

2016-01

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L. Ballesteros, M. Useem. 2016. "Black Swans and the Social Value of Corporate Disaster Giving" *Academy of Management Proceedings*, Volume 2016, Issue 1, pp.11990-11990. <https://doi.org/10.5465/ambpp.https://hdl.handle.net/2144/46086>

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Black Swans and the Social Value of Corporate Philanthropy

Luis Ballesteros, Michael Useem

The Wharton School

Draft of February 25, 2016

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 giving efficiently specializes in black swans, calamitous disasters. In such contexts, corporate giving increases the speed of relief provision and mitigates the loss of social welfare associated with the disaster by complementing public funding in nations that have been historically deprived of international aid.

Keywords: **corporate disaster giving, corporate philanthropy, black swans, 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 2010 earthquake and tsunami in Antofagasta, 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, & Nartey, 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 societies benefit from corporate social responsibility has generally been assumed rather than empirically evaluated (Kaul & Luo, 2015).

The goal of this paper is to address that gap by examining the social efficiency of corporate disaster giving. The donation of cash, goods, or labor and capital in post-disaster logistics by firms to support relief in the aftermath of natural disasters is a phenomenon that has grown significantly in recent years. During the last decade, no other sector has increased its proportional participation in disaster relief around the world more than the 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 philanthropy and disaster relief (Ballesteros, 2015a).

This surge in corporate disaster giving comes at a time when unmet social needs after a calamity have become larger than ever. Financing disaster recovery is an increasing challenge worldwide given that costs have quintupled in the last 40 years. The systemic disruption is particularly acute in the wake of black swans, rare calamities with extraordinary consequences (Taleb, 2010). The costs of these fat-tail

disasters have in some cases come to exceed the size of the affected economy. At the same time, the real value of the traditional internal and external sources that a country has to finance relief has had more 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, aid has financed only one percent of disaster costs in medium- and high-income countries. As a result, many countries, regardless of their level of development, have increasingly struggled to finance their recovery from black swans (Guillén, 2002; Munich Re, 2013; Weitzman, 2011).

In this context, an important question concerns the social value of the expanding flow of corporate disaster giving. 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), this rise in corporate disaster giving may enhance social welfare. If, however, corporate donations are misdirected for strategic considerations or by other business logics (e.g., Gao, 2011; Godfrey, Merrill, & Hansen, 2009; Lev et al., 2010; Muller & Kräussl, 2011; Wokutch et al., 2013) away from the most pressing social needs, corporate behavior may be socially suboptimal, whatever benefits may be accruing to the firm. Moreover, if business donations crowd-out assistance from public agencies that may better prepared to address public priorities, corporate disaster giving may be costly for society (Friedman, 1970).

Reflecting the focus in the literature on corporate social responsibility (cf., Mellahi, Frynas, Sun, & Siegel, 2015), empirical work has shown, for instance, 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, and other studies report evidence that disaster donations 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.

We approach this question and our contribution to the CSR literature with a theoretical argumentation of the comparative advantages of corporate philanthropy in the contexts of large systemic

shocks. Drawing on the literature on international aid, we propose a measure of national capacity to finance relief in the aftermath of black swans, which may be more indicative of social needs after a systemic shock than traditional criteria based on the level of economic development. This framework allows us to systematically evaluate the efficiency of corporate disaster giving to satisfy those social needs vis-à-vis other sources to finance relief.

We advance two main hypothetical arguments. First, business giving will tend to focus on black-swan disasters where the gap between the public national and multilateral sources to finance relief and the economic damage are the greatest. Firms need a fast restoration of market welfare to minimize any negative effect on firm performance and, consequently, they allocate resources where the need for additional funding is the greatest (Alessi, 1975; A. Cavallo, Cavallo, & Rigobon, 2013; O'Brien, 2011). Additionally, a synergy between a firm's market operation and philanthropy will provide the firm comparative advantages to supply social goods in the aftermath of black swans (Godfrey, 2005; Porter & Kramer, 2002). The firm leverages on market competences and operational routines to supply disaster goods in a more cost-benefit and swifter fashion than can foreign and nonprofit stakeholders. Consequently, speed in disaster relief and the long-run effect on social welfare increases in corporate intervention: the greater the relative value of corporate disaster giving, the faster emergency needs are met and the lower the negative effect of a black swan on social welfare. If confirmed, our arguments would suggest that business giving fills a social need underserved by traditional international aid, complementing its 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 a novel econometric method—synthetic comparative case study—that enhances the identification of causality in economic or social impact questions of this kind.

In sum, the main contribution of our study to the CSR literature is an empirical one by presenting a novel and systematic evaluation of the social consequences of corporate pro-social behavior, which is objectively operationalized in our study. Our findings shed light on the mechanisms under which such behavior is socially beneficial under conditions of large disruptions. Additionally, our study bears on stakeholder-theory scholars who suggest that firms' ability to buttress stakeholder's support through pro-social behavior depends on the 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 better off by the firm's intervention. By implication, arguably, the shareholder value of donor companies should be positively affected (Henisz et al., 2013; McWilliams & Siegel, 2011). Accordingly, our findings would be a counter-point to the long-standing argument that corporate pro-social behavior reduces aggregate welfare (Friedman, 1970). Finally, we contribute to the literature on international aid where the systematic empirical study of the role of firms in disaster response has been largely neglected. Moreover, we present a measure that, arguably, captures a country's financial vulnerability to large disasters more efficiently than traditional measures in the extant literature.

Our study also has practical implications by helping managers measure the social impact of their firms' philanthropic investment, a metric increasingly demanded by internal and external stakeholders (cf., Eccles, Ioannou, & Serafeim, 2014). Our findings can also help guide managers in public and multilateral agencies responsible for mobilizing disaster aid as they work to stimulate and direct the increasing role that the business community is assuming in relief around the world.

