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"There's a Guy in the Center Aisle with a Gun!"—Workplace Homicides and Shareholder Wealth

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Abstract: This paper examines equity market responses to workplace homicides. Although previous research has examined the demographic, behavioral, and loss control aspects of workplace violence, as well as stock price reactions to large, non-operating losses, this is the first study to jointly consider these two important research avenues. Although insigificant on the event day for the sample as a whole, significant negative abnormal returns were detected over the 30 days following workplace killings. A cross-sectional regression of the company-specific cumulative abnormal return levels registered over the event period suggests that the employment status of the killer was the key explanatory variable. Accordingly, the initial sample was divided between events in which the perpetrator was either a current or former employee of the firm versus events in which the killer was unrelated to the targeted company. Stark differences in market reactions to the two samples were found. In particular, employment-related killings produced a negative announcement effect and significant negative returns that persisted for some time after the killings. Overall, the results demonstrate the importance of loss control and market perception of culpability (e.g., forthcoming lawsuits and settlements) when a current or former employee commits a workplace homicide. [Key words: workplace homicides; stock returns; risk management.]

INTRODUCTION

William Baker *was* the man in the center aisle with the gun. On February 5, 2001, Baker used an AK-47 assault rifle to kill four of his former co-workers at a Navistar plant in Melrose Park, Illinois. He

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wounded four other people before turning the gun on himself. Unfortunately, such shootings, while comparatively rare, are not a new phenomenon. One of the first—and perhaps the most infamous—mass workplace killings occurred at a McDonald's franchise in San Ysidro, California, in 1984. In that incident, James Oliver Huberty killed 21 people and wounded 19 others in a shooting spree that shocked the nation.

Obviously, public entities are not immune from workplace killings and, indeed, the phrases "go postal" and "went postal" entered into the popular lexicon largely as a result of a sequence of fatal shootings at United States postal facilities in the 1980s. For example, in 1986, 14 people were killed at an Edmond, Oklahoma, post office by a postal employee who then committed suicide moments after the shootings. Nor have public schools been spared from such atrocities. Undoubtedly, the April 20, 1999 attack by Eric Harris and Dylan Klebold on Columbine High school (which resulted in the deaths of 14 students and a teacher and wounded 24 others) did more to thrust the horror of mass homicides into the public consciousness than any other in the nation's history.

This article examines equity responses to workplace homicides. A workplace homicide is defined as a murder that occurs at a work site or at some another location during the performance of employment-related responsibilities. The person (or persons) killed can be a manager, employee, co-worker, or, rarely, even a customer of the business. Interestingly, although the National Institute for Occupational Safety and Health (NIOSH) began compiling data on workplace fatalities in 1980 through its National Traumatic Occupational Fatalities Surveillance System (NTOF), the Bureau of Labor Statistics did not begin to collect workplace fatality information until 1992 through its Census of Fatal Occupational Injuries (CFOI).[1] As shown in Table 1, homicide was the second leading cause of workplace fatalities over the 1992 to 2004 time period, and while the annual number of homicides reached a high of 1,080 in 1994, over 500 people were murdered at their places of employment in 2004. For the five-year period from 2000 to 2004, the number of workplace homicides averaged just over 622 per year. About 78 percent of these killings were by shooting.

Not surprisingly, it is likely that the reduction in workplace killings since 1994 coincided with greater use of loss control techniques by American businesses and improving economic conditions. In a study of North Carolina businesses, Loomis et al. (2002) document a number of environmental and administrative interventions consistent with a reduction of risk of being killed on the job. Among the loss control methods discussed were bright exterior lighting, not having a worker alone at a work location during evening hours, and limiting access to work sites only to employees. In response to previous tragedies and to attempt to avoid similar incidents,

Table 1. Leading Causes of Workplace Deaths in the U.S.

