

University of Delaware
Disaster Research Center

PRELIMINARY PAPER
#281

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1999

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In Press, Natural Hazards Review, volume 1(2).

Businesses and Disasters: Empirical Patterns and Unanswered Questions

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Abstract: Through five systematic, large-scale mail surveys conducted since 1993, the Disaster Research Center (DRC) has obtained data on hazard awareness, preparedness, disaster impacts, and short- and long-term recovery among 5,000 private-sector firms in communities across the United States (Memphis/Shelby County, Tennessee, Des Moines, Iowa, Los Angeles, California, Santa Cruz County, California, and South Dade County, Florida). This paper summarizes findings from those studies in three major areas: factors influencing business disaster preparedness; disaster-related sources of business disruption and financial loss; and factors that affect the ability of businesses to recover following major disaster events. Implications of the research for business contingency planning and business disaster management are discussed.

Introduction

Until recently, the literature on hazards and disasters contained very few references to the ways in which private-sector organizations prepare for, respond to, and recover from disasters. Research in the disaster field has focused almost entirely on units of analysis other than businesses, most notably on families, households, and governmental units, particularly local

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Key words: business disaster impacts, business disaster preparedness, business disaster recovery, lifeline systems, contingency planning, earthquakes, hurricanes, floods

communities. Studies that have attempted to assess the economic consequences of disasters have tended to concentrate primarily on aggregate-level effects, such as community-wide and regional economic losses, rather than on firm-level impacts (see, for example, Rossi et al. 1978; Friesema et al. 1979; Cohen 1993; West and Lenze 1994; Gordon et al. 1995; for a review of the literature on large-scale economic impacts, see Jones and Chang 1995).

Although there is a long tradition of organizational research in the field of disaster studies, that research has focused overwhelmingly on public sector organizations, such as local emergency management agencies, fire and police departments, and other governmental entities. While interest in private organizations has grown, to date the majority of published material on businesses, disasters, and hazards consists of single-case studies, prescriptive articles that are largely lacking in empirical content, and research that concentrates either on rare catastrophic events (e.g., Perrow's 1984 classic on "normal accidents) or on atypical types of organizations (see for example, La Porte and Consolini 1991 and La Porte and Rochlin 1994 on high-reliability organizations). A small number of studies have attempted to document the hazard- and disaster-related experiences of particular types of firms, such as those involved in the production and transportation of hazardous materials (Quarantelli et al. 1979) and in chemical emergency preparedness (Solyst and St. Amand 1993; Lindell 1994), tourist industry firms (Drabek 1994), and small businesses (Durkin 1984; Kroll et al. 1991). However, systematic studies of groups of typical firms of different sizes representing the full range of economic sectors have been virtually absent from the research literature.

In 1993, the Disaster Research Center initiated a series of surveys exploring the preparedness activities and disaster-related experiences of large and representative samples of

businesses in communities around the U. S. As shown in Table 1, this group of studies, all of which involved large-scale mail surveys, focused on businesses in several different regions of the country, on different types of disaster events, and on different phases in the hazard cycle. The first of these studies, the Memphis/Shelby County project, provided data on earthquake hazard awareness and preparedness among businesses in a non-disaster context. The other studies involved research on businesses in communities that had experienced four of the most severe and costly disasters in U. S. history: the 1989 Loma Prieta earthquake; Hurricane Andrew in 1992; the 1993 Midwest floods; and the 1994 Northridge earthquake. These projects differ from other work that has been undertaken on businesses and disasters in that they focus on large, systematically-selected groups of businesses, employ advanced analytic techniques, and attempt to generate findings that can be generalized to broader populations of businesses. Three of the studies-- Memphis/Shelby County, Des Moines, and Los Angeles/Santa Monica--used stratified random sampling techniques to obtain large representative samples of businesses.⁴ The Loma Prieta and Hurricane Andrew surveys focused on the entire population of currently-existing businesses that had been operating in the areas selected for study at the time those events occurred. The topics addressed in the surveys included proprietors' hazard perceptions, business preparedness, disaster impacts and losses, and short- and long-term business recovery. In all, data have been obtained on nearly 5,000 businesses.