THEORY AND HYPOTHESES

The Challenge: Financing Black Swans

The welfare costs of black swans. The average annual inflation-adjusted economic loss associated with earthquakes, floods, hurricanes and other natural calamities nearly quintupled between 1980 and 2012, from \$54 billion to \$250 billion. Some studies have also shown that large natural disasters, 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 black swans, whose frequency and magnitude are fat tailed (Taleb, 2010; Weitzman, 2011). Black swans 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 black swans 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 grave financial shortfalls. 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, 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. As in the case of other black swans, 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 state, 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 cases 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 black swans (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 black swans (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 gap. A critical issue, then, concerns the factors that help create a state's resilience against black swans if a nation's income level is not itself an efficient 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, on paper, highly capable to act (Cutter, 2006; Dye, Eggers, & Shapira, 2014). With these issues in mind, we conceptualize the *relief gap of black swans* as the difference between the cost of relief (i.e., the cost of providing essential goods to restore status quo) in the wake of low-probability, high-magnitude disasters and the value of the available *internal* and *external* sources of emergency funding (Kousky, 2013).²

Broadly, an affected country has three main sources for disaster relief funding: local governmental assistance, private schemes (i.e., commercial insurance), and international aid (Becerra et al., 2013; Blaikie, Cannon, Davis, & Wisner, 2014; Noy, 2009). Both the magnitude of the shock and the state of the affected economy define how countries finance disaster recovery, as seen in Table 1. For most natural shocks, high-income nations are found to finance some 40 percent of their disaster recovery through commercial insurance, with affected households and local government assuming the rest of the

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 Formally, relief gap of black swans, g , for country i at time t is

$$g_t^i = \frac{h_t^i}{p_{t+t-1}^i}$$

where h_t is the sum of the direct costs by a given disaster and p is the formal (stock and flow) internal and external sources for financing disaster relief and recovery.

cost. Conversely, less than five and 10 percent of such losses are insured in low- and medium-income countries, respectively (Cummins & Mahul, 2009; Munich Re, 2013; Staib, Puttaiah, & Ronke, 2015).

[Insert Table 1 about here]

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 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 that slant in international aid and the fact that the costliest disasters tend to occur in middle- and high-income countries, the uncovered economic vulnerability to black swans rises with the level of the economy, resulting in large relief and recovery gaps in some 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, Cavallo, & Noy, 2014). Even worse, the real value of international aid for disaster financing has declined in recent years (Kellest & 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 relief gap 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).

The Response: the Rise of Corporate Disaster Giving

If countries prone to black swans cannot expect aid from the traditional aid donors to fill the widening gap in financing disaster relief, the need is evident for additional sources of financing (Becerra et al., 2014). In the last years, firms have demonstrated an increasing role. Between 1990 and 2014, for instance, the fraction of the 2,000 largest multinational enterprises at the international level engaging in corporate disaster giving in a given year rose from less than 30 to over more than 90 percent (Ballesteros, 2015a; White & Lang, 2012).³ As a result, company financing has sometimes reached the scale of public 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 aid flowing into the country, more assistance than 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).

The scope of corporate disaster giving. 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 foreign governments and multilateral agencies, one can argue that the recent rise in corporate disaster giving has made business giving a more important driver of social development. 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 social implications.

To undertake an evaluation of the social-welfare implications of business disaster giving, we first need to understand how companies actually allocate their aid relative to unmet social needs. On a first look at the data, the patterns suggest that corporate giving tends to go where it is less needed. Between 1990 and 2013, for instance, almost 85 percent of the deaths from major natural disasters have occurred

³ Authors' tracking based on news reports from LexisNexis and Factiva (see Appendix for further information).

in low-income countries—yet more than 85 percent of business assistance has gone to middle- and high-income countries (Ballesteros, 2015b; EM-DAT, 2014).⁴

In explaining these trends, we argue that while public aid centers on human loss, corporate disaster giving specializes on the underserved area of economic hardship, which may be more long-lasting and more global in impact because of the rising inter-connectedness of national markets (Boehm, 2014). The firm's greater focus on economic recovery than other donors 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). Although corporate disaster giving may be driven by social preferences, such as altruism and reciprocity (Muller, Pfarrer, & Little, 2014), firms give more to disaster-affected nations where the direct and indirect benefits to the firms should be greatest (Chamlee-Wright & Storr, 2009; Sandler, 2013). Recent studies show, for instance, that the share of a company's income from a given market is a good predictor of its willingness to engage in pro-social behavior in that market (e.g., Ballesteros, 2015c; Muller & Whiteman, 2008).

By giving to black-swan countries, firms in effect help cushion their own financial shocks (Alessi, 1975; Hirshleifer, 1963). The self-interested premise that a firm's performance may be weakened if the market is not soon restored may have the unintended effect of driving a firm to invest more where the gap in financial hardship is greatest. In fact, because of their economic charter, some firms may also receive better market signals regarding the distress of an affected economy and its financial capacity to comeback from systemic shocks than do prospective nonprofit donors (Alessi, 1975; Ang, Benischke, & Doh, 2014; Friedman, 1970; Husted, Jamali, & Saffar, 2012; Khan & Kumar, 1997; White & Lang, 2012). Thus, these business decision makers would be especially likely—not only prone—to become active providers of social goods when they have reason to believe that the economic magnitude of its

⁴ 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 (Ballesteros & Useem, 2015).

disaster may outstrip the three main sources of relief financing. Accordingly, corporate giving is a better-distributed resource for funding economic recovery from black-swan events than international aid and nonprofit assistance, particularly when human loss is not highly correlated with economic damage (Fink & Redaelli, 2011). In sum we hypothesize the following:

Hypothesis 1 (H1): The larger is a disaster country's relief gap to black swans, the larger the likelihood and magnitude of corporate disaster giving.

Corporate disaster giving will increase social welfare if and only if it does not crowd out international aid—put differently, if the rise in corporate giving in recent decades has resulted in a substitution for multilateral aid, the net social benefit could be nil (Yildirim, 2013). Conversely, if corporate disaster giving instead serves as a stop-loss mechanism after a black swan, it can be seen indeed as a complementary good.

Thus, we extend the previous argument by suggesting that firms furnish essential disaster relief becoming a Pareto-improvement resource in disaster countries where external entities do not direct funding for relief (Hochman & Rodgers, 1969). We formalize our hypothesis as follows:

Hypothesis 1a (H1a). In the aftermath of black swans, corporate disaster giving complements rather than crowds out traditional international public and multilateral aid.

The social efficiency of corporate disaster giving. The social value of corporate disaster giving depends not only on whether it helps reduce relief gaps but also on whether society is better off with the corporate intervention than with, for instance, a greater level of official multilateral or nonprofit assistance. Here we ask if an entity that was not created for disaster relief might nonetheless help restore social welfare in a more efficient fashion than traditional sources of disaster assistance.

As earlier noted, in the short run, efficiency in disaster response is determined in part by a minimal time gap between the occurrence of the shock and the provision of essential goods to its victims, which partly determines the long-run implications on social welfare of the disaster. We suggest that in conditions of systemic disruption that create dire shortages during which rapid delivery of collective goods becomes essential, the firm's operational capabilities generate a comparative advantage for the

firm to supply such goods vis-à-vis nonprofit and multilateral agencies. Firms draw on their routines and competences to deliver disaster relief in a timely fashion (e.g., Twigg, 2001; Useem et al., 2015; Wassenhove et al., 2008; White & Lang, 2012). Particularly, these resources generate comparative advantages for the firm in three critical activities: 1) collecting and transmitting information about the social need, and 2) obtaining and transferring financing resources across geographies and 3) delivering relief goods to disaster victims.

