the daily man-power wage for a specific professional or technician) or an equivalent pecuniary value based on other firms’ reporting of their donation to the same disaster.

ii. In case of donations reported in a currency different than the dollar, they were converted using the currency exchange rate of the day of the donation.

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26 There were spelling mistakes in some articles.
c. When the news article mentioned that the donation was an initiative of the employees (and, for example, the company is matching whatever the employees collected), a binary variable took value 1.

d. When the news article mentioned that the disaster affected the private-sector organization physically in any way (e.g., corporate assets such as buildings were damaged) and/or employees were injured, a binary variable took value 1.

e. To increase the relevance of the output (for example, some news reports were a series of articles with no relevance to the study but whose combination would make the report to be included in the outcome), the search was qualified with the following filtering process:

   i. The name of the country had to be within 50 words of the type of the disaster or the word “disaster.”

   ii. Entities and the act of donating were parsed:

      1. The entities per article were extracted and grouped in three categories: organization (e.g., Tepco), location (e.g., Canada), and individual (e.g., Barack Obama).

   iii. The verb identifying the act of donating had to be within 30 words of an entity

 Controlling Quality

To mitigate measurement error, the following procedures were implemented:

1. Five percent of the events (156) were randomly selected and giving was manually searched using Google, Lexis Nexis, and Factiva. From this procedure, 5.13 percent of the selected events (8) had data inaccuracies, e.g., donation amount, date of donation.

2. We had access to exclusive information of donation for the 2010 earthquake and tsunami in Chile via the Chilean government. By comparing our database with the list of donors provided by the Chilean government, we found that our dataset comprised 68 percent of
the official source. Our tracking did not include donating frequency of small- and medium-sized Chilean, non-multinational enterprises. In terms of magnitude, our dataset accounted for 92 percent of the total corporate aid for the event.

3. When available, the accuracy of the data was corroborated using external sources:
   a. The Financial Tracking System (FTS) of the United Nations Office for Coordination of Humanitarian Affairs (OCHA), which is a global database that records self-reported international humanitarian aid for different humanitarian crises. The FTS has information on corporate donation for about 3 percent of the tracked events; and government and NGO donation for about 10 percent of the tracked events. In all cases, for corporate giving, the built dataset was larger than the FTS dataset.
   b. Disaster corporate aid trackers of the Corporate Citizenship Center (CCC) at the U.S. Chamber of Commerce Foundation. This source provided information on corporate donation for 0.610 percent of the tracked events. In all cases, our database was larger than the CCC dataset.

Assessing construct validity

Researchers were hired to conduct an independent qualitative assessment of the accuracy of the independent variable to measure economic affiliation. A total number of 50 firms, 2.5 percent of the sample, were randomly selected. Different sources were analyzed to identify information of the economic importance of geographical areas during the period 2003-2013. The sources were annual corporate reports, Factiva Dow Jones, and Thomson Reuters.

Synthetic Comparative Case Study

Without loss of generality, our sample of $J+1$ events contains one event with such a degree of corporate disaster giving and $J$ events in the potential control group. Let $Y^N_\mu$ be the

---

27 See Abadie et al., (2010, 2015) for a comprehensive discussion on the method.
dollar amount of total disaster aid that would be observed for disaster country \( i \) at time \( t \) in the absence of the intervention, for disaster countries \( i=1,...,J+1 \), and periods \( t=1,...,T \). Let \( Y_{it}^I \) be the dollar amount of total disaster aid that would be observed for disaster country \( i \) at time \( t \) if that country received the intervention, which provides a proxy of the efficiency to supply essential collective goods (Day et al., 2012).

