

## Determinants of Business-Disaster Preparedness in Two U.S. Metropolitan Areas\*

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*Although there has been a proliferation of "how-to" planning guides in recent years, there has been very little documentation of the variation in and determinants of business-disaster preparedness. The few studies that have been conducted have focused on specific firms or industrial sectors, such as the chemical or tourist industry, or have been plagued by too few cases. These problems clearly limit the generalizability of the research findings. This paper attempts to fill a void in the literature by exploring the determinants and variations of planning within the private sector utilizing two stratified, random samples of businesses from Memphis/Shelby County, Tennessee (N=737), and Des Moines/Polk County, Iowa (N=1,079). Findings show that business size, whether the business property is owned or leased, and prior disaster experience are all related to business-disaster preparedness in both study areas. Type of business was related to preparedness among businesses in Memphis/Shelby County. Policy implications of the findings are discussed.*

### Introduction

In recent years there has been a proliferation of publications providing information and advice on how to reduce disaster-related damage to businesses (Alesch et al. 1993). One primary source of this information is governmental agencies that produce "how-to" manuals. For example, the

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Federal Emergency Management Agency (FEMA) has published the *Disaster Mitigation Guide for Business and Industry* (1990). (For more examples, see FEMA 1993; Southern California Earthquake Preparedness Project n.d.; American Defense Preparedness Association 1992.)

Private consultants and business executives are another source of information. Often these publications are a direct result of some disaster experience. For example, Bell (1991) produced a business disaster-planning manual based on her experiences following the 1987 Whittier Narrows earthquake. Utilizing experiences from a handful of disaster events, Barton (1993) focuses on the importance of planning and communication for managing organizational response to disaster.

Finally, a number of journals devoted to issues of disaster preparedness, response, and recovery within the private sector have emerged in recent years. Examples include the *Disaster Recovery Journal* (1988) and *Journal of Contingencies and Crisis Management* (1990).

While certainly necessary and important, these publications tell us little about the extent of actual business-disaster preparedness or its determinants. In his extensive review of the disaster-research literature, Drabek (1986) found only a handful of studies that even remotely addressed the issue of business-disaster preparedness. He noted "that the entire matter of disaster planning within the private sector merits extensive study so as to permit documentation of the range of variation and its determinants" (p. 30).

The lack of research on business-disaster preparedness should not be taken as an indication that disasters do not impact community commercial districts and, thus, private firms need not be concerned with disaster planning. The literature suggests otherwise. For example, the Xenia, Ohio tornado of 1974 destroyed 155 commercial and four industrial businesses, and severely impacted each of 100 other businesses (Francaviglia 1978). Following the 1989 Loma Prieta earthquake, it was estimated that 60 per cent of the Santa Cruz downtown businesses were destroyed or sufficiently damaged as to require at least temporary closure (Disaster Research Center 1993). Tierney (1994a) found that 41 per cent of the Des Moines/Polk County businesses sampled by the Disaster Research Center (DRC) following the 1993 Midwest floods were forced to close for some period of time during the flooding. In a DRC study of businesses in Memphis, Nigg and Tierney (1994) found that the overall disaster preparedness of businesses was very low, especially with respect to actions that could be taken to lessen business interruption. As Tierney (1994a) suggests, loss of property and sales tax revenues, potential loss of large and/or important employers, and

a variety of other problems face communities whose business districts have been damaged by disasters.

Drabek has suggested that disaster planning is a resource that business executives can utilize to help reduce one type of environmental uncertainty and "thereby enhance their capacity to protect the autonomy, security, and prestige of the organization" (1994b, p. 10). Preparedness can be thought of as any activity that has the potential to save lives, lessen property damage, and reduce the negative impacts of disaster events, including long-term interruptions of commercial activities. In essence, preparedness can increase individual, organizational, and community control over the subsequent disaster response.

This paper attempts to fill a void in the literature by exploring the determinants and variations of planning within the private sector utilizing two stratified, random samples of U.S. firms. More specifically, the following research questions will be addressed in the paper: (1) To what extent have businesses prepared for disasters? (2) What types of preparedness activities are firms likely to engage in? (3) And what factors constrain or facilitate disaster preparedness among private firms?