	Highway incidents	Homicides	Falls	Struck by object
1992	1,158	1,044	600	557
1993	1,242	1,074	618	565
1994	1,343	1,080	665	591
1995	1,346	1,036	651	547
1996	1,346	927	691	582
1997	1,393	860	716	579
1998	1,442	714	714	520
1999	1,496	655	721	585
2000	1,365	677	734	571
2001*	1,409	643	810	553
2002	1,373	609	719	505
2003	1,353	632	696	531
2004	1,374	551	815	596

Source: U.S. Department of Labor, Bureau of Labor Statistics, *Census of Fatal Occupational Injuries*, 2004.
*Excludes fatalities from the 9-11 terrorist attacks.

many employers began to use more rigorous pre-employment screens, restrict access to work locations, institute meaningful employee counseling programs, and open channels of communication between employees and human resource managers about potential threats. For example, in one case, an employee visited a co-worker's home and became alarmed about a collection of firearms kept in the home. The employee reported the incident to a human resources manager, who then decided to formally survey other employees to see if any of them felt uncomfortable or threatened by any of their co-workers. Two workers reported that they had been personally threatened by the employee who owned the firearms.[2]

In the wake of their perceived vulnerability following the Columbine massacre, many employers began to examine their specific workplaces for signs of potential trouble and to intervene earlier in the process to defuse hostile situations and to eliminate the occurrence of bloodshed. Indeed, some organizations have gone so far as to adopt detailed procedures when terminating at-risk employees. Such procedures often include notifying security/law enforcement officials, advising the employee that (s)he will not be readmitted to the building at any time or for any reason, conducting the dismissal in a room with a door leading directly outside the building,

not allowing the employee to return to his/her work area following termination, and providing a reasonable severance package (see, e.g., Viollis and Kane, 2005).

As might be expected, workplace homicides are not distributed equally across all economic sectors. Obviously, many homicides occur in the public sector, including, especially, the deaths of policemen and firemen. As noted above, workplace deaths also occasionally occur at government facilities such as post offices and schools. In addition, more than half of all workplace killings occur in retail and service industries, often resulting from armed robberies. Finally, certain types of small businesses, including gas stations, pawn shops, bars, convenience stores, cab companies, security companies, and repossession services—many of which are located in and/or serve less-affluent areas—experience a disproportionate number of work-related killings.

While every workplace homicide involves a tragic loss to friends, family, and co-workers (and, in view of the material to follow, it must be emphasized here that the depth of the losses suffered by these individuals simply cannot be overstated), it is also a fact that many workplace killings occur at larger organizations with publicly-traded ownership rights. As such, reasoned information regarding the losses and disruptions corporations experience as a result of such tragedies will undoubtedly prove of interest to many individuals involved in corporate risk management activities.

It is estimated that it can take as long as six weeks for employees affected by a workplace killing to recover emotionally. Undoubtedly, some people never recover. Rather, some employees may simply quit working at the location where the killing occurred. The executive director of the National Institute for the Prevention of Workplace Violence, Barry Nixon, has stated that the average *direct* cost of a workplace killing is around $1 million. Not surprisingly, this figure does *not* include substantial indirect costs of the attacks or the costs of litigation related to workplace homicides. Indeed, Nixon estimates the average cost of out-of-court settlements to be $500,000 and the cost of going to court and losing to be in excess of $3 million.[3]

Clearly, workplace homicides have an adverse impact on several classes of corporate stakeholders, including employees and their families (even those in no way related or quite distant from the tragedies), customers, and, perhaps, the owners of the financial securities issued by the targeted companies. Accordingly, this study investigates a number of important and previously untested hypotheses concerning shareholder wealth effects around the time of workplace homicides. Assuming that capital markets are efficient, the share price responses of the affected firms

around the time of the killings will provide insights into the market's opinion of the economic losses resulting from these tragic events.