Given the unpredictability of our analyzed shocks, the disaster giving has no effect on the outcome before the intervention and anticipation effects are ruled out. That is, for \( i \in \{1,...,N\} \) and \( t \in \{1,...,T_0\} \), \( Y_{it}^I = Y_{it}^N \). Implicit in our notation is the assumption of no interference between units (i.e., the intervention does not affect outcomes of the untreated disaster countries; cf., Rosenbaum, 2007). Let \( \alpha_i = Y_{it}^I - Y_{it}^N \) be the effect of the intervention for disaster country \( i \) at time \( t \), and let \( D_i \) be an indicator that takes value one if disaster country \( i \) is exposed to the intervention at time \( t \). Hence, the observed outcome is

\[
Y_{it} = Y_{it}^N + \alpha_i D_i
\]  

(4)

Because only the first disaster country is exposed to the intervention and only after period \( T_0 \), where \( (1 \leq T_0 < T) \), then

\[
D_i = \begin{cases} 1 & \text{if } i=1 \text{ and } t > T_0 \\ 0 & \text{otherwise} \end{cases}
\]

Our target parameters are \( (\alpha_1,T_0+1,...,\alpha_1,T) \), which are the lead-specific causal effect of corporate disaster giving on total disaster aid. Thus, for \( t > T_0 \),

\[
\alpha_i = Y_{it}^I - Y_{it}^N = Y_{it} - Y_{it}^N
\]  

(5)

Note that \( Y_{it}^I \) is observed, hence, we need to approximate \( Y_{it}^N \) in order to estimate \( \alpha_i \). To do so, we used exact inferential techniques as suggested by Abadie et al., (2010) and E. Cavallo et al., (2013). Additionally, we extended the idea in Abadie et al. (2010) and employed coarsened exact matching to construct suitable comparison groups. We implemented the synthetic control to every potential disaster-country control in the sample.

To select the observed predictors for total disaster aid used in the estimation matrix, we built upon the empirical literature on disaster aid (e.g. Becerra et al., 2014; Eisensee &
Strömberg, 2007; Fink & Redaelli, 2011; Stromberg, 2007). For relief effectiveness we used 1) quality of governance measured by the Worldwide Governance Indicators; 2) human hardship, the natural logarithm of either the number of people killed or number of people displaced or injured; 3) salience, the natural logarithm of (one plus) the count of news articles in English that referred to the event during the first 48 hours after the official time of occurrence of the shock; 4) size of the economy, the natural logarithm of the country’s pre-disaster GDP per capita (PPP); 5) number of disasters at the country and at the international level; 6) newsworthy events; and 7) openness to aid.

Regarding social welfare, we built on the growth literature (e.g., Barro, 2007; cf., Kousky, 2013) and used we used 1) schooling measured by secondary education attainment; 2) life expectancy; 3) inflation rate is the annual percentage change in consumer prices; 4) trade openness proxied by real exports plus real imports as a percentage of real GDP; and 5) investment rate is the ratio of real domestic private and public investment to real GDP.

We estimate the studied effect as follows:

\[ Y_i^\alpha = \delta_i + \theta_i Z_i + \lambda_i \mu_i + \epsilon_i \]  

where \( \delta_i \) is an unknown common factor with constant factor loadings across disaster countries, \( Z_i \) is a \((r \times 1)\) vector of the predictors described above, \( \theta_i \) is a \((1 \times r)\) vector of unknown parameters, \( \lambda_i \) is a \((1 \times F)\) vector of unobserved common factors, \( \mu_i \) is an \((F \times 1)\) vector of unknown factor loadings, and the error terms \( \epsilon_i \) are unobserved country-specific shocks affecting disaster aid with zero mean for all \( i \) and \( t \). Notice that we do not conduct a prediction of ex ante disaster giving in our matched-case-study analysis. Arguably, disaster donations are observed only after the occurrence of the shock. Additionally, recall our strategy of focusing on sudden disasters. Also notice that, as suggested, our estimation method allows the effect of unobservable heterogeneity to vary over time.

The traditional case-study method used in the extant literature has two critical empirical challenges. First, comparison cases are often chosen on the basis of subjective criteria of
affinity. Second, they typically use data on a sample of disaggregated units, but employing inferential techniques that observe uncertainty at the aggregate value in the population.

