University of Delaware
Disaster Research Center

PRELIMINARY PAPER
#243

WINNERS AND LOSERS: PREDICTING BUSINESS DISASTER RECOVERY OUTCOMES FOLLOWING THE NORTHRIDGE EARTHQUAKE

James M. Dahlhamer
and Kathleen J. Tierney

1996

Winners and Losers: Predicting Business Disaster Recovery Outcomes Following the Northridge Earthquake

James M. Dahlhamer
Kathleen J. Tierney

Department of Sociology and Criminal Justice
Disaster Research Center
University of Delaware
Newark, Delaware 19716 USA

Paper prepared for review for inclusion in the Disaster session at the annual meeting of the American Sociological Association, Toronto, Ontario, Canada, August 9-13, 1997

This research was undertaken with support from the National Center for Earthquake Engineering Research, Grant No. 93-6303, "Business Disruption and Initial Recovery in the Northridge Earthquake." The ideas, conclusions, and recommendations expressed here are those of the authors; they do not necessarily reflect the views of the National Center for Earthquake Engineering Research.

ABSTRACT

While the long-term effects of disaster and the factors that affect the ability to recover have received increasing attention by social science researchers, the majority of research to date has taken families and households as the units of analysis, with a smaller number of studies focusing on the recovery of entire communities. The processes and outcomes associated with the recovery of private firms, however, have almost never been addressed in the literature. Studies of the long-term economic consequences of disasters have generally focused on aggregate community effects. Findings of this research suggest that disasters produce negligible impacts at the community level. While important, this type of research neglects the impacts of disasters on individual firms and overlooks important micro-level recovery processes. For example, empirical support exists for the notion that disasters create both winners and losers, a process that aggregate analyses cannot capture. With this in mind, this paper explores the distributive effects of disaster on 1110 Los Angeles area firms impacted by the 1994 Northridge earthquake. The model used to predict winners and losers is based on an earlier analysis of business recovery following the earthquake, studies of both household and business disaster recovery, and the literature on organizational survival in non-disaster contexts. Findings show that business size, financial condition, disruption of business operations, earthquake shaking intensity, and the utilization of post-disaster aid are significant predictors of being worse off 18 months after the earthquake. Only financial condition was a significant predictor of being better off. Policy, theory, and future research implications are discussed.

INTRODUCTION

Although the long-term effects of disasters and the factors that affect recovery have received increasing attention from social science researchers, the majority of research conducted to date has taken families and households as units of analysis (Bolin, 1994; Bolin and Bolton, 1986; Miller and Nigg, 1993). A smaller number of studies have focused on the factors that facilitate or impede community recovery (Rubin, 1981; Rubin et al., 1985). However, very little research exists on how businesses cope with recovery, and what long-term effects, if any, disasters have on their viability.[1] Research on the economic consequences of disasters has generally focused on aggregate community effects. Those findings suggest that disasters produce negligible impacts at the community level (Friesema et al., 1979; Rossi et al., 1978; Rossi et al., 1983; Wright et al., 1979). For example, both Rossi et al. (1978) and Wright et al. (1979) found that the U.S. disasters they studied had no discernible or lasting effects on housing stocks, population, and other economic indicators at the county or census tract level. After studying four U.S. disasters, Friesema et al. concluded: "So far as we can determine, none of these disasters led to major long-term economic losses to these communities..." (1979:176).

While important, this more macro-level research overlooks business-level effects and micro-level recovery processes. Large-scale economic analyses do not capture the fact that some businesses may improve, while others may decline following disasters. Scanlon argues, for example, that "macro-economic research, which shows no appreciable economic effects of disasters , misses the many individual gains and individual losses, gains and losses which cancel each other out" (1988:49). In other words, disasters may create both winners and losers, a process that aggregate analyses cannot capture.

Some empirical support exists for this notion. Cochrane (1975) was the first to emphasize the distributive effects of disasters, suggesting that lower income groups suffer the disproportionate share of losses while their more wealthy counterparts may actually benefit. Earlier, Dacy and Kunreuther (1969) found that some homeowners benefitted from post-disaster relief programs following the 1964 Alaska earthquake, ending up in sounder financial condition than those who were left untouched by the event. Kroll et al. found that small firms and businesses in the

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[1]For notable exceptions, see Dahlhamer and Tierney (1996) and Kroll et al. (1991).

trade and services sectors were severely disrupted following the 1989 Loma Prieta earthquake, while business improved for firms in the construction sector. Despite this evidence, the concept of winners and losers itself has not been systematically explored (Scanlon, 1988).

PREDICTING WINNERS AND LOSERS

In this paper, we explore the distributive effects of disaster using data from a sample of 1110 Los Angeles area firms that were affected by the 1994 Northridge earthquake. The model we use to predict winners and losers is based on an earlier analysis of business recovery following the earthquake (see Dahlhamer and Tierney, 1996),[2] studies of both household and business disaster recovery, and the literature on factors affecting organizational survival in non-disaster contexts. The model estimates the effects of four types of independent and intervening variables--firm characteristics, direct and indirect disaster impacts, loss containment measures, and previous disaster experience--on the well being of Los Angeles area businesses, measured 18 months after the earthquake.