### Review of Literature

The handful of empirical analyses that have addressed the problem of business-disaster preparedness have been limited in scope. Generally, the research has focused on specific industries such as tourist-oriented firms (Drabek 1991, 1994a, 1994b) or chemical companies (Quarantelli et al. 1979; Gabor 1981). Much of this research has also been plagued by small sample sizes (Barlow 1993; Mileti et al. 1993). The narrow focus and small sample sizes of these analyses have limited the generalizability of the research findings. Nevertheless, they provide a theoretical and empirical base for the development of a model to analyze business-disaster preparedness.

Although this research has identified some managerial and community characteristics related to business-disaster preparedness, by far the strongest predictors have been a series of firm characteristics. The most consistent firm characteristic related to preparedness is firm size, usually measured by the number of employees. Quarantelli and associates (1979) were among the first to address disaster preparedness within the commercial sector. Focusing on a sample of chemical companies in 18 communities across the U.S., they found that larger chemical companies had engaged in more planning than their smaller counterparts. Small chemical companies did not view themselves as a significant threat or source of potential disaster regardless of the hazardous nature of the products they handled. Smaller

firms may also have fewer resources to devote to disaster preparedness. Drabek also found size to be significantly related to disaster-evacuation planning among two samples of tourist-oriented firms (1991, 1994a, 1994b). The first sample consisted of 65 firms selected from three communities with progressive local government disaster programs. The second sample consisted of 120 firms selected from six communities with recent disaster experience. In an initial analysis of the 65 firms, Drabek noted that "the more employees a business has, the more extensive its disaster evacuation planning" (Drabek 1994a, p. 21). In later multivariate analyses, Drabek pooled the two samples providing an overall sample size of 180 firms. Size was again found to be an extremely strong predictor of disaster-evacuation planning (Drabek 1994a, 1994b, 1995).<sup>1</sup>

Age of business is another firm characteristic thought to be related to business-disaster preparedness, but research findings are not consistent. Among the smaller sample of 65 tourist-oriented firms, Drabek (1991) found the age of business to be related to disaster-evacuation planning with more extensive planning occurring in firms that had been in business for six or more years. Interestingly, age of the firm made little difference beyond this threshold of six years. Quarantelli et al. (1979) found that newer chemical firms, usually built in modern industrial parks, were more likely than their older counterparts to engage in preparedness activities.

Drabek (1991, 1994a, 1994b, 1995) also found ownership patterns, i.e., whether or not the business was an individual firm or part of a larger chain, to be significantly related to disaster-evacuation planning. Firms that are part of a larger national chain had engaged in more evacuation-planning activities than individual firms. This was due, in large part, to corporate mandates. Corporate headquarters often provide local affiliates generic guidelines for disaster plans. Again, this is consistent with a finding of Quarantelli et al. (1979) that larger national chemical companies had engaged in more preparedness than locally based individual firms. National companies had policy directives from headquarters to institute programs relevant to chemical disasters.

Further, Drabek (1991, 1995) found type of business to be significantly related to disaster-evacuation planning. Although focusing only on tourist-oriented firms, he was able to distinguish between lodging, restaurant, entertainment, and travel establishments. Among the sample of 65 firms, Drabek found that lodging establishments had engaged in more evacuation-planning activities than restaurant, entertainment, and travel firms.

In their analysis of 54 firms selected from eight San Francisco Bay area counties, Mileti and associates (1993) found that firm type was indirectly

related to preparedness for earthquakes. Health, safety, and welfare organizations that had agency staff with earthquake activities as part of their jobs, and whose executives had higher levels of earthquake-risk perception were more likely to prepare for future damaging earthquakes.

In sum, the small amount of research that exists suggests that a series of firm characteristics, including firm size and type, whether the firm is an individual firm or part of a franchise or chain, and the age of the firm are all related to business-disaster preparedness.

One firm characteristic that has not been included in earlier analyses but that may be related to preparedness is whether a business property is owned or leased. In their analysis of household-earthquake preparedness in Southern California, Turner et al. (1986) found that home owners had engaged in more preparedness activities than renters and other household types. For example, homeowners were much more likely to possess various emergency supplies such as flashlights, battery-operated radios, and first-aid kits.