Just how *are* workplace homicides interpreted by financial market participants? Do share prices fall, as might be expected if the events were expected to lead to adverse changes in production or future litigation losses? Or do share prices essentially remain unchanged, as the random nature and generally quite limited scope of the events might suggest? Are there any incident-specific variables that might help to explain the cross-sectional variation in the magnitude of the share price reactions (if any) to such killings? Do share price changes (if any) suggest the potential efficacy of an enhanced role for corporate risk management personnel to mitigate similar losses in the future? The answers to these questions are of significant interest to many constituencies, including corporate risk managers, other corporate employees and managers, insurance company executives, and investors. They are the questions to which the remainder of this study is specifically addressed.

A "TYPICAL" WORKPLACE HOMICIDE

While no single workplace killing could begin to capture the many nuances of these extraordinary events, examination of the "typical" case of William Baker and Navistar will at least shed light on some of the relevant (and difficult) issues involved.

Mr. Baker had worked for Navistar for 39 years, most recently as a tool room attendant. Then, in 1994, he was suddenly fired for conspiring with five of his co-workers to steal close to $200,000 in diesel engines and components. Baker pleaded guilty in November of 2000 to conspiracy to commit theft from interstate shipments and was sentenced to serve five months in prison to be followed by five months of home confinement. He was scheduled to report to prison on February 6, 2001.

On the day before his prison sentence was to begin, Baker returned to his former workplace, the Navistar plant in Melrose Park, Illinois. He carried a golf bag and told a plant security guard that he wanted to return some borrowed property to a friend inside the plant. When the guard said she would summon the worker for him, Baker produced a .38 caliber revolver and, threatening the guard and other employees, forced his way into the plant. Once inside, Baker returned to the area where he had last worked, pulled an AK-47 assault rifle from the golf bag, and began shooting. Baker killed four of his previous co-workers, wounded four others, and then turned the gun on himself. In addition to the assault rifle and handgun, Baker had a shotgun and a .30-caliber hunting rifle inside the

golf bag, along with hundreds of rounds of ammunition. Three of the wounded employees were hospitalized, while a fourth was treated and released for a bullet wound to his foot.

As might be expected, Navistar workers were not required to report for work on the day after the shooting. Those workers who did report were met with increased plant security and a team of trauma counselors. As things "began to return to normal," federal, state, and local law enforcement officials began to formally investigate how Baker, a convicted felon, had procured the weaponry employed in the attack.

PRIOR RESEARCH

Previous research related to this area has been restricted specifically to the causes and consequences of workplace violence and to equity responses to non-operating losses suffered by publicly-traded companies. As noted above, this study is the first to link these two important research veins by examining the stock price reaction to workplace killings. In the paragraphs that follow, specific literature relevant to the study is discussed.

Workplace Violence

Research examining workplace killings has typically approached the topic from behavioral, psychological, and loss control perspectives. For example, in a study of workplace homicides in North Carolina, Loomis et al. (2001) determined that "new locations" (business in operation fewer than two years), having one person on the job (e.g., a single worker at a convenience store), and night and weekend hours were positively related to workplace killings. The authors found that locations where only men were employed were three times more likely to experience homicides than locations where the majority of employees were female. They also found differences based on ethnicity. Locations with no European-American workers were more likely to experience a workplace homicide than were locations that employed a mixed-race workforce or African-American or Asian workers only.

In an earlier work, Goodman, Jenkins, and Mercy (1994) examined work-related homicides of U.S. health care workers between 1980 and 1990. During this period, 106 violent occupational deaths occurred, including 27 pharmacists, 26 doctors, 18 registered nurses, 17 aides, and 18 other health care workers. The authors found that homicide was the second leading cause of death for health care workers during the period, and that the majority of victims were men who were killed by means of firearms.