*****Table 1 about here*****

⁴ The samples for all three studies were stratified by business size and by broadly-defined economic sectors. Additionally, the Northridge earthquake sample was stratified geographically by earthquake impact severity using the Modified Mercalli Intensity (MMI) measure of earthquake shaking intensity.

In this paper, we review and summarize selected findings from this body of research, focusing both on explanatory variables that have received considerable empirical support and on areas in which research is contradictory or ambiguous. Our discussion centers on significant research findings in three general areas: factors influencing business preparedness and the adoption of other self-protective measures; disaster-related sources of business disruption and financial loss; and factors that affect the ability of businesses to recover following major disaster events. Each section also highlights questions raised by this group of studies. We conclude by discussing gaps in our current knowledge and posing questions for future research.

Business Disaster Preparedness

Using checklists similar to those employed in studies of household disaster preparedness, DRC surveys have attempted to assess the nature and extent of preparedness activities undertaken by private-sector firms, as well as the factors that affect business preparedness. With respect to the first topic, perhaps the most consistent finding from this group of studies is that the average or typical business places relatively little emphasis on disaster preparedness and other loss-reduction measures. To illustrate this point, Table 2 shows the percentages of businesses in Memphis/Shelby County and in the Northridge earthquake sample that reported engaging in various pre-earthquake preparedness activities. Only one of the measures listed, obtaining first aid supplies, had been carried out by more than half of the businesses surveyed, and one measure, helping employees learn first aid, had been undertaken by about half. Adoption of other preparedness measures range from very low, for making arrangements for business relocation (9% in Memphis/Shelby County, 5% for the Northridge sample) and requesting an engineering assessment of the building (11% and 14%, respectively), to moderate for measures such as

attending meetings and obtaining earthquake-related information (39% in each community). Overall, mean business preparedness levels were quite low in both communities. Businesses undertook an average of 4.1 out of 17 measures for which information was requested in Memphis, and 3.9 out of 16 measures in Los Angeles. Our other studies show a similar pattern. In Des Moines, for example, nearly half of the businesses surveyed had not undertaken a single preparedness measure.

*****Table 2 about here*****

This pattern is in line with what other investigators have found. For example, Thomas Drabek found preparedness efforts “unsatisfactory” among the 180 tourist firms he studied, commenting that “less than one-third of the businesses surveyed really measured up” (1994:17), and Mileti et al. (1993) also reported very low levels of preparedness among the businesses they surveyed in the San Francisco Bay Area.

Focusing again on Table 2, businesses also appear to show a preference for particular kinds of preparedness activities over others. Activities that are less complicated and expensive and measures that provide protection against a range of different types of emergencies are preferred over technically difficult and more expensive and time-consuming efforts. Thus, both Memphis and Los Angeles businesses are much more likely to have first aid supplies on hand, have employees with first aid experience, obtain earthquake-related information, and talk with their employees about preparedness than they are to prepare business recovery and business relocation plans, purchase generators for emergency power, engage in extensive employee training and disaster drills, or employ engineering consultants to conduct structural assessments. Relatedly, businesses show a preference for undertaking measures geared toward enhancing life

safety in the immediate post-impact period, rather than those aimed at ensuring business continuity. These same general patterns have been observed in DRC's other surveys.

Moving beyond describing what businesses have done to prepare for disasters, DRC investigators have also focused on the development and testing of models explaining business disaster preparedness. These analyses have helped identify which businesses are most likely to prepare for disasters. Overall, the size of a business appears to be the most important factor influencing the propensity of businesses to prepare. In every community DRC has studied, larger organizations have done more to prepare than their smaller counterparts. Both DRC and other researchers (e.g., Mileti et al. 1993; Dahlhamer and Reshaur 1996; Dahlhamer and D'Souza 1997) have generally interpreted this relationship as a matter of resource availability. Larger businesses are more likely to have staff specifically dedicated to preparing for disasters, and compared with small companies, larger organizations generally have more access to financial resources with which to undertake preparedness.