Previous disaster experience has also been found to influence business-disaster preparedness. Drabek (1994a, 1994b) found that businesses with previous disaster experience had engaged in more evacuation planning than businesses with little or no disaster experience. Mileti and associates also found experience to be significantly related to preparedness. In his descriptive analysis of the preparedness activities of 20 St. Louis area firms, Barlow (1993) noted that a lack of disaster experience was probably the most significant factor for explaining the lack of earthquake preparedness among the firms.

Drawing and expanding on previous research, this paper presents a model of business-disaster preparedness and applies it to two business samples. Model variables consist of a number of firm characteristics including business size, type, age, whether it is an individual firm or franchise, and whether it is owned or leased.

Previous disaster experience is also included in the model (see Table 1).

## Methodology

A two-stage, stratified, sampling method was used to develop business samples in Memphis/Shelby County, Tennessee, and Des Moines/Polk County, Iowa. Memphis/Shelby County was selected for study because of the earthquake hazard associated with the New Madrid Fault Zone. Des Moines/Polk County was selected because of the damage and disruption the community sustained in the 1993 Midwest Floods. Along with business preparedness, business reliance on and use of various utility services were major topics addressed in the two surveys. Stratifying variables were

business type and size. This ensured that an adequate number of large and small businesses as well as businesses from all industrial sectors were selected for the survey. (Since most small businesses are in the service sector and since most businesses are small, a straight, random sample would overrepresent some types of businesses, making it difficult to draw conclusions about others such as large manufacturing firms.)

Table 1. Variable Definitions

Variables	Coding Scheme
<u>Independent Variables:</u>	
Age of Business	Continuous
Number of full-time employees	Continuous
Own or lease	0=Lease 1=Own
Firm or franchise	0=Franchise/chain 1=Individual firm
Disaster experience	0=No 1=Yes
Wholesale/retail	0=Other 1=Wholesale/retail
Services	0=Other 1=Services
Manufacturing/construction	0=Other 1=Manufacturing/construction
Finance/insurance/real estate	0=Other 1=Finance/insurance/real estate
<u>Dependent Variable:</u>	
Preparedness	Index of 17 items in Memphis and 13 items in Des Moines

In the first stage of the sampling design, the 27,197 businesses in Shelby County and the 14,193 businesses in Polk County were aggregated by Standard Industrial Codes (SIC) into five business sectors: wholesale and retail sales; manufacturing, construction, and contracting; business and professional services; finance, insurance, and real estate; and other businesses (agriculture, forestry and fishing; mining; transportation, communication, and public utilities).<sup>2</sup> The second stage of the sampling design entailed the random selection of both small (less than 20 employees) and large (twenty or more employees) businesses within each of the five sectors identified above. Twenty employees was used to delineate small and large businesses since anything larger would result in too few large businesses being selected for the study. The majority of businesses in Memphis/Shelby

County and Des Moines/Polk County were very small (less than 10 employees). As a result, the original, proportional-stratified samples were each partitioned into 10 smaller subsamples based on size and type of business.

The data-collection strategy employed was 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. On June 7, 1993, each of the 1,840 Memphis/Shelby County businesses selected to participate in the study received a self-completion survey by mail. Participants that did not return a completed survey by June 29 were sent a reminder postcard on June 30, 1993. (A total of 1,604 postcards were mailed.) Participants that had not returned a completed survey by July 25 were mailed a second survey on July 26, 1993. (A total of 1,154 surveys were re-mailed on this date.) Follow-up phone calls to businesses were initiated on July 30, 1993 to coincide with the arrival of the second mailed survey. Phone calls continued until August 13, 1993. A total of 737 questionnaires were received and coded. The response rate for the study was 40 per cent, exactly what was expected and adequate for undertaking the comparative analyses based on business type and size.

Given DRC's experience with the Memphis business survey, the initial mailing of questionnaires in Des Moines/Polk County was followed up by telephone calls to business owners after a reasonable amount of time had passed for questionnaire completion. Postcard and second reminder mailings were eliminated. On March 14, 1994, each of the 2,164 businesses selected to participate in the study received a self-completion survey by mail. Approximately two weeks after the initial mailing, businesses that had not returned a completed survey were followed up by phone, encouraging proprietors to respond. A number of business owners indicated they had not received the initial mailing or that it had been discarded, therefore they were mailed another copy of the questionnaire. Phone calls continued until July 1, 1994. A total of 1,079 questionnaires were received and coded. The response rate for the study was 50 per cent, well above the DRC's goal of 40 per cent.