Not surprisingly, the problem of workplace killings has prompted a number of articles on loss control methods designed to reduce the frequency and/or severity of such incidents. Travnick (1994), for example, proposed that companies should develop detailed company violence policies such as prompt response mechanisms and employee assistance programs, as well as changing management styles (e.g., from authoritarian to participative) in an effort to reduce workplace violence. Wade (2004) suggests that implementing a formal workplace violence prevention policy (including a threat notification and response system) and specific managerial training may significantly reduce the likelihood of workplace attacks.

In a recent (2004) report, titled "Workplace Violence: Issues in Response," the U.S. Federal Bureau of Investigation discusses some "best practices" that can be used to mitigate workplace violence. Among the various measures cited were in-depth pre-employment screenings, identification of problematic behavior (e.g., belligerence, acquisition of weapons, obsession with a supervisor or co-worker, violent outbursts, homicidal or suicidal comments or threats), identification of workplace factors that can produce stress and employee unrest (such as under-staffing, downsizing, labor disputes, authoritarian management styles, and lack of employee counseling), examination of the physical layout of the workplace (with specific consideration of escape routes, access control, and visibility), and the establishment of formal procedures to assess, report, and respond to threatening incidents.

Equity Response to Large Losses

In 1996, OSHA established guidelines for preventing workplace violence and notified companies that criminal penalties may be imposed for violating the recommended standards. As noted in the introduction, the present study's emphasis upon workplace homicide announcements essentially represents a new and important hybrid of two strains of academic research—workplace violence and the potential for large losses—as violence in the workplace of sufficient severity to result in a homicide of an employee almost certainly results in the filing of one or more wrongful death lawsuits and, potentially, significant indirect losses as well.

For example, a recently terminated employee returned to a North Carolina tool manufacturer and went on a shooting spree. Surviving family members accused the company of negligence in safeguarding its employees and, following a jury trial, were awarded $7.9 million in damages.[4] This case is not unique. Indeed, study of the damage awards following incidents of workplace violence suggests that large jury awards are much more likely to be the rule rather than the exception.

A number of researchers have examined the impact of company-specific non-operating losses upon firm value. In an early work, Sprecher and Pertl (1983) found a significant negative stock price reaction to 27 large losses that occurred between 1969 and 1978. The sample examined included large property losses, loss of productive capacity, and liability claims. A large loss was defined as a loss of at least 10 percent of a company's net worth. Davidson, Chandy, and Cross (1987) found a similar negative equity response for a sample of 57 airline crashes. Cross, Davidson, and Thornton (1989) examined equity response to the filing of a lawsuit against the directors and officers of a company. Interestingly, they found significant negative abnormal returns *prior* to the filing of the lawsuit. This result is reasonable, however, as there must have been a significant precursor event that ultimately triggered the litigation. Finally, a study by Lai, McNamara, and Oppenheimer (2002) of 155 large losses in all classes of property and liability insurance and reinsurance reported by the *World Insurance Report* and *World Loss Log* (published by the *Financial Times*) reported a significant negative equity response when the large losses occurred and that—although investors often anticipated large civil judgment awards—the actual awards were typically much greater than investor expectations.

DATA AND EMPIRICAL METHODOLOGY

Data

Although the Bureau of Labor Statistics compiles data on workplace fatalities, only statistics involving aggregated data are reported. As a comprehensive listing of workplace killings is not available, a sample of such events was generated through a number of searches. First, the *Wall Street Journal Index* and web sites dedicated to workplace violence were carefully reviewed. Numerous key-word searches were also conducted in an effort to glean additional workplace homicide events. Not surprisingly, most of the workplace killings that were identified occurred at public institutions (e.g., schools and post offices) and at small businesses that were not publicly traded. These events were eliminated from the sample, as were any events where robbery was determined to be a motivation for the crime. Accordingly, a brief discussion as to why robberies were specifically excluded from the analysis is warranted.