While the impact of size on preparedness was consistent across various surveys, other factors were also found to affect preparedness, albeit less consistently. In the Memphis and Des Moines surveys, firms that owned their businesses properties, as opposed to leasing them, were found to be more likely to engage in preparedness activities (Dahlhamer and D'Souza 1997). This may be the case because building owners see themselves as having a greater stake in the survival of their properties. It may also be that ownership of a property makes it more feasible to undertake a greater number of preparedness measures. For example, we would probably not expect a business proprietor who leases space in a larger building to pay to have the property inspected by an engineer or have its foundation strengthened. If leasing rather than owning the

business property does indeed make a difference in the willingness to prepare, the fact that a substantial majority of business properties around the country are leased rather than owned may well work to discourage business preparedness.

Our data show that it is also quite likely that different types of businesses differ in the emphasis they place on preparing for disasters. The Northridge and Memphis studies found that other things being equal, firms in the finance, insurance, and real estate sector were generally better prepared than businesses in other sectors of the economy (Dahlhamer and Reshaur 1996; Dahlhamer and D'Souza 1997), a pattern that may be attributable to the higher degree of regulation and overall scrutiny businesses in this sector receive. In contrast, retail and service-sector businesses tend to lag somewhat, which is disconcerting, given the relatively large size of these two sectors.

There is a good deal of evidence in the literature suggesting that disaster experience contributes to higher levels of preparedness at the household and community levels, and the studies undertaken by DRC suggest that the same pattern may well hold for businesses. For example, prior experience exerted a positive influence on pre-event preparedness in Memphis, Des Moines, and Los Angeles (Dahlhamer and Reshaur 1996; Dahlhamer and D'Souza 1997). Our surveys also indicate that over the long term, businesses in the areas hard-hit by the Loma Prieta earthquake and Hurricane Andrew have improved their preparedness over pre-disaster levels. Measured several years after those events, the mean number of preparedness measures adopted had risen from 3.5 to 5.6 (out of 17 items on the checklist) in Santa Cruz County and from 6.1 to 8 (out of 19 items on the checklist) in South Dade County.

While disaster experience clearly can have a positive effect, our research also shows that experiencing a major disaster does not necessarily lead to dramatic improvements in preparedness, at least not in the short term. Surveyed 18 months after the Northridge earthquake, for example, the businesses in our sample did improve their preparedness, but almost imperceptibly, from a pre-earthquake mean of 3.9 (out of 16 measures included in the checklist) to a post-earthquake mean of 4.0. Moreover, improvements in preparedness did not occur across the board. Rather, improvements were most marked among firms that had experienced business interruption as a result of the earthquake, larger firms, and those that had already been doing more to prepare before the earthquake occurred. In other words, not everyone learns equally from disaster experience, and those organizations that already place a priority on preparing and that have the resources to take action may be the ones that show the most improvement.

Sources of Business Disruption and Loss

Shifting from disaster preparedness to actual disaster impacts, DRC's business surveys have also documented various ways in which businesses are vulnerable to disasters. Although the physical damage disasters produce can have a major negative effect on business operations, our research clearly reveals that direct damage is only one among several factors that contribute to the losses businesses experience in the aftermath of disasters. In particular, damage and disruption to utility and transportation lifelines can contribute significantly to business interruption and subsequent financial losses. In the 1993 Midwest floods, for example, floodwaters inundated the Des Moines Water Works, leaving 300,000 residents without potable water. Electrical power stations were flooded, resulting in power outages that affected 35,000 households and the entire downtown business district. Our Des Moines study found that while only 15% of the businesses

surveyed experienced flood damage, 80% of all Des Moines businesses were without water as a result of the flooding, 40% lost sewer and waste water treatment services, one-third were without electricity, and just over 20% lost phone service. Forty-two percent of businesses were forced to close for at least some period of time. Illustrating the importance of offsite lifeline impacts, when asked for reasons why they experienced business interruption, businesses were most likely to cite disruptions to water, electric power, and sewer and waste water services (Tierney 1997).