Firm Characteristics

Firm Age. Stinchcombe (1965) coined the term "liability of newness" to explain the propensity of young or new organizations to fail. New organizations must invest time and effort to establish new roles, socialize members, compete with existing firms to secure customers, and establish links with other relevant actors (Stinchcombe, 1965). The inability to attract clientele away from established firms is one of the primary reasons that new organizations fail (Singh and Lumsden, 1990). Studies on organizational mortality and survival support the liability of newness argument (Carroll and Delacroix, 1982; Carroll and Huo, 1986; Freeman et al., 1983), although there is also some evidence suggesting a "liability of adolescence" (see Aldrich and Auster, 1986).

Firm Size. The organizational literature also highlights the "liability of smallness." Tax laws, government regulation, competition for labor, and the ability to raise capital all favor large organizations. Large firms tend to have more resources and better access to credit, and they benefit more from government programs (Aldrich and

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[2]In this earlier analysis, the dependent variable, recovery, was dichotomous, with "worse off" firms coded as "not recovered" and "about the same" and "better off" firms coded as "recovered." Size, shaking intensity, disruption of operations, and use of post-disaster aid were significantly related to recovery. In this analysis, the dependent variable is trichotomous. "About the same" is the reference category, with "worse off" (losers) and "better off" (winners) the outcomes of interest (see Table 1 for coding scheme).

Auster, 1986). In the disaster area, Alesch et al. (1993) trace the vulnerability of small firms to their low cash reserves and the difficulty they have undertaking preparedness and mitigation measures. Smaller firms affected by the Loma Prieta earthquake suffered proportionally greater losses than larger ones, and larger companies quickly implemented strategies for recovery following the disaster because they had planned to do so in advance (Kroll et al., 1991).

Type of Business. Business type also affects organizational success and survival. Industries vary in competitiveness, technology, and wage structures (Tigges and Green, 1994). Firms located in highly competitive and/or low-growth industries, such as the retail and personal service sectors, tend to generate lower earnings (Loscocco and Robinson, 1991), reducing the odds of success and increasing the probability of failure (Bruderl et al., 1992; Halliday et al., 1987). Following the Loma Prieta earthquake, construction firms fared better, while trade- and service-sector businesses declined (Kroll et al., 1991).

Risk Dispersion.[3] Winning or losing may also be related to whether a business is an individual firm or a franchise or part of a chain. Branch and franchise establishments have access to more resources, such as credit, than independent firms (Aldrich and Auster, 1986), and they benefit more from national advertising (Tigges and Green, 1994). Such establishments may be able to overcome the liability of newness since they enter into organizational environments with a stable affiliation to an existing firm. Partner and parent firms become a major source of advice and credit for franchise and chain establishments (Bruderl et al., 1992). Additionally, individual firms with single locations may be more vulnerable to disasters because their risk is more concentrated (Alesch and Holly, 1996).

Own/Lease. Owning, as opposed to leasing, a business property may also be important for business survival following disasters (Durkin, 1984). Firms that owned their business property had better odds of obtaining U.S. Small Business Administration (SBA) loans following the 1987 Whittier Narrows earthquake (Dahlhamer, 1992). Building ownership may be in part a proxy for financial success, since it requires more of an investment than leasing. A building can also be used as collateral in post-disaster loan arrangements, which may in turn facilitate recovery.

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[3]In this analysis, risks are considered dispersed if the business is a franchise, part of a chain, or has multiple locations, and concentrated if the business is an individual firm. Franchise, chain, and multiple location establishments should be better able than individual firms to spread the risks associated with disasters, and thus should have fewer problems recovering.

Lessees may also have less opportunity than owners to take actions to mitigate disaster damage since they do not actually own the property.

Financial Condition. Durkin (1984) found that businesses that were marginal or in financial trouble prior to the 1983 Coalinga earthquake had a difficult time recovering. This was confirmed by Alesch and Holly (1996) in their study of small business recovery following the Northridge earthquake. This finding is also consistent with research on family and household recovery, which suggests that family socioeconomic status is an important determinant of recovery, with higher socioeconomic status translating into greater odds of recovery (Bolin, 1994; Bolin and Bolton, 1986; Quarantelli, 1991).

Direct and Indirect Disaster Impacts

Other things being equal, we expect that businesses that experience more disaster-related damage and disruption will be more likely to encounter problems than their less affected counterparts. This analysis considers five types of impacts: physical damage, loss of utility services, disruption of business operations, business interruption/inactivity, and earthquake shaking intensity.

Physical Damage. Business disruption was positively correlated with building damage in the Loma Prieta earthquake (Kroll et al., 1991), and household damage was a key determinant of economic recovery for households impacted by the Whittier Narrows earthquake (Bolin, 1994).