Uncertainty about the efficiency of the control group to reproduce the counterfactual result is not mitigated with the availability of aggregated data because such uncertainty is not captured by the standard errors of the traditional inferential methods commonly employed (Abadie et al., 2010). Applying CEM to every potential disaster country in the control group allows us to better assess if the studied effect found in the synthetic control for the disaster country with the minimum share of business giving is significantly large vis-à-vis the effect estimated found in a randomly chosen country with no intervention. This inferential method is efficient because it is always feasible to calculate the exact distribution of the estimated effect of corporate disaster giving regardless of the number of disaster countries. Thus, the inference identifies whether the estimated effect of the business intervention is significantly large vis-à-vis the distribution of effects for the disaster countries not exposed to a ratio of corporate disaster giving to disaster relief of at least five percent.

Our approach allows us to isolate the effect of corporate giving in the efficiency of disaster recovery from a number of institutional factors. The synthetic case study method, hence, compares disaster countries with statistically similar institutions and level of institutional development. This is important because learning from disasters may be associated with an incremental institutional evolution in disaster risk management. For example, countries often improve building codes in the aftermath of destructive disasters or create agencies dedicated to disaster prevention (Kunreuther & Useem, 2009).

**Coarsened Exact Matching.** We used no-replacement coarsened exact matched procedure in which we targeted a treatment-to-control ratio of 1:10, but tested up to 1:2 for robustness. CEM is carried out with no replacement using variables chosen in accordance with literature in philanthropy and particularly on corporate disaster giving (cf., Crampton and Patten 2008, Marquis et al. 2007, Muller et al. 2014, Patten 2008, Tilcsik and Marquis 2013, Whiteman
et al. 2005); primary industry, number of employees, market capitalization, percentage of foreign affiliates, headquarters country of ultimate parent, total revenue, and return on assets. Pre- and post-descriptive statistics for assessing quality and measures of imbalance were calculated as suggested by Iacus et al., (2008). We used the Freedman-Lane semi-partialing method implemented as a linear probability model with fixed-effects for the treatment and control groups (Rogan & Sorenson, 2013) to control spatial autocorrelation in standard errors, (Dekker, Krackhardt, & Snijders, 2007). See the Appendix for a description of the CEM procedure.

The sum of absolute differences across the multivariate histogram has the following form:

\[ L(t, c) = \frac{1}{2} \sum_{l=1}^{k} n |t_{il, lk} - c_{il, lk}| \]

where \( t_{il, lk} \) is the relative frequency of the categorical variables for the firms in the treatment group and \( c_{il, lk} \) is the correspondent number for the firms in the control group. A magnitude of \( L(t, c) = 0 \) means perfect balance while a magnitude of 1 represents perfect separation. The procedure to obtain the relative frequencies of the categorical variables is based on Iacus et al., (2008). Once a number of categories for each continuous variable, a cross-tabulation of the discretized variables is generated for the treatment and the control groups. Then, the k-dimensional relative frequency is calculated.

Treating Missing Data

Regarding missing firm- and event-specific missing data, we statistically confirmed that these observations were missing at random (MAR). Given the relatively small subset of firms engaging in disaster giving by event, addressing this issue with traditional strategies like list-wise deletion or mean substitution would have fostered the risk of obtaining biased estimates, increasing Type II errors, and underestimating correlations and coefficient weights (Stock & Watson, 2003).
Therefore, we used a multiple-input bootstrapping algorithm for time-series-cross-sectional data as explained by Honaker et al. (2011). This form of multiple imputation accounts for smooth time trends, changes across cross-sectional variables, and time and space correlations and it susceptible to integrate scant knowledge to specific cells when available. To account for nonlinear effects in the case of disasters, we used dummies to inform if killed, total affected, and estimated damage were in the percentile regions 0th-25th, 25th-50th, 50th-75th, or 75th-95th, with the omitted categories are above 95th. A review of how this method can produce more accurate imputation particularly for data used in the social sciences than traditional procedures can be found in Honaker and King (2010).