The impact of lifeline disruptions on business operations has been documented in other cases as well. In 1992, for example, when the waters of the Chicago River flooded into an underground tunnel system directly below the Chicago Loop, all businesses in that commercial area were unable to operate, not because of flooding but because of the loss of electrical power. In research on the regional economic impacts of the 1994 Northridge earthquake, Peter Gordon and his colleagues (Gordon et al. 1995) estimated that just over one-fourth of the business interruption losses resulting from the earthquake were the result of damage to the region's transportation system. Our own analyses of firm-level losses resulting from the Northridge earthquake suggest that loss of electric power, and in particular the duration of power service interruption, were significant contributors to the dollar losses businesses experienced (Dahlhamer, Webb, and Tierney 1999).

This series of surveys also found that businesses often have difficulty coping with a range of disaster-induced operational problems that are not necessarily the result of direct property damage at the business site. These problems include disruptions in the flow of supplies and in the ability to ship goods, reduced employee productivity caused by transportation problems and by employees' own disaster-related difficulties at home, and declines in customer traffic and reduced

demand for certain kinds of goods and services in the aftermath of a disaster. Owners may find themselves forced to pay less attention to their businesses because of damage to their own homes, or, conversely, to neglect problems at home in order to concentrate on keeping the business up and running. Damage to nearby businesses and residential areas can result in reduced customer traffic. Such problems, which can persist for long periods after disasters, affect even those businesses that escape direct damage. And, as we discuss in the section that follows, these post-disaster operational problems can be a significant impediment to business recovery.

Post-Disaster Recovery

Explaining business disaster recovery outcomes is difficult for a number of reasons. It is often hard to track down businesses that go out of existence following disasters, particularly after time has passed. New businesses are established and others fail on a regular basis, making it hard to determine how disasters affect these ongoing patterns. The fact that normal rates of founding and mortality also differ by business type and size introduces additional complications. The notion of what constitutes a post-disaster business failure can be problematic. For example, after a disaster the owner of a damaged but potentially viable firm may make a strategic decision to retire a year or two early rather than go through the effort of restarting the business. Should this be counted as a business failure caused by the disaster? Looking at businesses at only one point in time, as we have in our studies, could present a distorted picture, since a business may do well a short time after a disaster only to flounder later, while businesses experiencing initial difficulties may subsequently become very profitable. And despite the occurrence of a disaster, larger economic cycles continue to exert a very strong influence on the well-being of individual firms, making it difficult to disaggregate macroeconomic and disaster-related effects. With all these

caveats in mind, we nevertheless believe that our research has yielded a number of important findings concerning business recovery.

First, although it is commonly assumed on the basis of anecdotal evidence that disasters result in business failures and bankruptcies on a large scale, our research indicates that most businesses, even those that are especially hard-hit, do indeed recover following disasters. In the post-event surveys we conducted, business owners were asked for assessments of the financial condition of their businesses at the time of the survey, compared with financial well-being just prior to the disaster event, and to indicate whether the business was worse off, better off, or about the same as it had been. Table 3 summarizes general patterns of reported short- and long-term recovery outcomes for the Loma Prieta and Northridge earthquakes, Hurricane Andrew, and the Midwest floods. Based on these findings, it is clear that the vast majority of businesses return to pre-disaster levels, both in the short-term and in the long-term, and that a substantial number of firms also report being better off in the wake of disaster. DRC's study of the Loma Prieta earthquake, for example, found that eight years after the event, 37% of businesses in the sample reported being better off than they had been just before that event.

*****Table 3 about here*****

The data reported in Table 3 also indicate that disasters vary in the extent to which they affect the short- and long-term well-being of businesses. At one extreme, when the survey was conducted in Des Moines one year after the 1993 floods, nearly 88% of business owners indicated that their businesses were functioning at or above pre-disaster levels. The majority reported being about the same as before the floods, 18% were better off, and only 12% said that their businesses were worse than they had been prior to the disaster. At the other extreme, six years after

Hurricane Andrew, about two-thirds of the businesses surveyed can be said to have recovered--if recovery is defined as returning to or exceeding pre-disaster levels--while one-third reported being worse off than they had been before the hurricane. Businesses in South Dade County fared worse than their counterparts in Santa Cruz County, the other community in which long-term recovery outcomes were assessed, where about one business in five reported being worse off than before the earthquake. Indeed, viewed in another light, these kinds of data on recovery outcomes may serve as proxy measures of disaster severity.