Loss of Utilities. Recent research following the 1993 Midwest floods suggests that indirect disaster impacts such as lifeline outages can have serious repercussions for businesses. For example, utility loss resulting from the 1993 Midwest floods was a much more important cause of business closure in the city of Des Moines than direct flood damage (Tierney et al., 1996).

Business Interruption/Inactivity. Business inactivity resulting from disaster should also affect the recovery outcomes of private enterprises. Businesses forced to close have immediate cash flow problems. Employees lose work, and customers who must go elsewhere for goods and services may not return when the business does reopen (Alesch et al., 1993; Nigg and Tierney, 1990).

Shaking Intensity. While previous analyses have focused on the relationship between damage and recovery (Bolin, 1994; Kroll et al., 1991), few have included direct physical measures of disaster impact. This analysis employs data on ground shaking (modified Mercalli intensity (MMI)) collected during the Northridge earthquake.[4] Shaking intensity is used here as a proxy for damage to the general area in which the business is located and at the business site itself. Since many businesses depend on an overall level of commercial traffic, and since high-shaking areas are likely to have higher overall levels of damage, businesses in high shaking intensity zones may have extra disadvantages in trying to recover.

Disruption of Operations. Previous research has suggested that such problems as lack of employee and customer access may hamper the ability of firms to recover from disaster (Durkin, 1984; Kroll et al., 1991). Our measure of disruption taps the following problems: employees being unable to get to work; damage to the owner's home or other properties; loss of customers; difficulties getting supplies/materials; difficulties delivering products or services; or difficulty paying their employees. We assume that the larger the number of problems of this kind businesses experienced, the more difficulty they had recovering.

Loss Containment Measures

This model assesses the impact of one step owners can take to recoup the costs associated with disaster: the use of aid and financial resources following the earthquake. The types of aid used by businesses in the sample include insurance, loans from the Small Business Administration, bank loans, help from relatives, and other forms of outside assistance. Previous research on family and household recovery, utilizing an open-systems analogy from organizational sociology, has demonstrated the importance of post-disaster aid for recovery (Bolin, 1989, 1994), and we reason that the same is probably true for businesses.

Previous Disaster Experience

Previous disaster experience can lead to increased preparedness among private firms (Dahlhamer and D'Souza, forthcoming; Drabek, 1994). Experience may have led businesses to develop business recovery plans, make

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[4]A shaking intensity value, ranging from MMI VI (low) to MMI IX (high), was assigned to each case in the sample based on the highest shaking intensity recorded in the zip code in which the business was located. In the Northridge event, shaking intensities in the impact region ranged from VI to IX.

arrangements to relocate in the event of building damage, or take other steps to cope with disaster-related problems. It may also have made owners familiar with how to obtain various sources of recovery aid.

To summarize, the model consists of four main components: firm characteristics, direct and indirect disaster impacts, loss containment measures, and previous disaster experience. Business characteristics in the model include type of business; age of the business; number of full-time equivalent employees; whether the business property is owned or leased; pre-disaster financial condition of the business; and risk dispersion. Measures of direct and indirect disaster impacts include whether the business suffered physical damage; earthquake shaking intensity; loss of utilities; business interruption/inactivity; and disruption of operations. The loss containment measure considered in the model is utilization of post-disaster aid. The final model component is disaster experience (see Table 1).

METHODOLOGY

Businesses were selected using a three-stage stratified sampling design, with shaking intensity and type and size of business used as stratifying variables. In the first stage of the design, Los Angeles and Santa Monica businesses were aggregated into high (Mercalli VIII and IX) and low (Mercalli VI and VII) shaking intensity zip codes. In the second stage, businesses in the high and low MMI zip codes were aggregated by Standard Industrial Codes into five economic sectors: wholesale and retail; manufacturing construction, and contracting; business and professional services; finance, insurance, and real estate; and "other" businesses. The latter category consists of firms involved in agriculture, forestry, fishing, mining, transportation, communications, and utilities. The final stage of the design involved the random selection of both small (fewer than 20 employees) and large (20 or more employees) firms in each of the five industrial sectors. The data was collected through a modified version of Dillman's (1978) "total design method." This approach is widely used in mail survey research and consists of a series of mailings and phone calls. With an initial sample size of 4752, mailings for the survey began in May, 1995, approximately 16 months after the earthquake. In all, 1110 surveys were received and coded, reflecting a 23 percent response rate.

RESULTS

Table 2 provides data on the model variables for the total sample, "worse off" businesses, firms that were "about the same," and those that were "better off." Businesses in the total sample were generally small but established, with a median size of six full-time employees and a median business age of 15. Eighty percent of the businesses were individual, single-location firms, and 73 percent leased their business properties. The majority of firms in the analysis considered themselves in sound financial condition at the time of the earthquake. Finally, over 60 percent of the firms were in the wholesale and retail trade (35 percent) and business and professional services (36 percent) sectors.