The survey instruments for the two study communities contained a variety of comparable questions, as well as specific questions tailored to the study sites. In Memphis/Shelby County, the survey questions addressed the following topics: (1) general business information; (2) the earthquake risk in Memphis/Shelby County; (3) business reliance on utility services; (4) preparedness activities undertaken by businesses; (5) earthquake and other disaster experience; (6) knowledge of and potential reliance on various post-disaster assistance sources; and (7) general earthquake preparedness among businesses and local government.

In Des Moines/Polk County, the survey instrument focused mainly on the direct and indirect impacts of the 1993 Midwest floods on businesses. Specific topics addressed in the instrument included: (1) flooding and physical damage as a result of the 1993 Midwest floods; (2) importance of utility services to business operations; (3) utility service disruptions as a result of the floods; (4) whether the business was forced to close as a result of the floods; (5) sources of assistance utilized following the floods; (6) the extent to which businesses had recovered from the impacts of the floods; (7) preparedness activities undertaken by businesses; (8) previous disaster experience; and (9) general information on each business.

It is important to note that businesses in Des Moines/Polk County were asked to indicate the preparedness activities they had undertaken prior to the floods as well as after the floods. Since, unlike Des Moines/Polk County, Memphis/Shelby County had not experienced a recent disaster event at the time the survey was administered, this analysis focuses only on pre-flood preparedness activities undertaken by Des Moines/Polk County businesses. Future analyses of the Des Moines/Polk County data will assess the extent to which the floods influenced the preparedness activities of businesses in that area.

### Results

Table 2 presents means and standard deviations for all independent variables as well as the dependent variable included in the model for the two business samples. The mean number of preparedness activities undertaken by businesses in Memphis/Shelby County is 4.16 (out of a possible 17). This is considerably higher than the mean of 1.98 activities undertaken by Des Moines/Polk County businesses (out of a possible 13). It is important to note that businesses in Des Moines/Polk County were asked questions on four fewer preparedness activities than Memphis/Shelby County businesses and this may, to some extent, explain the former's lower average score. However, as will be shown, comparing responses to similar preparedness questions indicates that Memphis/Shelby County businesses do, in general, have higher levels of disaster preparedness.

While businesses in Memphis/Shelby County have higher levels of disaster preparedness than those in Des Moines/Polk County, there appears to be a similar pattern in the preparedness measures undertaken in the two areas.

Table 2. Descriptive Statistics of Model Variables

Variable	Memphis		Des Moines	
	Mean	SD	Mean	SD
Independent Variables:				
Age of business	21.91 (14.00) <sup>a</sup>	22.67	30.09 (20.00)	29.38
Number of full-time employees <sup>b</sup>	60.50 (6.00)	420.00	64.53 (7.00)	373.51
Own or lease	0.38	0.49	0.45	0.50
Firm or franchise	0.69	0.46	0.66	0.47
Wholesale/retail	0.27	0.44	0.21	0.41
Services	0.30	0.46	0.33	0.47
Manufacturing/construction	0.14	0.35	0.17	0.37
Finance/insurance/ real estate	0.14	0.35	0.17	0.37
Disaster experience	0.10	0.30	0.10	0.30
Dependent Variable:				
Preparedness	4.16	3.61	1.98	2.44
			N=737	N=1,079

<sup>a</sup>Median shown in parentheses.

<sup>b</sup>Original metric shown. To correct for a positively skewed distribution, the natural log of the number of employees was used in the regression analysis.

Table 3 presents frequency and percentage breakdowns of the preparedness measures undertaken by businesses in the two study areas. As expected, the more generic types of preparedness measures were undertaken by the highest frequency of businesses. For example, stockpiling first aid medical supplies (Memphis: 60%, Des Moines: 49%), and having employees learn first aid (Memphis: 51%, Des Moines: 39%) rank the highest among preparedness measures undertaken in both areas. A comparatively sizeable percentage of businesses had developed an emergency plan (Memphis: 22%, Des Moines: 29%). At the other extreme, very few businesses made arrangements for moving to an alternative location (Memphis: 9%,

Des Moines: 7%), or conducted emergency drills (Memphis: 9%, Des Moines: 3%).