Additional analyses have sought to identify the factors that account for firm-level recovery outcomes. The most thorough analyses conducted to date have focused on businesses affected by the Northridge earthquake (Dahlhamer 1998). In that study, Dahlhamer identified several variables that distinguished between non-recovered and recovered firms, i.e., businesses that had either returned to or exceeded their pre-disaster status. As with pre-disaster preparedness, size proved to be an important predictor of recovery. Other things being equal, larger firms were more likely to have recovered than smaller ones.

In the preceding section, we pointed to the fact that in addition to direct physical damage and lifeline service interruption, disasters also produce a variety of operational problems for businesses, such as disruptions in supply chains and employee-related problems. Dahlhamer's analyses found that the more of these kinds of problems businesses reported, the less likely they were to recover. Additionally, irrespective of their own levels of damage and disruption, businesses located in areas where the earthquake shaking had been more intense were less likely to recover. Physical damage and business interruption, in and of themselves, were not related to recovery. Rather, the impact of these variables on recovery was mediated by other factors, such

as operational disruption and earthquake shaking intensity. These kinds of findings point to the importance of viewing disaster impacts and recovery in a broader ecological context. What happens to an individual business organization depends importantly on how neighborhoods, critical infrastructural systems, and communities are affected by a disaster.

Analyses of survey data have also focused on explaining differential patterns of gains and losses. Nearly twenty-five years ago, Harold Cochrane (1975) pointed out that disasters have distributive effects. Lower-income groups suffer a disproportionate share of disaster losses, while their better-off counterparts may actually benefit. Earlier, Dacy and Kunreuther (1969) found that because of their ability to tap into post-disaster relief programs, some homeowners victimized in the 1964 Alaska earthquake ended up in better financial condition than nonvictims. Looking specifically at business outcomes, research by Kroll et al. (1991) suggests that particular kinds of businesses, i.e., construction-related firms, experienced gains as a result of the Loma Prieta earthquake.

Our research on short-term recovery following the Northridge earthquake found that some types of businesses experienced financial gains in the aftermath of disasters, while others tended not to fare as well (Dahlhamer and Tierney 1996; Dahlhamer 1998). Consistent with the research by Kroll et al., cited above, construction-related businesses experienced major gains, suggesting that the earthquake gave these firms a needed boost, at least in the short term. Smaller firms were significantly more likely to report being worse off than larger ones, as were businesses that reported being in poor financial condition just prior to the earthquake. These last findings suggest that marginal firms with few resources are particularly ill-equipped to weather a disaster.

Prior disaster experience might be expected to have a positive impact on recovery, since

presumably businesses that have been through other disasters have learned from those experiences and are thus better able to cope. In fact, our research suggests this is not the case. In the Loma Prieta and Andrew studies, experience was unrelated to recovery outcomes, and in the Northridge study, business owners with prior disaster experience were less likely to report that their businesses had recovered.⁵

Some of the most intriguing findings from this group of studies center on the linkage between pre-disaster preparedness and post-disaster aid and short- and long-term recovery outcomes. We would intuitively expect that good preparedness planning helps businesses to recover more rapidly and completely, but DRC's research suggests that this is not the case. Extensive analyses of the data from Northridge, Loma Prieta and Hurricane Andrew show no relationship at all between preparedness measures and recovery outcomes. In other words, unprepared businesses were as likely to report positive recovery outcomes as their well-prepared counterparts. In considering why this might be the case, we suggest several possible answers. First, as noted earlier, the vast majority of businesses are quite ill-prepared, and even the best-prepared among the businesses we studied had done relatively little to get ready for disasters. There may be a threshold below which self-protective measures do little actual good, and it may be the case that most businesses fall well below that threshold. Second, of the items asked about in our preparedness checklists, the measures that businesses were most likely to undertake were