Looking at the measures of disaster impacts, 56 percent of the businesses in the total sample were inactive for a period of time, while 57 percent reported some type of physical damage. Business owners, on average, reported operational disruptions in two of six areas listed in the survey, most commonly the inability of employees to get to work and damage to owners' other properties. The median number of lifelines lost as a result of the earthquake was two, out of a possible four, with the loss of electricity and phones being the most prevalent.

The majority of business owners in the total sample (64 percent) had no pre-Northridge disaster experience. And finally, 25 percent of the firms used some sort of post-disaster assistance to aid them in the recovery process.

While important, figures for the total sample mask important differences across the three recovery outcomes. For example, businesses that were worse off tend to be smaller (4.0) and concentrated in the wholesale and retail and finance, insurance, and real estate sectors. A greater percentage of the better off firms were larger (7.0), franchise, chain, or multiple location operations (27 percent), and concentrated in the manufacturing and construction sector.

As expected, a greater percentage of businesses reporting physical damage (68 percent) or interruption/inactivity (71 percent) were worse off following the earthquake. Interestingly, businesses that reported physical damage (61 percent versus 51 percent) or interruption/inactivity (54 percent versus 50 percent) were also more likely to report being better off than about the same. This pattern suggests that the earthquake impacts helped some firms in the sample. Indeed, the primary response given by firms reporting physical damage or interruption/inactivity and that were better off was that the earthquake generated business. Conversely, the primary

reason given by firms that had experienced no physical damage or inactivity/interruption and were better off was that the economy was improving or they were experiencing natural growth. These findings seem counterintuitive and are difficult to explain. It is possible that the better off firms reporting damage or inactivity were located in areas of high damage and disruption, yet they were able to resume operations quickly enough to provide goods and services that were in demand and that more severely impacted businesses could not.[5]

A greater percentage of businesses that were worse off (45 percent) or better off (22 percent) used post-disaster assistance to aid them in the recovery process than firms that were about the same (17 percent). This suggests that post-disaster assistance aids some firms in the recovery process but not others. This, quite possibly, may be related to the type of assistance utilized.[6] Finally, owners with previous disaster experience were more likely to report being worse off (43 percent) than better off (34 percent) or about the same (34 percent).

Since the dependent variable is trichotomous (doing better, about the same, or worse), a multinomial logistic regression was run to test the model. "About the same as before the earthquake" is the reference category and is coded 0. "Worse off than before the earthquake" (losers) is coded 1, and "better off than before the earthquake" (winners) is coded 2. Our interest here is not in explaining the return to the pre-disaster financial status, but rather in exploring which businesses decline and which improve.

Worse-off Businesses

Table 3 presents multinomial logit coefficients for the probabilities of being worse off (losers) or better off (winners), relative to being about the same 18 months after the earthquake. In looking at the coefficients for worse off, two business characteristics are significant predictors. First, larger businesses were significantly less likely to be worse off, relative to being about the same, than their smaller counterparts. Thus, as others have found (Kroll et al., 1991), smaller firms were significantly more likely to be worse off after the earthquake. Correlations between size,

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[5]This argument probably hinges on a number of factors including the type of firm, whether the customers base is local or national, and the amount of competition a firm has. As we argue in later sections, businesses in the hardest-hit localities, even if they did not sustain direct damage, faced additional problems that were not experienced by firms in less-damaged areas.

[6]While distinguishing between types of assistance (e.g., formal and informal) would be useful, too few businesses in the sample used any assistance forcing us to include a simple dichotomous measure of aid utilization.

preparedness, and financial condition suggest that larger firms were in much sounder financial condition before the earthquake and were more likely to engage in pre-event planning than smaller firms. Additionally, larger firms in our analysis were significantly more likely to be franchise or chain operations, or have multiple locations, suggesting that size and the ability to spread risks both worked to these firms' advantage.

Finally, businesses that had been in poor financial health before the earthquake were significantly more likely than firms in good financial condition to be worse off, as opposed to being about the same. This is consistent with earlier research on business and household recovery that suggests low financial resources hamper recovery (Alesch and Holly, 1996; Bolin, 1994; Bolin and Bolton, 1986; Durkin, 1984; Quarantelli, 1991).

Two measures of disaster impacts, disruption of business operations and shaking intensity, are significantly related to being worse off following the earthquake, relative to being about the same. Businesses experiencing more disruption of operations were significantly more likely to report being worse off after the earthquake. Again, this was not surprising since earlier research on business recovery has found such problems as lack of employee and customer access and shipping delays to be major impediments to business recovery (Durkin, 1984; Kroll et al., 1991).