First, firms can draw upon their local operations, networks of affiliates, and partner organizations to assess the magnitude of the disaster's damage and to pinpoint the immediate needs. In the aftermath of disasters, local company managers, for instance, often assume the role of task-force coordinator and serve as their firm's main liaison between the headquarters and the local affiliates and often government authorities. This local presence gives the corporation a close-up view of the emergency and its local capacity to act that often nonprofit and foreign entities do not have (Twigg, 2001).

In the aftermath of the 2010 Chilean disaster, for example, Anglo American relied on its country vice president for corporate affairs to identify the most urgent needs in collaboration with government representatives in the stricken region. Just hours after the earthquake, Anglo American's London-based headquarters received this information and approved what became one of the first major donations from any source. Additionally, the company immediately dispatched a fleet of heavy equipment, normally used in its mining operations, to gather street debris, remove rockslides, and erect emergency housing (Useem, Kunreuther, & Michel-Kerjan, 2015).

At the same time, national governments often face significant issues to respond efficiently during black swans (cf., Birkland, 1997; Cutter, 2006; Wokutch et al., 2013). For example, a municipal official of Chile's Maule region that was devastated by the tsunami in 2010 narrates the emergency in this form: "the municipal government disappeared...the police was absent...We are too far away from Santiago and the government representatives were 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). Different sources 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).

Second, rapid delivery of relief resources during black-swan emergencies is necessary to mitigate the consequences of the shock. The literature on international aid reports that multilateral agencies and foreign government aid often face deep-rooted bureaucratic constraints that militate against quickly deploying assistance (Cohen & Werker, 2008; Franks, 2013; Lipsy & Takinami, 2013). Moreover, public aid is subject to political volatility that can potentially hamper its effectiveness (Eisensee & Strömberg, 2007; Stromberg, 2007). Hence, when the magnitude of the hardship require donors to swiftly ramp-up their engagement, firms face fewer constraints and are thus 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 (Becerra et al., 2013; OCHA, 2016).

On the other hand, firms also benefit from synergies when transferring fungible resources across their network of corporate affiliates (Barney, 1991; Penrose, 1959). They use resources that have few capacity constraints and are scalable across markets (Kaul & Wu, 2015; Levinthal & Wu, 2006). Firms with operations in a host of countries can diversify their geographically-based risks and thereby improve their ability to rapidly focus their relief on a given country even in the context of systemic shocks in a way that nonprofit providers cannot (Andersson, Forsgren, & Holm, 2002; Oetzel & Oh, 2014; Whiteman, Muller, & Voort, 2005). Therefore, firms can provide relief at a lower cost than nonprofit stakeholders.

Third, regarding the provision of relief goods to victims, business managers are also likely to bring distinctive skills that can translate into the more beneficial social goods. They often, for instance, bring greater expertise than nonprofit stakeholders for evaluating the cost-benefit impact of infrastructural projects (Khan & Kumar, 1997; Khan & Reinhart, 1990). Consider the case of the logistics company TNT assisting the United Nations in building relief warehouses in Italy. 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. Arguably, then, corporate giving is more likely to go to disaster relief with more direct economic benefits than will traditional foreign sources of aid (Cavallo & Daude, 2008; Day, Melnyk, Larson, Davis, & Whybark, 2012). This argument is supported by empirical work on public economics showing that private investment has larger direct effects on economic growth than public investment (e.g., Cavallo & Daude, 2008; Khan & Kumar, 1997; Khan & Reinhart, 1990).

Finally, companies bring greater cost-advantages than traditional aid agencies and nonprofit entities since they can draw upon their business competences and resources to innovatively address relief needs. In the aftermath of the Chilean disaster in 2010, for instance, mining companies helped rebuild schools by drawing on their country-specific experience in large-infrastructure projects. Coordinating with makers of mobile buildings, the mining companies rapidly delivered state-of-the-art structures that might have rimmed a copper mine but now served as seismic-proof schoolhouses (Useem et al., 2015). Companies based their relief actions on their business competences, providing relief 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 theorize that:

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

It should be noted that efficiency in disaster relief is also sure to vary among firms and across time. The greater the overlap between a firm's competences 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 operational competences to supply disaster goods with even greater efficiency than

nonprofit 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. In those cases, no donated goods have gone to waste or airport has been forced to close, as had occurred in other cases (Wassenhove, Tomasini, & Stapleton, 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). In such case, the firm faces relatively low costs in reconfiguring 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 delivering relief goods in the 2008 floods in Mexico.

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 its 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 higher the degree of relatedness of corporate disaster giving to the firm's market operations, the higher the effect of corporate intervention on the speed of disaster relief and the long-run effect on social welfare.

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.⁵ We gathered data on donations rendered up to one year after a country-designed time of a disaster’s occurrence.⁶ 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 corporate dataset is comprised by the more than 10,000 international parent corporations of the Lexis Nexis’ Directory of Corporate Affiliates (DCA).⁷

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

⁵ 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.

⁶ For robustness purposes, we run all the tests with 3-month and 6-month windows.

⁷ 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.

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.⁸ 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. Because we use data on economic damage, we dropped disasters with missing values.⁹ 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.

We classified 78 events as black swans, defined as disasters whose ratio of economic hardship to public financing capacity was larger than two standard deviations above the global mean for such events. These extremely rare disasters are associated with high adverse impacts on human health and national infrastructure for which the need for international relief and recovery assistance is exceptionally large. Note that we are focused on black swans as they are defined at the international rather than national level, and our study is thus concerned with large disasters worldwide. Hence, and 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 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

⁸ 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 countries).

⁹ We run specifications with the 3,115 disasters by completing data using multiple overimputation. 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.

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 *relief speed* (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*.¹⁰ The HDI is calculated by the United Nations Development Program (UNDP) and measures three dimensions of social development:¹¹ health and longevity; knowledge and education; and standard of living.

Independent variables. To construct a measure of *relief gap of black swans*, 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:¹²

i) *Local government assistance* is a composite measure of the main public-policy instruments that the government can use to secure liquid resources during economic disruptions: 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.

¹⁰ See Anand & Sen, (1994, 2000) for an explanation and efficiency of the measure over GDP and alternative measures of social welfare.

¹¹ 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.

¹² 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).