**Table 3. Businesses-Preparedness Measures (Percent) Taken Memphis/Shelby County, Tennessee (Earthquake), and Des Moines/Polk County, Iowa (Flood)**

Action	Memphis	Des Moines
Attend meetings/receive written information	39	7
Talk with employees	30	10
Brace shelves, equipment	17	—
Purchase earthquake/flood insurance	41	8
Purchase interruption insurance	29	18
Store food or water	14	—
Store office supplies	34	—
Store fuel or batteries	22	10
Learn first aid	51	39
Obtain first aid kit or extra medical supplies	60	49
Develop an emergency plan	22	29
Develop a recovery plan	13	17
Have engineer assess building	11	—
Conduct drills or exercises	9	3
Involved in preparedness or response training programs	11	5
Made arrangements for alternative location	9	7
Obtain an emergency generator	15	15

A major difference between the pattern of preparedness between the two metropolitan areas is the area of information gathering through, among other things, attending meetings (Memphis: 39%, Des Moines: 7%). The level of information gathering could be possibly related to the differences in the percentages of businesses that discussed preparedness measures with their employees (Memphis: 30%, Des Moines: 10%).<sup>4</sup>

Additionally, a proportionately larger percentage (41%) of Memphis/Shelby county businesses purchased earthquake insurance, in comparison with the percentage of Des Moines/Polk county businesses (8%) that purchased flood insurance.<sup>5</sup>

Although preparedness levels were somewhat higher among businesses in Memphis/Shelby County, and this varied depending on the preparedness measure, preparedness levels in both study areas were fairly low. In fact, nearly half of the Des Moines/Polk County businesses had not undertaken a single preparedness measure, and approximately half of the Memphis/Shelby County businesses had undertaken three or less preparedness measures. This is consistent with earlier research that has uncovered disturbing

figures regarding business disaster preparedness. For example, Drabek found "unsatisfactory" levels of preparedness among the 180 tourist-oriented firms he sampled, noting that "less than one-third of the businesses surveyed really measured up" (1994a, p. 17). Mileti and associates (1993) found that less than half of the businesses they interviewed in the Bay Area, which has a high earthquake risk and recent earthquake experience, had engaged in any emergency drills, training, planning, stockpiling of supplies, and creation or updating of emergency plans. And finally, Barlow observed that among the 20 St. Louis firms he studied: "Earthquake preparedness per se is not something that has been taken very seriously at most of the plants in question" (1993, p. 432). Thus, the findings on low levels of disaster preparedness among businesses in Memphis/Shelby County and Des Moines/Polk County are consistent with other studies of U.S. businesses.

To assess the extent to which the firm characteristics and previous disaster experience (see Table 1 for model variables and coding scheme) predict disaster preparedness among businesses in the two study areas, a regression analysis was employed. In looking at Table 4, it is clear that the firm characteristics model was a significant predictor of preparedness in both study areas (Memphis/Shelby County:  $F=12.228$ ,  $p<0.001$ ; Des Moines/Polk County:  $F=17.964$ ,  $p<0.001$ ). The model explains about 15 per cent of the variation in preparedness for the Memphis/Shelby County sample (adjusted R-squared=.149), and 18 per cent for the Des Moines/Polk County sample (adjusted R-squared=.182).

Among the businesses characteristics that were regressed on level of preparedness, the size of the business (number of employees) was the strongest predictor of preparedness for both Memphis/Shelby County (Beta=.245,  $p<0.001$ ) and Des Moines/Polk County (Beta=.396,  $p<0.001$ ). This is in accordance with previous research on business disaster preparedness. It is possible that smaller businesses simply lack the staff to assign to such activities. Mileti and associates (1993) have indicated the importance of having staff members with preparedness activities as part of their jobs. Small businesses may lack the staff and therefore time to engage in disaster preparedness. The size of the business may also be a proxy variable for business prosperity, with smaller businesses simply unable to afford certain preparedness activities. There is some evidence for this among Memphis/Shelby County businesses. A correlation coefficient shows size to be significantly related to owners' assessments of business financial condition (.213,  $p<0.01$ ), with larger businesses described as better off financially. However, when financial condition was included as an independent variable in the model for Memphis/Shelby County (a comparable measure does not exist for Des Moines/Polk

County), it was unrelated to preparedness and had little discernible effect upon the other model variables. Thus, financial condition may play a role indirectly through size, but size still has an important independent effect on preparedness.