Firms located in zip codes that recorded high shaking intensities during the earthquake were significantly more likely to be worse off following the earthquake. High shaking intensity areas were more prone to a number of earthquake-related problems, such as residential and commercial damage and lifeline service interruption, and this in turn had a negative effect on businesses. As we discuss later, shaking intensity may have helped to mediate the effects of other disaster impact measures, suggesting that businesses in the hardest hit areas faced additional problems that were not experienced by firms in the less damaged parts of the impact region.[7]

The lone loss-containment measure, utilization of post-disaster aid, is also significantly related to the probability of being worse off following the earthquake. However, the effect is not in the anticipated direction. Firms that utilized post-disaster assistance were significantly more likely to report being worse off following the earthquake,

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[7]We would also expect the type of structure housing the business to mediate the effects of shaking intensity since some buildings perform better than others when subject to earthquake shaking. Therefore, type of building may also play an important role in explaining the recovery outcomes of private firms. While we asked business owners to indicate the type of structure housing the business in the survey, many were unaware of the construction type or simply did not answer the question. This resulted in an extensive amount of missing data on this question, precluding us from incorporating a measure of the earthquake resistance of buildings in our model.

relative to being about the same, than firms that used no disaster aid. Closer examination of the data revealed that businesses utilizing post-disaster aid were also more likely than their counterparts to report severe physical damage and disruption as a result of the earthquake. Therefore, firms that used aid were in some ways harder-hit to begin with. It is also possible that the type of aid businesses used, such as SBA and bank loans, actually left them worse off, since it raised their debt. Alternatively, since firms were surveyed only 18 months after the earthquake, it may have been too soon to determine whether the assistance helped.

Interestingly, physical damage and business interruption/inactivity were not significantly related to recovery. However, there is evidence that disruption of operations, use of post-disaster aid, and shaking intensity mediated the effects of damage and inactivity on the probability of being worse off, relative to being about the same. When an alternative model was tested without those three measures, business inactivity was significantly related to recovery, and physical damage approached significance, both in the expected directions. When either aid or disruption is included in the model, the significant effect of business inactivity on the probability of being worse off disappears.

Better-off Businesses

Only one model variable is significantly related to the probability of being better off after the earthquake, compared to being about the same. Surprisingly, firms that were in financial trouble prior to the earthquake were significantly more likely than firms in solid financial condition to report being better off following the earthquake. This finding is difficult to explain, especially when considering that businesses in poor financial condition were also significantly more likely to be worse off following the earthquake. Perhaps some owners of firms in poor financial condition prior to the earthquake viewed their businesses as better off simply because they survived the event. Also, firms in sound financial condition prior to the earthquake may have had more to lose. While their greater financial resources allowed them to preserve their economic position, owners of these firms may have been less inclined to perceive their post-earthquake situation as improved.

Another possible explanation for this puzzling pattern may be related to the economic sectors in which the better off firms were operating. Disaster winners that started out in either good or poor financial condition differed in a number of ways, but one clear difference emerged. A much greater percentage of construction firms in the better off

category had been in poor financial condition prior to the earthquake. Evidently, the construction resulting from the earthquake itself provided a much needed economic stimulus to the construction sector, including firms that had not been doing well.[8]

The model we tested does a better job of predicting who loses than it does explaining who wins. Overall, however, the model fit the data well, as indicated by the model χ^2 of 141.425, significant at the .0001 level. The pseudo R^2 indicates that the model explains 16.2 percent of the variance in recovery outcomes. Using classification analysis to assess goodness-of-fit, the model was able to correctly predict the recovery outcome of 54.8 percent of the firms in the analysis. However, the model predicted some outcomes better than others. For example, the model correctly classified 86.8 percent of the firms in the about the same category, but only 40.6 percent of the losers and 9.7 percent of the winners. The overall lack of explanatory power along with the classification results suggests the model may be misspecified. A number of non-earthquake factors that were not included in the analysis may be causally related to the recovery outcomes.

DISCUSSION

The model of business recovery we tested predicts business losses much better than gains; while five of the model variables were significantly related to the probability of being worse off, only one variable was a significant predictor of being better off, relative to being about the same. This discrepancy in predictive ability was also confirmed by the classification analysis. Overall, the model was a reasonably good predictor of recovery outcomes, although a large amount of variance in the dependent variable remains unexplained.

Three of the four model components are important contributors to our understanding of business recovery outcomes. Small size, a business characteristic, is a significant predictor of being worse off, relative to being about the same. This finding is consistent not only with earlier research on business recovery (Kroll et al., 1991), but also with studies of organizational success and survival (Aldrich and Auster, 1986). Factors that contribute to firm

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[8]More specialized sectoral analyses indicated that construction firms were significantly more likely to report being better off than other firms. However, since there were so few construction firms in the sample, the standard error for the coefficient predicting worse off was extremely inflated. Thus, we estimated the model containing the four general economic sectors defined in Table 1(other firms as the reference category).

viability in normal times play a similar role in the survivability of firms confronted with sudden disruptions in operations, such as disasters. Size evidently helps insulate firms not only from other sudden perturbations in their environments, such as interruption in the flow of supplies or sudden market downturns, but also from disaster impacts.