For robustness purposes, we used imputation with maximum likelihood. This strategy centers on the observed relationships among the covariates and considers a degree of random error that takes into account uncertainty of imputation (Acock, 2005). For increasing accuracy of the MLE calculation, the data are grouped by industry for the first set of questions and by country for the second.
Table 1. Scale of Disaster Risk and the Sources of Financing Disaster Costs

<table>
<thead>
<tr>
<th>Risk Scale</th>
<th>Formality of the RM</th>
<th>Type of Risk Management (RM) Mechanism</th>
<th>Hazard Impact</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systemic Risk</td>
<td>Formal RM</td>
<td>International disaster relief and human assistance</td>
<td>National Disaster</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reinsurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Public restitution funds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idiosyncratic Risk</td>
<td>Informal RM</td>
<td>Insurance</td>
<td>Individual Loss</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Community risk pooling</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-managed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. When a household suffers an idiosyncratic shock like a house fire or a chronic disease, two family members with similar socioeconomic characteristics and hazards-exposure can combine incomes and mitigate the impact on household’s welfare. Bardhan and Udry (2007) provide an account of consumption-smoothing practices that achieve an efficient allocation of individual risk within the community. They show that the marginal utility of any household is a monotonically increasing function of average village consumption. In a Pareto-efficient allocation, the temporary changes in income are fully pooled at the community level. The only risks faced by the household are systemic hazards affecting the community. Conversely, when hazards are systemic, the benefit of pooling incomes for managing risk disappears.
Table 2. Study Hypotheses, Variables, Indicators, and Sources

<table>
<thead>
<tr>
<th>Hypothesis 1 (H1):</th>
<th>Hypothesis 2 (H2):</th>
<th>Hypothesis 2a (H2a):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firms allocate corporate disaster giving more frequently and in a higher magnitude to countries that suffer large financing deficits after disasters.</td>
<td>The speed in providing disaster relief and recovery and the long-run effect on social welfare increase with the proportional participation of corporate giving in international aid.</td>
<td>The speed in providing disaster relief and recovery and the long-run effect on social welfare generated by the participation of corporate giving in international aid increase in the degree of relatedness of</td>
</tr>
<tr>
<td><strong>Dependent variable:</strong> Allocation of corporate disaster giving = total dollar amount of the monetary or in-kind donation</td>
<td><strong>Ratio of corporate intervention</strong></td>
<td><strong>Degree of relatedness of corporate disaster giving</strong></td>
</tr>
<tr>
<td><strong>Indicators</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ \frac{\text{economic cost}<em>{1}}{\text{internal and external sources of disaster financing}</em>{1}} ] = [ \frac{\text{economic cost}}{\text{sources of disaster financing}} ] = estimated associated damage (USD PPP)</td>
<td>[ \frac{\text{corporate disaster giving}}{\text{total disaster aid}} ]</td>
<td>[ \frac{\text{Relatedness of corporate giving (USD)}}{\text{corporate giving (USD)}} ]</td>
</tr>
<tr>
<td>[ \text{sources of disaster financing} = (\text{Local government assistance} = \text{composite measure of debt, deficit, and interest rate}) ] + [ (\text{International aid} = \text{average aid flows in the two post-disaster years} - \text{average aid flows in the two years preceding the disaster}) ] + [ (\text{Private schemes} = \text{average gross insurance payments on claims made in the two post-disaster years} - \text{average gross insurance payments on claims made in the two years preceding the disaster}) ]</td>
<td></td>
<td>[ Relatedness = \text{the donation is in the firm’s core market product, service, or an activity that is essential for the firm’s market operation} ]</td>
</tr>
<tr>
<td>Non-disaster years are adjusted for inflation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authors tracking</td>
<td></td>
<td>Authors tracking and coding</td>
</tr>
<tr>
<td>FTS UNOCHA, World Economic Outlook, the World Development Indicators, the OECD, KPMG, Munich Re, and Swiss Re</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesis</td>
<td>Variable</td>
<td>Indicators</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>corporate disaster giving to the firm’s market operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td>Primary sector, Primary industry, Year founded, Total assets, Total employees, Total enterprise value, Total debt, Consumer focus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total population, Total land area in squared kilometers, Index with i) life expectancy at birth, ii) knowledge and education, and iii) GDP per capita (PPP) [United Nations Human Development Index]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratio of deaths=number of people killed/total population, Type of natural catastrophe, Count of other major catastrophes during the year, Count of major social, sport, political, or economic events during the year, Relative economic damage=associated economic damage/GPD PPP, Proportion of affected population=(number of people displaced or injured)/total population</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1. Distribution of hardship per type and subtype of disaster