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.¹³

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.¹⁴ We standardized these three financing measures and the disaster cost (EM-DAT, 2014) 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.¹⁵ In sum, the relief gap of black swans of country i at time t can be now formalized as follows:

$$r_t^i = \frac{h_t^i}{p_{t+t-1}^i} = \left(\frac{\text{estimated economic cost}_t^i}{\text{internal and external sources of disaster financing}_t^i} \right) \quad (1)$$

For testing hypothesis 1a, we used the binary variable *aid appeal* that is set to “1” when there was an official aid appeal or a response plan reported by OCHA (e.g., as there was after a volcanic eruption in Peru in 2006). Additionally, we regressed international aid on corporate disaster giving. For testing hypothesis 2, we calculated the *ratio of corporate intervention*, which is the proportion of total disaster aid that was furnished by firms. For hypothesis 2a, 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

¹³ 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 statistics (e.g., Staib, Puttaiah, & Ronke, 2015).

¹⁴ 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, research institutes and press agencies. The center gives priority to data from UN agencies, governments and the International Federation of Red Cross and Red Crescent Societies.

¹⁵ 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.

firm's market operation (e.g., removing debris in the case of a mining company).¹⁶ 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 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 development and quality of governance using scale indicators based on the World Bank Worldwide Governance Indicators (WGI).¹⁷ Arguably, these variables may affect the willingness of donating. 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

¹⁶ 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.

¹⁷ 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).

search in news media using Factiva and Lexis. We also controlled for logs of the *total land area* (km²) 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).¹⁸ We obtained these data from the EMDAT, World Bank, and the International Monetary Fund.

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.

[Insert Table 2 about here]

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.

The scope of corporate disaster giving. For the first empirical question, we relied on multilevel modeling (MLM) that fits the nature of the studied relationship [see Peterson, Arregle, & Martin (2012)

¹⁸ 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.

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 $P_m^i = \Pr(u_m^i > u_n^i)$. That is, the probability that utility of donating to disaster m (u_m^i) is higher than the utility of donating to disaster n (u_n^i). We estimated two-level mix-effects linear regressions of the following type:

$$\text{\$ corporate giving}_m^i = \alpha_1 \text{relief gap of black swans}_m^i + (\theta_i) + \varepsilon_i \quad (2)$$

$$\alpha_1 \text{relief gap of black swans}_m^i = \beta_1 (\text{government assistance})_m^i + \beta_2 (\text{international aid})_m^i + \beta_3 (\text{insurance})_m^i + \beta_4 (\text{damage})_m^i$$

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

$$(P_{ij}) = \int \prod_{t=1}^T \prod_{j=1}^J \frac{\exp(X_i \alpha_{jt} + Z_{ij} \beta_{jt})}{\sum_{k=1}^J \exp(X_i \alpha_{kt} + Z_{ij} \beta_{kt})} f(\beta | \theta) d\beta \quad (3)$$

In both cases the random intercept θ_i shifts the regression line up or down according to each disaster-country pair. The control vector contains firm-, country-, and event-specific variables. 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].

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).¹⁹ 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 social efficiency of corporate disaster giving. 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 (EM-DAT, 2014). 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. To

¹⁹ See Appendix for a description of these variables.

satisfy these conditions, we applied a novel quasi-experimental method to study impact questions: *synthetic comparative case study*. The central argument behind this method 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).

This method relies on constructing counterfactual cases and to comparatively evaluate the synthetic case with the actual observed path. The use of case studies facilitates the estimation of the effect of interventions taking place at an aggregate level and affecting aggregate entities (Abadie, Diamond, & Hainmueller, 2010). In the case of our study, 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). Therefore, for analyzing the hypothesis 2 and 2a, our unit of analysis is the disaster country. The Appendix has the formal description and application of our method.

RESULTS

The Scope of Corporate Disaster Giving

We found a positive and significant association between the magnitude of relief gap of black swans and corporate disaster giving (Table 3). As predicted by hypothesis 1, 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 government readily available funds for assistance are not sufficient. *Ceteris paribus*, an increase of one standard-deviation unit in the degree of relief gap 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.

Regarding hypothesis 1a, 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 disaster financing coming from foreign governments and multilateral agencies spur the magnitude of business giving by about 24 percent on average (model 1), which challenges public-economics theories that public interventions crowd out private philanthropy (Andreoni, 2006; Roberts, 1984).

[Insert Table 3 about here]

We have suggested that firms are more willing to allocate relief resources to countries hit by black swans when their profit is a function of the affected market. They seek to restore local welfare to bolster their own profitability. 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 relief gap is the greatest. To test this mediating relationship, we used a Chebyshev approximation on subsidiaries, sales, and employees at the national level.²⁰ We found that the baseline finding is stronger when the endogeneity of economic affiliation is considered. Model 2 in Table 3 shows that the effect of relief gap in the magnitude and frequency of the donation increases in the firm's economic reliance on the affected market by about 28 percent.

Taken together, these results suggest that corporate disaster giving acts a stop-loss mechanism in the case of black swans. 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.

The Social Efficiency of Corporate Disaster Giving

The values of the variables used for matching a given treated disaster with a control disaster are shown in Table 4 and Table 5. 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 black-

²⁰ See Ballesteros, (2015b) for a discussion on the method.

swan events associated with a relatively larger level of corporate disaster giving (i.e., at least 10 percent of total international aid) receive relief faster than disasters with lower level of business participation. Specifically, we found that the treated disaster countries receive almost three times more aid during the first four post-disaster weeks than the control disasters, which supports hypothesis 2.²¹

[Insert Table 4 about here]

Figure 2 and 3 are a graphic representation of the time series of relief speed, the outcome variable for the treated unit and the synthetic control group. In both, the period of observation is four weeks after the disaster. 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 for black swans is at least 30 percent. For example, such countries received disaster aid on average about 65 percent faster than the 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. Overall, our findings suggest that corporate disaster giving enhances social well-being.

[Insert Figure 2. Percentage of total disaster aid covered by week.about here]

[Insert Figure 3 about here]

On the other hand, we found a meaningful difference between the social welfare, as proxied by the HDI, of control and treatment disaster countries when the ratio of corporate disaster giving to total international aid is at least 45 percent (see Table 5). In those cases, the loss in HDI associated with the black swan 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 black swans on social

²¹ 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.

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 black swan in 2005 and the proportion of corporate disaster giving is lower than 45 percent, its value it is adjusted down to .678. Conversely, when corporate disaster giving is at least 45 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 black-swan 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 about here]

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

Robustness

The effect of institutional development. 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.

We conducted two analyses to check for these arguments. First, using our original two-level mixed-effects model, we regressed the likelihood and the magnitude of corporate donation on *government effectiveness*, a measure of quality of national institutions calculated by the World Bank.²² Additionally, we added such variable to our original model specification using relief gap as the main predictor.²³ Although in both cases the variable per se has a positive coefficient, the effects were not significant.