Financial condition, another business characteristic, was also a significant predictor of recovery outcomes. Not surprisingly in light of earlier research (Alesch and Holly, 1996; Durkin, 1984), businesses in good/excellent financial condition prior to the earthquake were significantly less likely to be worse off, as opposed to being about the same, than firms in poor financial condition. Firms in stable financial condition have slack resources that can be invested in the recovery process, and if post-disaster assistance is needed, financially sound firms should find it easier to secure aid due to greater amounts of collateral. Finally, businesses in good financial condition have the resources necessary to invest in measures to mitigate disaster-related damage.

Financial condition was also a significant predictor of who ended up a winner. Unexpectedly, firms in financial trouble prior to the earthquake were significantly more likely to be better off after the earthquake than firms in good financial condition. Part of this may be perceptual; struggling businesses may think mere survival constitutes improvement, while those in good condition may inflate their sense of loss. More likely, the relationship was shaped by the kinds of businesses that had been struggling before the earthquake. A much greater percentage of construction firms in the better off category had been in financial trouble prior to the earthquake. Clearly, the earthquake provided a much needed economic boost for the construction firms in the sample.

Measures of the direct and indirect impacts of disasters proved equally important for understanding recovery outcomes; both disruption of business operations and shaking intensity were significant predictors of being worse off, compared to being about the same. The more problems the earthquake caused businesses and business owners, for example, by disrupting customer traffic or making it difficult to ship and receive goods, the more likely they were to be worse off following the earthquake. This finding suggests the importance of moving away from narrow definitions of disaster that only take into account factors like direct physical damage. Some types of physical damage can be

dealt with relatively easily--glass can be replaced, for example. Owners may find it much more difficult to cope with downturns in customer volume or lost employee productivity.

We found shaking intensity, a variable that has not been employed in other analyses of recovery, to be an important predictor of recovery outcomes. Businesses located in high shaking intensity zones had higher probabilities of being worse off after the earthquake. Those businesses likely had more problems recovering because, in addition to experiencing damage and disruption themselves, they also had to deal with neighboring pockets of residential and commercial damage. In their qualitative study of small businesses in the hardest-hit areas of the San Fernando Valley, Alesch and Holly (1996) found those businesses were vulnerable following the earthquake, particularly if they were dependent on a local customer base. Extensive residential damage forced some customers to relocate out of the area, resulting in lost business. Residents who had to invest heavily in repairing and rebuilding their homes suddenly had less discretionary income to spend. Damage to surrounding businesses disrupted customer traffic. Such effects were felt even by businesses that experienced little or no direct earthquake damage, suggesting the need to look beyond what happens to individual firms and begin focusing on disaster-related disruption of neighborhoods and commercial districts. Irrespective of individual levels of damage and disruption, firms have more difficulty if they are located in areas where damage is widespread, indicating that ecological factors have an independent effect on recovery.

Finally, firms that used post-disaster assistance were significantly more likely to be worse off following the earthquake than firms using no aid. This finding is inconsistent with the literature on household recovery, which finds that the more aid a household uses, the better its chance for recovery. There are three likely reasons for the apparent discrepancy. First, as we noted earlier, businesses had to be very badly off before they sought aid following the earthquake. Thus, those who used outside aid may have done so because they were worse off to begin with. Second, since grants to firms are virtually nonexistent and few businesses have earthquake or other types of disaster insurance,[9] those that formally seek outside funds generally must rely on governmental or bank loans to cover disaster-related losses. Loans, however, bring with them additional indebtedness. Even if income returns to pre-

[9]Only 20.5 percent of the firms in the sample reported having earthquake insurance at the time of the disaster, and, of those, only 28.0 percent filed an insurance claim after the earthquake. Overall, only 5.5 percent of the firms in the total sample used earthquake insurance to cover disaster-related losses.

disaster levels, businesses may thus be worse off. In their Northridge business impact study, Alesch and Holly (1996) found many owners who expressed concern about being able to pay back their loans. Third, it is also possible that the assistance received was insufficient, or that even with outside aid market forces are simply working against some businesses. Owners may seek aid and put money into replacing inventory and making repairs, only to find that their old customers have gone elsewhere. Even businesses who receive sufficient aid may suffer because their neighbors have not reopened or are not doing well. If the general economic climate is poor for particular business sectors, disaster assistance is not likely to reverse those effects.

Our analysis of business outcomes following disaster is limited in that it focuses primarily on firm-level variables and disaster impacts. Business fates are also tied to more general local, regional, and economic trends that this paper did not take into account. In future analyses, we hope to explain a greater portion of the variation in recovery outcomes by incorporating data on broader economic trends in the Los Angeles region.