⁵ Los Angeles businesses with prior disaster experience were most likely to report having sustained damage in the 1992 riots, which occurred less than two years before the earthquake. It may be that many of these businesses were still dealing with riot-related problems when the earthquake struck and thus found it even more difficult to cope. Businesses with previous disaster experience were also more likely to seek post-disaster aid following the Northridge event, which, as we will see later, may actually have been detrimental to their overall financial well-being.

directed much more toward life-safety and immediate emergency response than toward longer-term loss containment. Having a first aid kit on hand and providing information about disasters to employees are certainly very helpful should disaster strike, but such measures will not necessarily help a business regain its financial footing in the aftermath of a disaster. Third, the preparedness measures we assessed in our surveys--which are the measures most commonly advocated for businesses--focus primarily on avoiding or handling problems that may occur at the worksite when a disaster occurs, rather than on coping with problems originating offsite, such as transportation system and community-level disruption. Businesses that score high in these workplace-centered preparedness activities may nevertheless find themselves ill-equipped to deal with other sources of disaster-related disruption and loss, including the various kinds of operational problems we described above. Thus, we hypothesize that preparedness has no influence on recovery because businesses have done so little to prepare, because they are preparing to *respond*, rather than to *recover*, and because recommended preparedness actions do not address the real recovery-related problems businesses face.

Our findings on the relationship between the use of post-disaster assistance and recovery outcomes are equally counterintuitive and intriguing. Obviously, aid is supposed to facilitate recovery, and it seems fair to assume that the use of outside sources of aid helps businesses, just as post-disaster assistance has been shown to improve recovery outcomes for households (Bolin 1989; 1994). However, in the analyses conducted to date, we have found no evidence that outside aid helps businesses recover following disasters. In the Santa Cruz and Dade County studies, for example, businesses that tried to take advantage of various sources of recovery assistance, ranging from Small Business Administration and bank loans to public disaster

assistance, showed no improvement over those that had utilized less aid. Indeed, there was no relationship whatsoever between the number of aid sources businesses relied on during the post-disaster period and the extent to which they had recovered.

DRC's post-Northridge study found that use of disaster aid was associated with recovery, but in the opposite direction. That is, businesses that reported using outside assistance were actually less likely to have recovered and more likely to report being worse off. This pattern seems to be attributable to the fact that the businesses that used external aid were also those that had suffered higher losses and were thus worse off in the first place (for additional discussions, see Dahlhamer 1998; Dahlhamer and Tierney 1998).

Another reason outside aid does little to help businesses to recover may lie in the kinds of aid that are available for businesses, as compared with households. While in many cases households can rely on outright grants from programs such as FEMA's Individual and Family Grant (IFG) Program, direct assistance from agencies like the Red Cross, and insurance, a greater proportion of business recovery aid comes in the form of loans that businesses must repay. Few of the businesses we studied had insurance coverage, and many of those with coverage did not file claims. Many business owners reported using their own personal savings in order to recover. For many businesses, then, recovery assistance brings additional indebtedness and draws down savings. Seen in this light, it is not surprising that recovering businesses see little advantage in the monetary assistance they receive from outside sources.

Finally, there is some evidence to suggest that individual business fates may well be more dependent on larger economic trends than on disaster-related factors. For example, following the Northridge earthquake, businesses in industrial sectors that had been experiencing growth just

prior to the earthquake were more likely to recover than businesses in declining industries (Dahlhamer 1998). In our Loma Prieta and Hurricane Andrew studies, owners' assessments of the health of the overall business climate in their communities were strongly associated with their assessments of the extent to which their own businesses had recovered. Economic trends likely have a strong effect on business recovery, independent of how individual firms are affected.