²² Government effectiveness aims at capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (Kaufmann et al., 2011).

²³ However, notice that in the random-effects portion of our models we included a number of country-specific variables that arguably are highly correlated with the level of institutional development (North, 1990).

Moreover, its inclusion did not change the estimated effect of relief gap to black swans on the magnitude and likelihood of corporate disaster giving.

Second, we stratified the application of the synthetic case study by *government effectiveness* using percentiles 50th, 75th, and 90th as cutoff values. We did not use lower percentiles because our number of available disaster countries to generate synthetic controls was insufficient. We did not find significant differences in the effect of proportion of corporate disaster giving on economic growth across groups. These findings are consistent with the literature on emergency international assistance where scholars have found no empirical evidence that policy effectiveness and institutional capacity to implement aid affect the magnitude of donations (Olsen, Carstensen, & Høyen, 2003). All robustness checks can be found in the Appendix.

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 black swans (Muller & Kräussl, 2011), business disaster giving may unintendedly be increasing the income gap between countries. To test this possibility, we stratified the analyses 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 scope 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 relief gap 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 neoinstitutional 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, 1991) and 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 black-swans relief gaps 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 relief gap and the allocation decisions of corporate giving is spurious.

DISCUSSION

Our study has aimed at establishing the effects of a form of business pro-social behavior on national social welfare, an effect that had not yet been established in the empirical literature on corporate social responsibility (Kaul & Luo, 2015). Hopefully, our study had contributed to the literature on corporate philanthropy by examining an empirical context where the *doing well by doing good* argument can be tested. We suggest that corporate behavior in the wake of black swans can provide a productive avenue for the development of organizational theory given the relevance of systemic risk in organizational decision making. This type of risk remains understudied in the management literature.

Analyzing our two sets of research questions has led us to the finding that business organizations play a socially beneficial role in helping the international community cope with the occurrence of unexpected and destructive natural disasters. We found that corporate disaster giving comes as a complementary good to the traditional forms of international aid, and in that way it helps mitigate the effect of a local government’s incapacity to cope with black swans particularly in nations traditionally deprived of international aid. In this sense, business giving drives the timeliness of disaster recovery and mitigates the negative impact of natural disasters on social welfare.

According to previous theoretical work, if complementarities arise between public and private investment, the marginal product of corporate disaster giving will increase (Khan & Kumar, 1997). Hence, our findings may underestimate the aggregate implications of corporate disaster giving in social-welfare. Moreover, corporate disaster giving can also serve as a mechanism for company gain. Thus, if a private benefit is obtained by the corporate donor, and such gain is not directed away from business purposes [e.g., philanthropy is not subject to moral hazard (Jensen & Meckling, 1976; Salomon, 2013)] enhancing shareholder value (Porter & Kramer, 2002), and no other member of society is worse off,

corporate disaster giving can be seen as a Pareto optimal choice. This suggests that corporate disaster giving opens an avenue of research for scholars in stakeholder theory that are interested in the association between stakeholder perceptions and the substance of the social benefit provided by the firm.

As contribution to the international business literature, our study is based on a longitudinal dataset that integrates firm-, country-, and event-specific factors into a single analysis of worldwide disasters and their relief. In doing so, we are hopeful that other investigators benefit from our methodological approach to undertake studies of corporate provision of collective goods more greatly at an international and fully comprehensive level (Salomon, 2013; Zhang & Luo, 2013). In this sense, we use an econometric technique that facilitates quantitative inference without excluding the level of granularity of case studies. The main advantage of the synthetic comparative case study centers on research whose units of analysis are aggregate entities (e.g., industries, business groups, countries, regions). This quasi-experimental method 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.

We believe that this paper may also have practical implications. The economic hardships associated with black swans are expected to continue to grow because of expanding human settlement in regions exposed to extreme natural risks (Cutter et al., 2009). Traditional sources of humanitarian aid and standard insurance schemes have not proven sufficient to cover fat-tail disaster losses, particularly in large markets, and the gap may be growing (Kellett & Caravani, 2013; Noy, 2012; United Nations, 2016; Weitzman, 2011). Therefore, the value of corporate disaster assistance for socioeconomic development is thus likely to rise over time. This phenomenon points to two managerial implications. First, managers in public and multilateral agencies may want to make greater effort to inform the business community where the greatest relief and recovery gaps exist after a disaster. They may also want to draw upon our findings on the comparative advantages of the firm in disaster relief and the effect of market operation-philanthropy relatedness 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 from firms on such domain, the request for clear, objective, and measurable indicators of social impact has never been greater (UNCTAD, 2008). Our study provides a tool for company managers to meet such informational needs in one of the fastest growing areas of corporate pro-social behavior.

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APPENDIX

Tracking Disaster Donations

The dataset was built using a combination of manual and automated 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” orR “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”²⁴) and (“tsunami” or “earthquake” or “quake” or “disaster”) and (“donation” orR “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

²⁴ There were spelling mistakes in some articles.

using either current prices applicable in the affected country (e.g., the average price of one liter 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.
- 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 Study²⁵

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_{it}^N be the 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 $i=1, \dots, J+1$, and periods $t=1, \dots, T$. 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 $i \in \{1, \dots, N\}$ and $t \in \{1, \dots, T_0\}$, $Y_{it}^I = Y_{it}^N$. 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 $\alpha_{it} = Y_{it}^I - Y_{it}^N$ be the effect of the intervention for disaster country i at time t , and let D_{it} be an indicator that takes value one if disaster country i is exposed to the intervention at time t . Hence, the observed outcome is

$$Y_{it} = Y_{it}^N + \alpha_{it} D_{it} \quad (4)$$

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

$$D_{it} = \begin{cases} 1 & \text{if } i=1 \text{ and } t > T_0 \\ 0 & \text{otherwise} \end{cases}$$

Our target parameters are $(\alpha_1, T_{0+1}, \dots, \alpha_1, T)$, which are the lead-specific causal effect of corporate disaster giving on total disaster aid. Thus, for $t > T_0$,

²⁵ See Abadie et al., (2010, 2015) for a comprehensive discussion on the method.

$$\alpha_{it} = Y_{it}^I - Y_{it}^N = Y_{it} - Y_{it}^N \quad (5)$$

Note that Y_{it}^I is observed, hence, we need to approximate Y_{it}^N in order to estimate α_{it} . 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) *saliency*, 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:

$$Y_{it}^N = \delta_t + \theta_t Z_i + \lambda_t \mu_i + \varepsilon_{it} \quad (6)$$

where δ_t 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, θ_t is a $(1 \times r)$ vector of unknown parameters, λ_t is a

$(1 \times F)$ vector of unobserved common factors, μ_i is an $(F \times 1)$ vector of unknown factor loadings, and the error terms ε_{it} 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.