Table 4. Regression Coefficients and Standard Errors for Business-Preparedness Models<sup>a</sup>

Variables	Memphis		Des Moines	
	Unstd. Coeff.	Std. Coeff.	Unstd. Coeff.	Std. Coeff.
Independent Variables:				
Age of business	0.006 (0.007)	0.37	-0.002 (0.003)	-0.020
Number of full-time employees	0.599*** (0.105)	0.245	0.578*** (0.058)	0.396
Own or lease	1.274*** (0.305)	0.171	0.337* (0.164)	0.073
Firm or franchise	-0.209 (0.325)	-0.026	-0.184 (0.176)	-0.038
Wholesale/retail	-0.417 (0.435)	-0.052	-0.198 (0.288)	-0.035
Services	0.750 (0.431)	0.096	0.059 (0.267)	0.012
Manufacturing/construction	-0.499 (0.518)	-0.047	-0.393 (0.303)	-0.063
Finance/insurance/ real estate	1.811*** (0.530)	0.164	0.315 (0.307)	0.050
Disaster experience	0.927* (0.448)	0.081	1.031*** (0.262)	0.137
R-squared	0.162		0.193	
Adjusted R-squared	0.149		0.182	
F	12.228***		17.964***	
N	579		686	
* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$				

<sup>a</sup>Standard errors in parentheses.

Whether the business property was owned or leased was also a significant predictor of preparedness in both study areas, with owners engaging in more preparedness activities than lessees (Memphis/Shelby County: Beta=.171,  $p < 0.001$ ; Des Moines/Polk County: Beta=.073,  $p < 0.05$ ). It could be ar-

gued that in comparison to renters, owners of buildings have a greater stake to lose in the event of a disaster. Facility ownership may also be a proxy for financial condition, with owners more likely than lessees to be able to undertake preparedness measures. This was not borne out, however, in a subsequent analysis among Memphis/Shelby County businesses. Finally, owners may simply be able to engage in a broader range of preparedness activities. For example, owners can have an engineer structurally assess the building housing the business, an activity that lessees would be precluded from undertaking.

Previous disaster experience was also a significant predictor of preparedness. In both study areas, businesses that had previous disaster experience were more likely to engage in disaster-preparedness activities (Memphis/Shelby County: Beta=.081,  $p < 0.05$ ; Des Moines/Polk County: Beta=.137,  $p < 0.001$ ). Again, this finding is consistent with earlier research and suggests the importance of prior experience in reinforcing the value of disaster preparedness. Previous disaster experience was a more important determinant of preparedness among Des Moines/Polk County businesses than in Memphis/Shelby County. It is difficult to determine why this is the case. It may have to do with the severity of disaster events in the two areas, which would not be tapped by the current measure of experience (0=No, 1=Yes). This measure was employed, however, because very few businesses in either area (roughly 10%) indicated any previous disaster experience, and most of these could only recall one or two events. The disaster agent may also provide a partial explanation. For Des Moines/Polk County, the DRC questionnaire focused specifically on flood preparedness. Des Moines/Polk County respondents were most likely to indicate experience with flood disasters. The same was not the case with Memphis/Shelby County businesses. Whereas the DRC questionnaire focused on earthquake preparedness, very few Memphis/Shelby County respondents indicated experience with earthquakes.

Finally, of the major business sectors included in the model, finance, insurance, and real estate businesses in Memphis/Shelby County (Beta=0.164,  $p < .001$ ) were significantly more likely than "other" businesses to engage in preparedness activities. There were no sectoral differences in Des Moines/Polk County. This finding is difficult to explain. At first glance it may suggest that finance, insurance, and real estate businesses may have corporate mandates to adopt certain preparedness behaviors, but we would expect this to be consistent across the two study areas. It is possible that actions have been taken to champion preparedness within this sector in Memphis/Shelby County. For example, the Central United States Earthquake