Note: Distribution of 3,115 natural disasters in the period 2003-2013. Affected include people that have been injured (i.e., individuals suffering from physical injuries, trauma or an illness requiring medical treatment), affected (i.e., individuals requiring basic survival needs such as food, water, shelter, sanitation, an immediate medical assistance during a period of emergency) and left homeless (i.e., individuals needing immediate assistance in the form of shelter). Source: (EM-DAT, 2014).
Table 3. Multi-level Models on the Scope of Corporate Disaster Giving
Dependent Variable= USD Donation Amount (logged)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Baseline (RE)</th>
<th>Model 1 (RE)</th>
<th>Model 2 (RE)</th>
<th>Model 3 (RE)</th>
<th>Model 4 (FE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing Gap of Disasters</td>
<td>.5985*** (0.395)</td>
<td>.6731*** (0.609)</td>
<td>.7052*** (0.849)</td>
<td>.4919*** (3.544)</td>
<td>.1874*** (0.482)</td>
</tr>
<tr>
<td>Aid Appeal</td>
<td>.2399*** (0.620)</td>
<td></td>
<td>.1165** (0.693)</td>
<td></td>
<td>.1122 (0.921)</td>
</tr>
<tr>
<td>Financing Gap x Economic reliance</td>
<td></td>
<td></td>
<td>.7519*** (0.958)</td>
<td>.6708*** (0.416)</td>
<td></td>
</tr>
<tr>
<td>Economic Reliance</td>
<td></td>
<td></td>
<td>.4994*** (0.288)</td>
<td></td>
<td>.1122 (1.630)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTROLS</th>
<th>Baseline (RE)</th>
<th>Model 1 (RE)</th>
<th>Model 2 (RE)</th>
<th>Model 3 (RE)</th>
<th>Model 4 (FE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing Gap of Disasters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aid Appeal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financing Gap x Economic reliance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic Reliance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>-0.030 (0.073)</td>
<td>0.096 (0.120)</td>
<td>0.015 (0.079)</td>
<td>0.015 (0.079)</td>
<td>0.015 (0.079)</td>
</tr>
<tr>
<td>Affected Population</td>
<td>-0.378*** (0.058)</td>
<td>-0.178* (0.092)</td>
<td>-0.393*** (0.064)</td>
<td>0.328*** (0.125)</td>
<td>0.328*** (0.125)</td>
</tr>
<tr>
<td>Number of Disasters (Country)</td>
<td>0.079 (0.200)</td>
<td>-0.048 (0.385)</td>
<td>0.195 (0.217)</td>
<td>1.834*** (0.495)</td>
<td>1.834*** (0.495)</td>
</tr>
<tr>
<td>Population</td>
<td>0.408 (0.138)</td>
<td>0.405* (0.208)</td>
<td>0.482*** (0.149)</td>
<td>0.003 (0.296)</td>
<td>0.003 (0.296)</td>
</tr>
<tr>
<td>Land Area</td>
<td>-0.689*** (0.151)</td>
<td>-1.389*** (0.242)</td>
<td>-0.737*** (0.164)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Disasters (International)</td>
<td>0.958*** (0.234)</td>
<td>0.503 (0.376)</td>
<td>1.080*** (0.260)</td>
<td>1.834*** (0.495)</td>
<td>1.834*** (0.495)</td>
</tr>
<tr>
<td>Voice and Accountability</td>
<td>0.329 (1.155)</td>
<td>1.930 (1.605)</td>
<td>1.444 (1.225)</td>
<td>1.337 (1.209)</td>
<td>1.337 (1.209)</td>
</tr>
<tr>
<td>Government Effectiveness</td>
<td>1.358 (1.131)</td>
<td>1.634 (1.573)</td>
<td>0.295 (1.209)</td>
<td>1.369 (1.195)</td>
<td>1.369 (1.195)</td>
</tr>
<tr>
<td>Regulatory Quality</td>
<td>1.289 (1.135)</td>
<td>2.148 (1.572)</td>
<td>1.764 (1.185)</td>
<td>1.325 (0.173)</td>
<td>1.325 (0.173)</td>
</tr>
<tr>
<td>Rule of Law</td>
<td>1.173 (1.137)</td>
<td>1.157 (1.157)</td>
<td>0.237 (1.158)</td>
<td>0.599 (1.178)</td>
<td>0.599 (1.178)</td>
</tr>
<tr>
<td>Openness to Aid</td>
<td>3.133 (1.969)</td>
<td>2.762 (1.969)</td>
<td>1.249 (1.133)</td>
<td>1.510 (1.148)</td>
<td>1.510 (1.148)</td>
</tr>
<tr>
<td>Deaths</td>
<td>0.414*** (0.151)</td>
<td>0.503*** (0.093)</td>
<td>0.405*** (0.055)</td>
<td>0.316** (0.131)</td>
<td>0.316** (0.131)</td>
</tr>
<tr>
<td>Return on Assets %</td>
<td>0.012 (0.055)</td>
<td>0.028 (0.025)</td>
<td>0.013 (0.028)</td>
<td>0.017 (0.098)</td>
<td>0.017 (0.098)</td>
</tr>
<tr>
<td>Consumer Orientation</td>
<td>0.741** (0.348)</td>
<td>0.582 (0.393)</td>
<td>0.831*** (0.377)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>-0.001 (0.011)</td>
<td>0.021* (0.012)</td>
<td>0.001 (0.011)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees</td>
<td>0.254 (0.166)</td>
<td>0.176 (0.190)</td>
<td>0.212 (0.177)</td>
<td>-1.742 (1.114)</td>
<td>-1.742 (1.114)</td>
</tr>
<tr>
<td>Market Capitalization</td>
<td>0.408*** (0.138)</td>
<td>0.384*** (0.163)</td>
<td>0.318** (0.148)</td>
<td>-0.191 (0.428)</td>
<td>-0.191 (0.428)</td>
</tr>
<tr>
<td>Constant</td>
<td>.3271*** (0.181)</td>
<td>.19149*** (2.771)</td>
<td>.23628*** (3.640)</td>
<td>.18967*** (2.948)</td>
<td></td>
</tr>
</tbody>
</table>