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TABLE 1. Variable Definitions

Variable	Coding Scheme
Business Characteristics:	
Age of business[a]	Continuous
Number of full-time employees (natural log)[a]	Continuous
Own or lease	0=Lease; 1=Own
Risk dispersion	0=Individual firm; 1=Franchise/chain/multiple location
Financial condition	0=Financial trouble/not doing well; 1=Good/excellent financial condition
Wholesale/retail	0=Other; 1=Wholesale/retail
Manufacturing/construction	0=Other; 1=Manufacturing/construction
Business/professional services	0=Other; 1=Services
Finance/insurance/real estate	0=Other; 1=Finance/insurance/real estate
Direct and Indirect Disaster Impacts:	
Physical damage	0=Yes; 1=No
Business interruption/inactivity	0=Yes; 1=No
Loss of utilities	0=Lost no utilities to 4=Lost electric, phones, water, and sewer
Disruption of business operations	0=No disruption to 6=High disruption (Count of operational problems businesses reported as a result of the earthquake.)
Shaking intensity	1=MMI VI; 2=MMI VII; 3=MMI VIII; 4=MMI IX
Loss Containment Measures:	
Used external post-disaster aid	0=No; 1=Yes
Previous Disaster Experience:	
Disaster Experience	0=No; 1=Yes
Dependent Variable:	
Winners and Losers	0=About the same; 1=Worse off; 2=Better off

[a]In the multinomial logistic regression analysis, the natural log of the number of full-time employees was taken to correct for a non-normal distribution. Outliers were removed from the age of business variable to deal with the same problem.

TABLE 2. Descriptive Characteristics of Model Variables

Variable	Total Sample	Worse Off	About the Same	Better Off
Business Characteristics:				
Age of Business				
Mean:	20.7	19.5	22.1	17.9
Median:	15.0	15.0	15.0	14.0
	(N=1035)	(N=238)	(N=520)	(N=248)
Number of full-time employees				
Mean:	40.4	56.0	36.1	37.3
Median:	6.0	4.0	6.0	7.0
	(N=1059)	(N=241)	(N=536)	(N=251)
Percent own Business property	27.5	22.4	29.9	26.9
	(N=1100)	(N=245)	(N=558)	(N=260)
Risk dispersion				
% Individual firm	79.7	82.2	78.9	73.1
% Franchise/chain/ multiple location	20.3	17.8	21.1	26.9
	(N=1016)	(N=236)	(N=503)	(N=260)
Financial condition				
% Financial trouble	3.4	7.5	1.6	3.5
% Not doing well	24.5	27.4	20.8	29.5
% Good fin. cond.	48.3	45.2	53.4	40.3
% Excellent fin. cond.	23.8	19.9	24.1	26.7
	(N=1048)	(N=241)	(N=547)	(N=258)
Percent wholesale/ retail firms	25.1	31.3	22.4	23.7
	(N=1110)	(N=249)	(N=562)	(N=262)
Percent manufacturing/ construction firms	13.6	6.8	15.1	17.9
	(N=1110)	(N=249)	(N=562)	(N=262)
Percent business and professional service firms	36.1	34.1	39.1	32.1
	(N=1110)	(N=249)	(N=562)	(N=262)
Percent finance/insurance/ real estate firms	13.0	17.7	10.9	13.0
	(N=1110)	(N=249)	(N=562)	(N=262)

TABLE 2. (continued)

Variable	Total Sample	Worse Off	About the Same	Better Off
Direct and Indirect Disaster Impacts:				
Percent with physical damage	57.2 (N=1096)	68.4 (N=247)	51.0 (N=553)	61.2 (N=260)
Percent interruption/ inactivity	55.9 (N=1106)	71.3 (N=247)	49.9 (N=561)	54.2 (N=262)
Loss of utilities				
Mean no. lost (out of 4)	1.4	1.7	1.3	1.4
Median no. lost	2.0 (N=1045)	2.0 (N=232)	1.0 (N=532)	2.0 (N=247)
Disruption of business operations				
Mean no. of problems encountered (out of 6)	1.9	2.7	1.7	1.9
Median no. of problems	2.0 (N=1093)	2.0 (N=245)	2.0 (N=553)	2.0 (N=261)
Shaking intensity				
% MMI 6	5.6	2.4	7.3	5.3
% MMI 7	34.1	27.3	37.0	33.2
% MMI 8	54.0	58.6	51.2	56.1
% MMI 9	6.3 (N=1110)	11.6 (N=249)	4.4 (N=562)	5.3 (N=262)
Loss Containment Measures:				
Percent used post-disaster aid	24.8 (N=1015)	44.8 (N=239)	16.9 (N=508)	21.7 (N=253)
Previous Disaster Experience:				
Percent of owners with disaster experience	36.0 (N=1078)	43.4 (N=244)	34.4 (N=550)	33.8 (N=260)

TABLE 3. Multinomial Logit Coefficients for the Probabilities of Being "Worse Off" and "Better Off" Than Before the Earthquake (N=763)

Independent Variable	"Worse Off"	"Better Off"
Business Characteristics:		
Age of business	.003	-.011
Full-time employees (ln)	-.200*	.097
Own or lease	-.286	-.224
Risk dispersion	-.261	-.137
Financial condition	-.439*	-.455*
Wholesale/retail	.377	.079
Manufacturing/construction	-.432	.398
Services	-.289	-.306
Finance/insurance/real estate	.781	.308
Disaster Impacts:		
Physical damage	.012	-.223
Business interruption/inactivity	-.051	.077
Loss of utilities	-.098	.008
Disruption of operations	.352***	.066
Shaking intensity	.400*	.041
Loss Containment Measures:		
Post-disaster aid	.954***	.355
Previous Disaster Experience:		
Disaster experience	.202	-.144
Model χ^2	141.425***	
Pseudo R^2	.162	