Consortium (CUSEC), located in Memphis, has played a significant role in emphasizing the importance of disaster preparedness among businesses. Due to the earthquake hazard, CUSEC has paid considerable attention to potential impacts on the finance, insurance, and real estate sector. CUSEC has further emphasized the importance of owning earthquake insurance. Perhaps the efforts of CUSEC have raised the awareness levels of businesses within this sector. The role of CUSEC highlights the importance of viewing such organizations as environmental forces that can facilitate or constrain the preparedness efforts of private sector firms. By conceptualizing community organizations as "environmental" variables, future research on business-disaster preparedness should benefit from greater theoretical precision and explanatory power.<sup>6</sup>

### Discussion

Model variables significantly related to preparedness in both study sites included the number of full-time employees, whether the business property is owned or leased, and previous disaster experience. Business sector was significantly related to preparedness in the Memphis/Shelby County sample. While the model was a reasonably good predictor of preparedness among businesses in both study areas, a great deal of variance in the dependent variable was left unexplained. Clearly, the preparedness activities of private firms is a research topic in need of further exploration.

Although preliminary, these findings have important policy implications. Given the uniformly low levels of preparedness revealed in the study, awareness and education strategies that specifically target businesses seem warranted. However, since businesses are not preparing voluntarily, simple education and awareness programs may not be enough. Direct intervention on the part of local governments may be necessary to raise preparedness levels among businesses. Intervention strategies may include mandates that would require businesses to undertake specific preparedness activities such as developing emergency and recovery plans, as well as conducting annual disaster drills. Incentives could also be offered to induce disaster preparedness. Businesses could receive tax breaks and/or special service rates for engaging in various preparedness activities. For example, businesses that file emergency plans with local offices of emergency management could receive reduced utility rates. Finally, efforts should be undertaken to make hazard insurance more affordable. This may have an effect in areas like Des Moines/Polk County where only 8 percent of businesses had purchased flood insurance.

Finally, small businesses as well as renters face greater obstacles in preparing for disaster and could therefore be considered special populations of businesses that need to be targeted by local governments. Again, special programs similar to those discussed above may need to be developed to aid these business populations.

### Notes

1. Drabek (1994b, 1995) tested a number of models in his multivariate analyses before arriving at a "selected model." This model was the most parsimonious in the sense that a great deal of variance in preparedness was explained by a handful of variables. Variables in this model included presence of a disaster subculture, owner/manager membership in a professional organization, number of full-time employees, owner/manager risk perception, assistance from local emergency managers, and an index of a variety of intraorganizational factors.

2. While commonly employed, classifying organizations by economic sector (standard industrial classification codes) is not without its critics. For a more thorough discussion of this issue see Hall (1991) and Warriner (1980).

3. In Memphis/Shelby County, businesses were asked to indicate whether they had done, planned to do, or had not or were unable to do each of the 17 preparedness activities listed in Table 3. Des Moines/Polk County businesses were asked to indicate if they had done prior to the floods, done since the floods, planned to do, or had not or were unable to do each of the 13 preparedness activities listed in Table 3.

4. The higher levels of information gathering among Memphis/Shelby County businesses may be due to the increased awareness of the earthquake threat in the Central U.S. brought about by the 1990 Iben Browning earthquake prediction. The late Iben Browning, a biophysicist and self-taught climatologist, issued a prediction that a major earthquake could occur around December 2 or 3, 1990, in one of several geographical areas, including the Central U.S. A DRC survey conducted with a random sample of Memphis/Shelby County households revealed that residents had been extensively involved in seeking and sharing information about earthquakes. Eighty-nine per cent of the respondents reported having talked with someone about earthquakes in the past year (Tierney 1994b).

5. Again, the higher percentage of businesses with hazard insurance in Memphis/Shelby County may be related to the Browning prediction. Tierney (1994b) found that the sale of earthquake insurance increased dramatically in the Central U.S. due to concern over the prediction. Local governmental

agencies used this concern to raise preparedness levels among local residents and businesses, for example, by highlighting the importance of earthquake insurance for mitigating earthquake-related damage. Certainly, insurance companies took an active role in advertising the merits of earthquake insurance since the sale of such policies in "low-risk" areas like the Central U.S. is highly profitable. Clearly, community organizations, both public and private, should be considered "environmental" influences on the preparedness activities of private firms. Future research should recognize the role of these environmental entities as facilitators or constrainers of business-disaster preparedness.

6. Drabek (1994b) has taken this step, for example, by focusing on the role of local emergency-management agencies in aiding the disaster-evacuation-planning efforts of tourist-oriented firms.

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