Observations: 2,236,000
Country FE: YES
Year FE: YES
Month FE: YES
Firm FE: YES

Clustered-by-event standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Fixed-effects models have robust standard errors, month-, year-, country-, and firm-effects. The total sample of natural disasters in the period 2003-2013 is 1,118.
Table 4. Predictor of Relief Effectiveness

Dependent variable: % of disaster aid 4 weeks

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Treatment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disaster Response Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate Disaster Giving</td>
<td>6.12</td>
<td>2.70</td>
</tr>
<tr>
<td>Local Government Assistance</td>
<td>30.57</td>
<td>30.84</td>
</tr>
<tr>
<td>International Aid</td>
<td>5.38</td>
<td>5.45</td>
</tr>
<tr>
<td>Private Schemes</td>
<td>23.41</td>
<td>24.41</td>
</tr>
<tr>
<td>Estimated Economic Cost (Disaster)</td>
<td>811.74</td>
<td>702.83</td>
</tr>
<tr>
<td><strong>Selection Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP (logged)</td>
<td>29.32</td>
<td>26.78</td>
</tr>
<tr>
<td>Deaths</td>
<td>380.58</td>
<td>422.13</td>
</tr>
<tr>
<td>Salience</td>
<td>14.35</td>
<td>14.33</td>
</tr>
<tr>
<td>Disasters (country)</td>
<td>7.31</td>
<td>7.32</td>
</tr>
<tr>
<td>Disasters (international)</td>
<td>237.46</td>
<td>239.08</td>
</tr>
<tr>
<td>Newsworthy events</td>
<td>8.47</td>
<td>8.99</td>
</tr>
<tr>
<td>Openness to aid</td>
<td>.77</td>
<td>.81</td>
</tr>
<tr>
<td>Number of Events</td>
<td>246</td>
<td>2869</td>
</tr>
<tr>
<td>% of disaster aid 4 weeks</td>
<td>38.9</td>
<td>13.6</td>
</tr>
</tbody>
</table>