*$p<.05$ **$p<.01$ ***$p<.001$

Session 242, continued

3. Does Remarriage Affect Health and Life Satisfaction? *Anne E. Barrett*, Duke University
4. Gender Distribution of Non-College Post-Secondary Schooling and Its Effect on Attainment. *Lorraine R. Bell*, Duke University
5. Changes in the Sex Role Attitudes of Male Students When Female Students Were Accepted into a Traditional All-Male Private School. *G. Michael Bowen*, Simon Fraser University
6. The First Time/Das Erstes Mal: Scripts for Virginity in U.S. and German Teen Magazines. *Laura M. Carpenter*, University of Pennsylvania
7. A Comic Interpretation of Print: A Preliminary Study of the Printed Word, Comics, and Television. *Catherine E. Celebreeze*, New School for Social Research
8. Item Response Theory and Marital Happiness: An Analysis of Scale Elements. *Kurt David Johnson*, University of Nebraska, Lincoln
9. Tracing the City: Spatial Practices in Everyday Life. *Margarethe Kusenbach*, University of California, Los Angeles
10. The Structure and Dynamics of Criminal Networks. *Duncan McAndrew*, University of Liverpool, England
11. The Pregnant Body in Public: Visual Representations in Media and Everyday Life. *Christine H. Morton*, University of California, Los Angeles
12. The Effects of Mentoring on Family Environment, Adolescent Substance Use, Delinquency, and Academic Achievement. *Greg Muller*, *Paul Muller*, *Craig H. Blakely*, and *Ramdas Menon*, Texas A&M University
13. The Effects of Demographic and Coping Factors on Police Officers' Psychological Well-Being. *George T. Patterson*, State University of New York, Buffalo
14. Critical Struggles: Conflict and Change in Social Movement Organizations. *Sarita Srivastava*, University of Toronto
15. Dependency among Older Women: Is It the Product of Social Construction? *Cecile N. Yancu*, Columbia University

243. Regular Session. Collective Behavior: Environmentalism and Environmental Movements, Canadian Studies

Sheraton Centre, Kenora

Organizer and Presider: *John A. Hannigan*, University of Toronto

Trust and the Pollution Issue: Public Trust in Pollution Information and Environmental Group Involvement. *S. Harris Ali* and *Ralph Matthews*, McMaster University

Wood Frames: An Examination of Environmental Movement Framing of Forestry and Conservation in British Columbia. *David B. Tindall* and *Aaron Doyle*, University of British Columbia

Moral Panic Versus the Risk Society: A Critical Comparison of Differing Sites of Social Anxiety. *Sheldon Ungar*, University of Toronto, Scarborough

Discussion: *Robert Paehlke*, Trent University

244. Regular Session. Criminology II

Toronto Marriott, Trinity Salon 1

Organizer and Presider: *Rosemary Gartner*, University of Toronto

The Dialectics of White Collar Crime: The Anatomy of the Savings and Loan Crisis and the Case of Silverado Banking, Savings & Loan Association. *Davita Silfen Glasberg* and *Dan Skidmore*, University of Connecticut

Criminal Careers as Sequences: An Exploratory Analysis of Criminal Histories of a Sample of White Collar Offenders. *Elin J. Waring* and *Gisela Bichler-Robertson*, Rutgers University

Commitment, Crime, and Social Control. *Jeffery T. Ulmer*, Purdue University

Politics, Social Unrest, and Punitive Resources: Modeling the Determinants of Expenditures on Corrections. *David Jacobs* and *Ronald E. Helms*, University of Oregon

Discussion: *Joachim Savelsberg*, University of Minnesota

245. Regular Session. Disaster

Sheraton Centre, Kent

Organizer and Presider: *Gary A. Kreps*, The College of William & Mary

Social System Causes of Aviation Disasters. *Robert Stallings*, University of Southern California

Taking the Environment Seriously: A Respecification and Test of the Disaster Framing of the Stress Process. *Valerie A. Haines*, University of Calgary; and *Jeanne S. Hurlbert* and *John J. Beggs*, Louisiana State University

Winners and Losers: Predicting Business Disaster Recovery Outcomes Following the Northridge Earthquake. *James M. Dahlhamer* and *Kathleen J. Tierney*, University of Delaware

Some Effects of Rescue Work on Rescuers: Oklahoma City and Florida Task Force 1 Firefighters One Year after the Alfred P. Murrah Federal Building Bombing. *John K. Schorr*, Stetson University; *Angela s. Boudreaux*, Florida Department of Juvenile Justice; *Sara Jo Nixon*, University

Paper presented at the annual meeting of the American Sociological Association, Toronto, Aug 9-