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

$$L(t, c) = \frac{1}{2} \sum_{i..lk} n |t_{i..lk} - c_{i..lk}|$$

where $t_{i..lk}$ is the relative frequency of the categorical variables for the firms in the treatment group and $c_{i..lk}$ 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 Risk and Risk Management

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

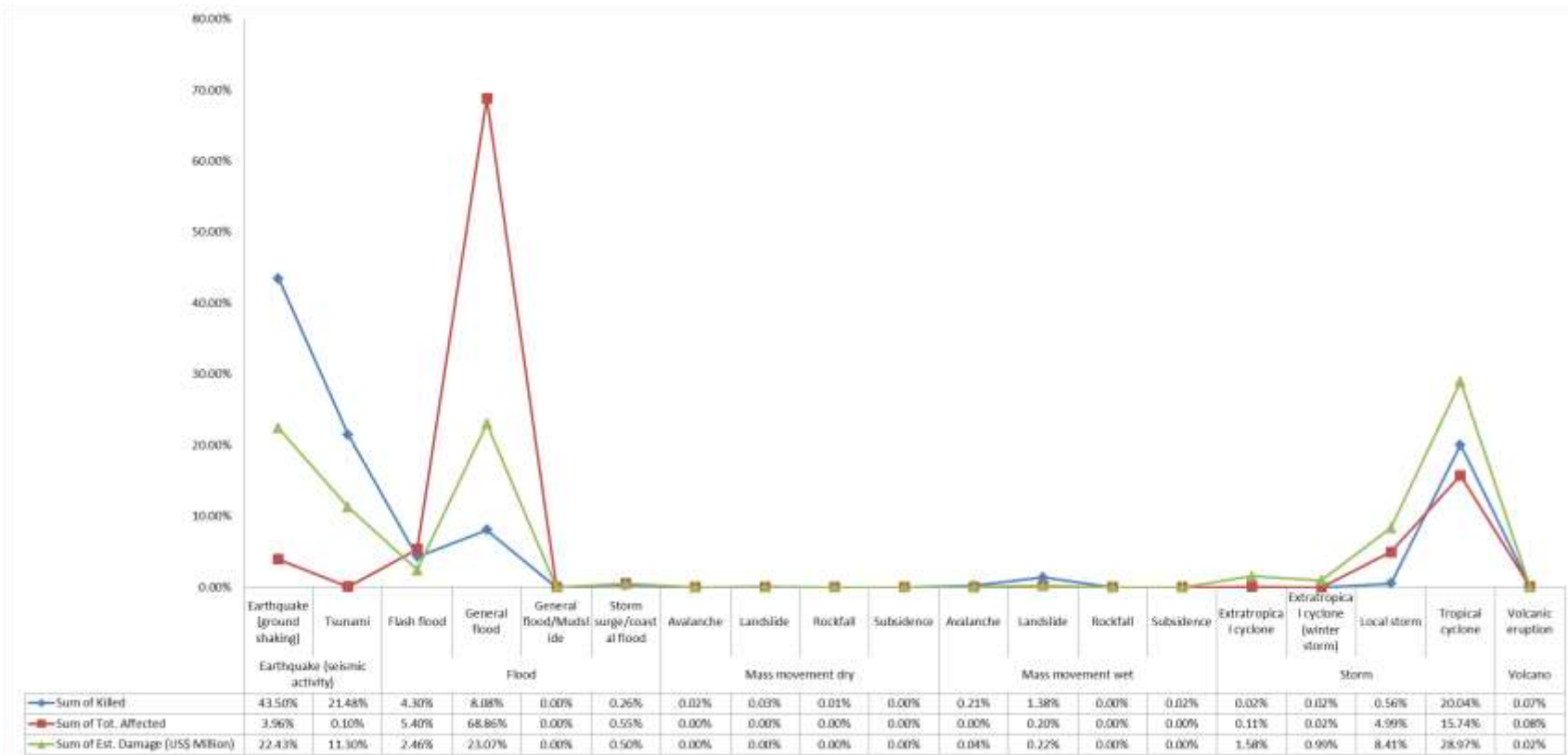
Note. When a household suffers an idiosyncratic shock like a house fire or a chronic disease, two family members with similar socioeconomic characteristics and hazards-exposure can combine incomes and mitigate the impact on household's welfare. Bardhan and Udry (2007) provide an account of consumption-smoothing 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

Hypothesis	Variable	Indicators	Sources
Dependent variable: Allocation of corporate disaster giving= total dollar amount of the monetary or in-kind donation			Authors tracking
Hypothesis 1 (H1): Corporate disaster giving focuses more on disasters where the degree of relief gap of black swans is greater.	Relief gap of black swans	$\left(\frac{\text{economic cost}_t^i}{\text{internal and external sources of disaster financing}_t^i} \right) =$ <p><i>economic cost</i> = estimated associated damage (USD PPP)</p> <p>sources of disaster financing = <i>(Local government assistance</i> = composite measure of debt, deficit, and interest rate) + <i>(International aid</i> = average aid flows in the two post-disaster years – average aid flows in the two years preceding the disaster) + <i>(Private schemes</i> = average gross insurance payments on claims made in the two post-disaster years - average gross insurance payments on claims made in the two years preceding the disaster) Non-disaster years are adjusted for inflation</p>	FTS UNOCHA, World Economic Outlook, the World Development Indicators, the OECD, KPMG, Munich Re, and Swiss Re
Hypothesis 1a (H1a): Corporate disaster giving reduces the magnitude of the relief gap of black swans by complementing international public and multilateral aid.	Aid appeal	There was an official appeal for international aid reported by the United Nations	FTS UNOCHA
Dependent variables: relief speed= the proportion of total disaster aid covered during the first four post-disaster weeks social welfare= human development index			Authors tracking, FTS UNOCHA, UNDP
Hypothesis 2 (H2). The greater the proportional participation of business giving in disaster aid, the more efficient is the response to the disaster.	Ratio of corporate intervention	$\left(\frac{\text{corporate disaster giving}_t^i}{\text{total disaster aid}_t^i} \right)$	Authors tracking and FTS UNOCHA
Hypothesis 2a (H2a). The higher the degree of relatedness of corporate	Degree of relatedness of corporate	<i>Relatedness</i> = the donation is in the firm's core market product, service, or an activity that is essential for the firm's market operation	Authors tracking and coding