Questions For Future Research

Although yielding large amounts of data, DRC's business surveys also have a number of weaknesses and shortcomings. Each of the five surveys was cross-sectional, rather than longitudinal, making it impossible to track changes that occurred over time. Despite the fact that virtually identical survey procedures were used in each study, response rates varied from a low of 24% (Northridge) to a high of 50% (Des Moines). Concepts were not always measured consistently across survey instruments. For example, the number and content of items used to assess disaster preparedness varied slightly across the different surveys. Assessments of recovery outcomes were based on self-report measures, rather than on actual business financial data, largely because the latter were judged too difficult to obtain for reasons of confidentiality. The surveys were not timed consistently. Both the short-term recovery studies (Des Moines and Los Angeles) and the surveys assessing longer-term recovery outcomes (Santa Cruz and South Dade Counties) were carried out at slightly different post-disaster time intervals, making cross-event comparisons difficult. The long-term studies focused on business "survivors," i.e., businesses that could be located years after the earthquake and the hurricane occurred. Businesses that were no longer in existence were not part of the study, raising the question of whether long-term impacts were underestimated.

This series of studies raises at least as many questions as it answers. Only a small number of findings, such as those concerning the positive impact of organizational size on preparedness and on recovery outcomes, were replicated across multiple sites, indicating that further research is needed. As we noted in the section above, findings were often contradictory across study sites. For example, while it seems relatively clear that the use of outside post-disaster assistance does little to help businesses recover, the question of whether currently available sources of aid are actually detrimental to businesses remains open. Although similar explanatory models were used in the various studies, relationships among model variables that were found to be statistically significant in some analyses did not achieve significance in others.

Many of the models that were tested in the various analyses associated with the surveys explained relatively little variance in dependent variables such as preparedness, monetary losses, and recovery, indicating that these variables are subject to multiple and complex influences that our models did not capture well. This may be because this series of studies focused primarily on organizational, agent-specific, and community-level variables. Other types of factors not taken into account in this research, such as the behavior and decision processes of individual business owners, also need to be taken into account. As Alesch and Holly (1996) noted in their study of small businesses in the aftermath of the Northridge earthquake, some owners simply try harder to keep their businesses operational in the aftermath of disasters, and some owners make sounder business decisions than others. These kinds of factors, which undoubtedly affect how well businesses fare when disaster strikes, warrant more extensive study.

New studies are needed that improve upon the approaches described here. There is a need for more longitudinal research on businesses, as well as for studies that explore how business

disaster impacts and recovery outcomes vary across different types of disaster agents and different degrees of disaster severity. Researchers should undertake the difficult task of systematically following up on businesses that have ceased operations to find out why they closed, while also examining whether disasters can stimulate the creation of new firms or alter turnover processes in particular business niches.

Implications for Loss-Reduction Practitioners and Business Owners

Recent years have seen an expansion in interest in advising businesses on how to get ready for, manage, and recover from disasters. Business contingency planning is a growing field, and new journals with titles like Disaster Recovery have been established specifically to give advice and assistance to private sector organizations. The research findings and issues discussed here can provide a more solid empirical basis for such efforts. For example, the data show that businesses are more likely to carry out particular types of preparedness measures while overlooking others, which should provide guidance for practitioners who are trying to encourage more comprehensive planning. These studies also show that certain types of businesses are less able and willing to prepare for disasters than others, even though those same businesses may also be among the most vulnerable. Although educational programs and other strategies are being undertaken to enhance business preparedness, these programs appear to be reaching mainly the largest businesses in particular sectors of the economy, suggesting that more emphasis needs to be placed on targeting smaller firms and less well-prepared sectors.

To improve practice in the area of business disaster management, more information is needed on what kinds of approaches work best in encouraging businesses to undertake loss reduction measures and on what forms of assistance actually help businesses recover when they

do experience disasters. The need for better private-sector crisis and recovery management has been recognized, but before advocating particular programs and approaches, it is necessary to document systematically which strategies have proven effective for different types of businesses, in real disaster situations.