Note: The table shows the mean values of the covariates used for matching cases and the magnitude of the disaster response for the analyzed period only as a reference—the synthetic case study algorithm minimizes the distance between potential control disaster countries and the treated disaster country on a case by case basis. Disaster response variables and the estimated cost are averaged for the two post-disaster years. Actual is disaster countries with a relatively high level of corporate disaster giving (i.e., at least 5 percent of total international aid). The total sample of natural disasters in the period 2003-2013 is 1,118.
### Table 5. Predictor of Social Welfare

Dependent variable: Human Development Index

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>Treatment</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disaster Response Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate Disaster Giving</td>
<td>47.82</td>
<td>21.59</td>
</tr>
<tr>
<td>Local Government Assistance</td>
<td>29.41</td>
<td>29.23</td>
</tr>
<tr>
<td>International Aid</td>
<td>6.89</td>
<td>7.01</td>
</tr>
<tr>
<td>Private Schemes</td>
<td>3.78</td>
<td>3.86</td>
</tr>
<tr>
<td>Estimated Economic Cost (Disaster)</td>
<td>1,152.45</td>
<td>1,148.22</td>
</tr>
<tr>
<td>Selection Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schooling (mean of years)</td>
<td>57.3</td>
<td>57.4</td>
</tr>
<tr>
<td>Life expectancy</td>
<td>14.35</td>
<td>14.33</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>9.15</td>
<td>9.14</td>
</tr>
<tr>
<td>Trade openness</td>
<td>57.3</td>
<td>57.4</td>
</tr>
<tr>
<td>Investment rate</td>
<td>20.9</td>
<td>20.8</td>
</tr>
<tr>
<td>Number of Events</td>
<td>246</td>
<td>2869</td>
</tr>
<tr>
<td>HDI</td>
<td>.706</td>
<td>.643</td>
</tr>
</tbody>
</table>

Note: The table shows the mean values of the covariates used for matching cases and the magnitude of the disaster response for the analyzed period only as a reference—the synthetic case study algorithm minimizes the distance between potential control disaster countries and the treated disaster country on a case by case basis. Disaster response variables and the estimated cost are averaged for the two post-disaster years. Actual is disaster countries with a high level of corporate disaster giving (i.e., at least 25 percent of total international aid). The total sample of natural disasters in the period 2003-2013 is 1,118.
Figure 2. The effect of corporate disaster giving on relief and recovery speed
Actual is disaster countries with a relatively high level of corporate disaster giving (i.e., at least 5 percent of total international aid). Sample of 1,118 large disasters in the period 2003-2013.

Evolution of Disaster Aid
Black Swans

Percentage of Total Disaster Aid
Post-Disaster Week

- Counterfactual
- Actual
Figure 3. The effect of the relatedness of corporate disaster giving on relief and recovery speed
Actual is disaster countries with a relatively high level of corporate disaster giving (i.e., at least 5 percent of total international aid) and the ratio of in-kind corporate donation to total corporate giving is at least 30 percent. Sample of 1,118 large disasters in the period 2003-2013.
Figure 4. The effect of corporate disaster giving on the negative effect of the disaster on the Human Development Index

Actual is disaster countries with a relatively high level of corporate disaster giving (i.e., at least 25 percent of total international aid). Sample of 1,118 large disasters in the period 2003-2013.