Hypothesis	Variable	Indicators	Sources
disaster giving to the firm's market operations, the higher the effect of corporate intervention in disaster efficiency.	disaster giving	$\left(\frac{\text{Relatedness of corporate giving (USD)}}{\text{corporate giving (USD)}} \right)$	
<i>Controls</i>			
Primary sector, Primary industry, Year founded, Total assets, Total employees, Total enterprise value, Total debt, Consumer focus			Firm controls
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]			Country controls
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			Event controls

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)

VARIABLES	Baseline	Model 1 (RE)	Model 2 (RE)	Model 3 (RE)	Model 4 (FE)
Relief Gap of Black Swans	.5985*** (0.395)	.6731*** (0.609)	.7052*** (0.849)	.4919** (3.544)	.1874*** (0.482)
Aid Appeal		.2399*** (0.620)		.1165** (0.693)	.1122 (0.921)
Relief Gap x Economic reliance			.2825*** (0.958)	.7519*** (0.416)	.6708*** (1.630)
Economic Reliance			0.408 (0.288)	.4994*** (1.175)	.1122 (0.921)
CONTROLS					
GDP		-0.030 (0.073)	0.096 (0.120)	-0.015 (0.079)	(0.131) -0.097
Affected Population		-0.378*** (0.058)	-0.178* (0.092)	-0.393*** (0.064)	0.328*** (0.125)
Number of Disasters (Country)		0.079 (0.200)	-0.048 (0.385)	0.195 (0.217)	1.834*** (0.495)
Population		0.504*** (0.138)	0.405* (0.208)	0.482*** (0.149)	-0.003 (0.296)
Land Area		-0.689*** (0.151)	-1.389*** (0.242)	-0.737*** (0.164)	
Number of Disasters (International)		0.958*** (0.234)	0.503 (0.376)	1.080*** (0.260)	1.834*** (0.495)
Voice and Accountability		0.329 (1.155)	1.930 (1.605)	1.444 (1.225)	(1.337) 0.469
Government Effectiveness		1.358 (1.131)	1.634 (1.573)	0.295 (1.209)	(1.369) 1.195
Regulatory Quality		1.289 (1.135)	2.148 (1.572)	1.764 (1.185)	(1.325) (0.173)
Rule of Law		1.173 (1.137)	1.157 (1.157)	0.237 (1.158)	0.599 (1.178)
Openness to Aid		3.133 (1.969)	2.762 (1.969)	1.249 (1.133)	1.510 (1.148)
Deaths		0.414*** (0.051)	0.503*** (0.093)	0.405*** (0.055)	0.316** (0.131)
Return on Assets %		0.012 (0.055)	0.028 (0.035)	0.013 (0.028)	0.017 (0.098)
Consumer Orientation		0.741** (0.348)	0.582 (0.393)	0.831** (0.377)	
Industry		-0.001 (0.011)	0.021* (0.012)	0.001 (0.011)	
Employees		0.254 (0.166)	0.176 (0.190)	0.212 (0.177)	-1.742 (1.114)
Market Capitalization		0.408*** (0.138)	0.384** (0.163)	0.318** (0.148)	-0.191 (0.428)
Constant	.3271*** (0.181)	.19149*** (2.771)	.23628*** (3.640)	.18967*** (2.948)	
Observations	2,236,000	2,236,000	2,236,000	6,167,700	1,370,256
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.

Table 4. Predictor of Relief Effectiveness

Dependent variable: % of disaster aid 4 weeks

VARIABLES	Treatment	Control
Disaster Response Variables		
Corporate Disaster Giving	6.12	2.70
Local Government Assistance	10.45	10.53
International Aid	5.38	5.45
Private Schemes	3.78	3.86
Estimated Economic Cost (Disaster)	6.59	5.39
Selection Variables		
GDP (logged)	29.32	26.78
Deaths	380.58	422.13
Saliency	14.35	14.33
Disasters (country)	7.31	7.32
Disasters (international)	237.46	239.08
Newsworthy events	8.47	8.99
Openness to aid	.77	.81
Number of Events	246	2869
% of disaster aid 4 weeks	38.9	13.6

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 10 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

VARIABLES	Treatment	Control
Disaster Response Variables		
Corporate Disaster Giving	6.12	2.70
Local Government Assistance	10.45	10.53
International Aid	5.38	5.45
Private Schemes	3.78	3.86
Estimated Economic Cost (Disaster)	6.59	5.39
Selection Variables		
Schooling (mean of years)	57.3	57.4
Life expectancy	14.35	14.33
Inflation rate	9.15	9.14
Trade openness	57.3	57.4
Investment rate	20.9	20.8
Number of Events	246	2869
HDI	.706	.643

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 45 percent of total international aid). The total sample of natural disasters in the period 2003-2013 is 1,118.

Figure 2. Percentage of total disaster aid covered by week.

Actual is disaster countries with a relatively high level of corporate disaster giving (i.e., at least five percent of total international aid). Sample of 78 black swans in the period 2003-2013.