This research also indicates that in thinking about disasters, businesses need to look beyond their own doors and to appreciate the extent to which their chances of coping with and recovering from disasters are tied to community-wide loss-reduction activities. Although awareness is certainly growing, more business owners need to recognize that they have a vested interest in promoting higher levels of disaster resistance in their communities. For example, this research shows that businesses are very vulnerable to disaster-related lifeline disruption and other off-site impacts. Concentrating on reducing losses only at the business level will not address those sources of vulnerability. Instead, the business community should understand that making lifelines and other key elements in the civil infrastructure more resistant to disaster-related disruption will help reduce losses to individual businesses by reducing the likelihood of business interruption. Similarly, if a community has an effective plan in place for responding to disasters--containing and assessing damage, cleaning up debris, making emergency lifeline repairs, and undertaking other critical emergency response tasks--businesses will benefit directly, because they can resume operations more rapidly in the event of a disaster. If a community engages in pre-event disaster recovery planning, the businesses in that community will recover more quickly in the event of a disaster. The more businesses work with governmental preparedness organizations in the communities in which they operate to reduce potential community-wide disaster impacts and streamline the recovery process, the more confident they can be that their own disaster-related

problems will be less severe.

Acknowledgment

The research summarized here was supported by two grants from the National Science Foundation, SGER grant no. 9425810001 and grant no. CMS-9632779 and by the National Center for Earthquake Engineering Research (now the Multidisciplinary Center for Earthquake Engineering Research) grant no. 93-6303. The findings and conclusions are those of the authors.

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Table 1 Disaster Research Center Studies on Businesses, Hazards, and Disasters

Community	Year of Survey	Event	Sample	N(Response Rate)	Time	Topics
Memphis/ Shelby County	1993	-----	Random Stratified	737(40%)	Pre-event	Hazard Awareness, Lifeline Criticality, Pre-event Preparedness
Des Moines	1994	Midwest Floods	Random Stratified	1,079(50)	12 months post-event	Losses, Disruption, Pre- and Post- event Preparedness, Short-term Recovery
Los Angeles/ Santa Monica	1995	Northridge Earthquake	Random Stratified	1,120(24)	18 months post-event	Losses, Disruption, Pre- and Post- event Preparedness, Short-term Recovery
Santa Cruz County	1997	Loma Prieta Earthquake	Population	933(34)	8 years post-event	Losses, Disruption, Pre- and Post- event Preparedness, Long-term Recovery
South Dade County	1998	Hurricane Andrew	Population	1,078(27)	6 years post-event	Losses, Disruption, Pre- and Post- event Preparedness, Long-term Recovery

Table 2 Pre-Earthquake Preparedness Measures Taken by Businesses in Memphis/Shelby County, Tennessee and Los Angeles and Santa Monica, California

Action	Memphis	Los Angeles/ Santa Monica
Attended meetings/received information	39% (N=729)	39% (N=1,015)
Talked to employees about preparedness	30 (N=728)	35 (N=1,009)
Purchased earthquake insurance	41 (N=680)	18 (N=952)
Purchased business interruption insurance	29 (N=675)	24 (N=936)
Stored fuel or batteries	22 (N=725)	29 (N=980)
Learned first aid	51 (N=726)	49 (N=996)
Obtained first aid supplies	60 (N=728)	61 (N=1,013)
Developed business emergency plan	22 (N=723)	29 (N=1,007)
Developed business disaster recovery plan	13 (N=721)	14 (N=978)
Conducted earthquake drills	9 (N=730)	17 (N=993)
Involved in earthquake preparedness or response training programs	11 (N=725)	18 (N=988)
Arranged to move business to other location	9 (N=727)	5 (N=970)
Obtained generator	15 (N=726)	13 (N=973)
Braced shelves and equipment	17 (N=724)	26 (N=1,003)
Stored water	14 (N=725)	36 (N=995)
Had engineer assess building	11 (N=720)	14 (N=978)
Stored office supplies	34 (N=723)	--
Mean number of actions taken	4.1	3.9

Table 3 Patterns of Short- and Long-Term Business Disaster Recovery

Event	Current Business Condition^a		
	Worse Off	About the Same	Better Off
Midwest Floods (N=1,017)	12.2%	70.0%	17.8%
Northridge Earthquake (N=1,083)	23.3	52.2	24.6
Loma Prieta Earthquake (N=898)	21.5	41.5	37.0
Hurricane Andrew (N=1,055)	34.2	34.4	31.4

^a Measured as a comparison between the condition of the business at the time of the survey and its condition just before the disaster event.