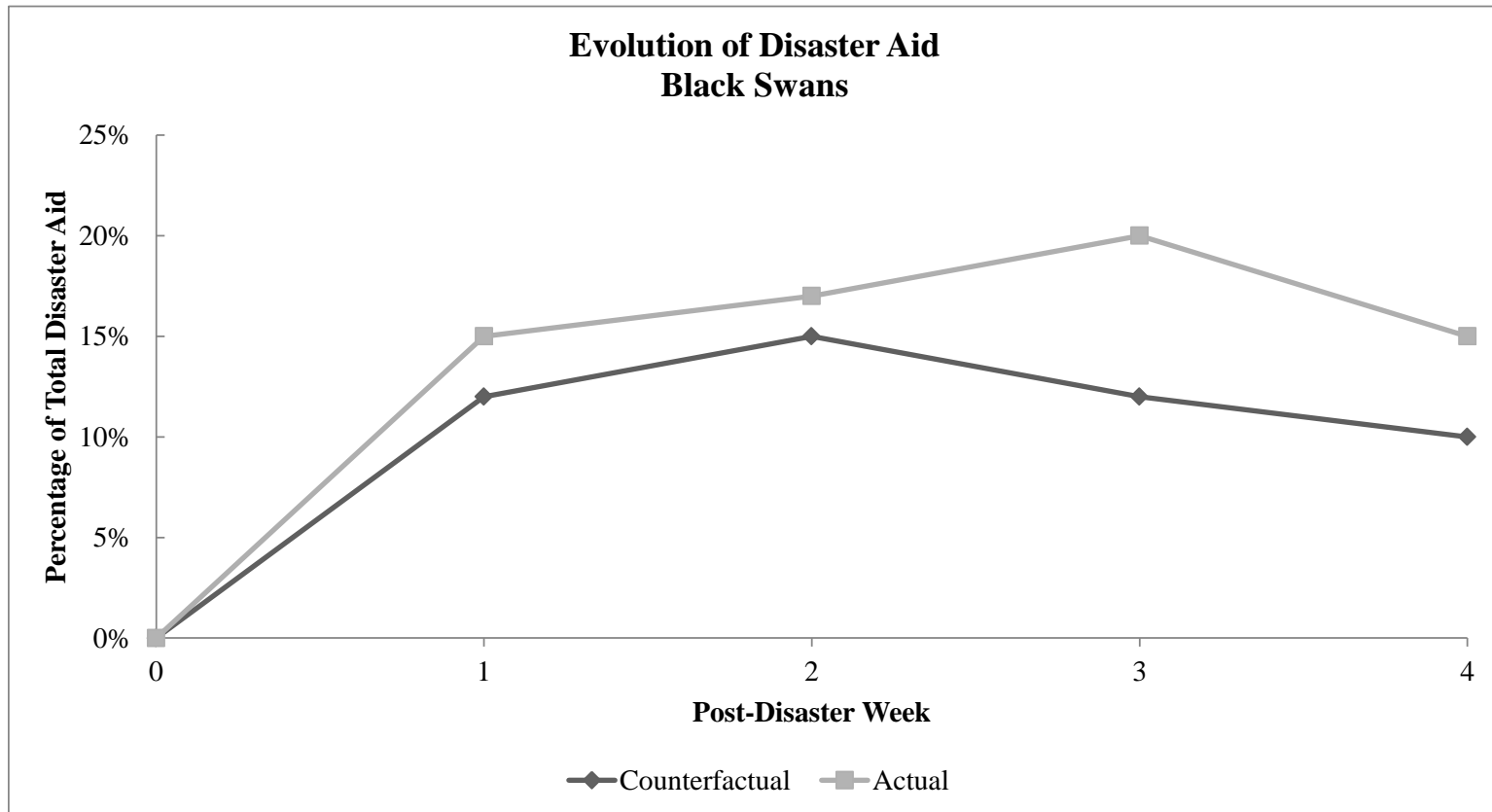


Figure 3. Percentage of total disaster aid covered by week.

Actual is disaster countries with a relatively high level of corporate disaster giving (i.e., at least five percent of total international aid). Sample of 78 black swans in the period 2003-2013.

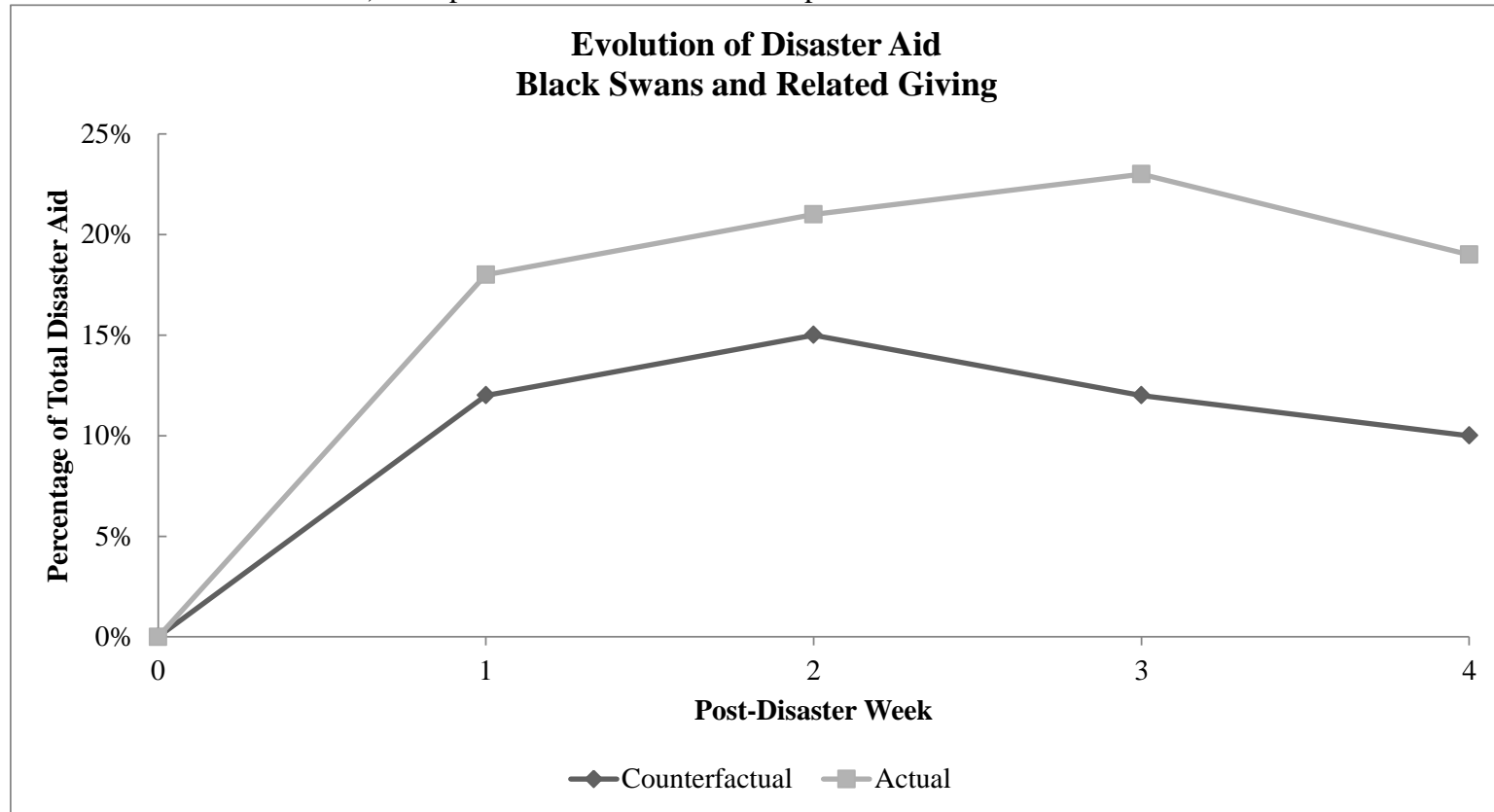


Figure 4. Changes in Human Development Index.

Actual is disaster countries with a relatively high level of corporate disaster giving (i.e., at least 45 percent of total international aid). Sample of 78 black swans in the period 2003-2013.