According to Patricia Biles, OSHA's Workplace Violence Program Coordinator, 75 to 80 percent of workplace killings involve robberies and less than 10 percent involve co-workers (Wiscombe, 2002). Robberies are obviously motivated by monetary gain, whereas the workplace killings

included in this sample are motivated by anger, revenge, mental frailty, or some other *non-financial* cause. Robberies are directed at a specific location (usually within retail premises) where loss control mechanisms may be employed. Indeed, a homicide occurring during a robbery may result from an action of an employee (e.g., pulling a gun to confront the robber). Finally, it is a sad fact that investors anticipate robberies and robbery-motivated homicides. Indeed, so many robberies and killings occur at certain types of business establishments that society is almost desensitized to their occurrence. As such, when a killing occurs that is *not* motivated by apparent financial gain, it most likely will be interpreted very differently by stakeholders.

Finally, in order to enhance the relevance of the study to contemporary business practice, the sample was limited to events that occurred between 1990 and 2004. The final sample of 40 events is reproduced in Table 2. For each of these 40 events, data on a number of crime-specific attributes (e.g., the number of people killed, the date of the crime, the targeted company, the market value of the targeted company) were collected from published sources.[5] Following standard practice, all stock return data for the companies where the workplace killings occurred were obtained from the Center for Research in Security Prices (CRSP) data tape.

Empirical Methodology

The event-time methodology employed in this study to measure the wealth effects of workplace homicides has enjoyed extremely wide acceptance in the fields of risk management, finance, economics, accounting, marketing, and management. Commonly referred to as the "market model," the methodology involves the estimation of a time series of stock market returns to measure the effects of temporally distinct events (in this case, workplace homicides) upon the stock prices of the affected firms.

The statistical procedure employed in the generation of the stock market results for this study is known as the Scholes-Williams standardized cross-sectional market model. With this procedure, three separate parameter-estimating regressions between the stock market index (in this case the CRSP value-weighted index of all stocks in the database) and the stock returns of each company are performed. The Scholes-Williams approach was selected since the companies included in the sample vary significantly in size and scope (ranging from a market value of $231 million to over $248 billion), and the Scholes-Williams methodology was specifically designed to reduce the influence of nonsynchronous trading on the thinly traded, lower-market-value firms included in the data set.

Because workplace homicides are obviously individually *completely* unanticipated events, there is no need to incorporate any pre-event exam-

Table 2. Workplace Killings Sample

Date	Company	Event	Number killed
06/18/90	GMAC	Owner of repossessed car goes on shooting spree	9
02/22/91	South. Cal. Edison	Estranged husband of worker shoots accountant	1
10/16/91	Luby's Cafeteria	Mentally ill man opens fire in cafeteria	22
01/24/92	General Dynamics*	Fired former employee shoots labor negotiator	1
08/10/93	McDonalds	Two killed, three wounded at franchise	3
01/07/95	Ford*	Employee wounds estranged wife and her boyfriend	1
11/19/95	BankOne*	Fired employee kills former co-workers, supervisor	4
03/23/97	McDonalds	Three murdered at a franchise	3
08/27/97	NEC*	Former employee kills estranged girlfriend	1
06/04/98	Royal Ahold*	Food service worker opens fire, kills co-worker	1
12/24/98	Walgreens*	Worker kills co-worker at warehouse	1
01/13/99	AT&T Corp.	Deranged woman shoots and kills employee	1
06/03/99	Albertson's	Former marine goes on shooting rampage	4
11/02/99	Xerox Corp.*	Repairman kills co-workers at warehouse	7
02/08/00	Walmart	Man kills another man in parking lot	1
03/01/00	McDonalds	Race-based shooting spree, two killed	2
12/26/00	Edgewater Tech.*	Software tester kills co-workers	7
02/05/01	Navistar*	Former employee kills former co-workers	4
05/23/01	Walmart	Deranged woman fires shots in store	1
07/14/01	Home Depot	Man shoots former girlfriend while she shops	1
04/27/02	Harrah's	Rival gangs have gunfight at casino	3
06/06/02	A.H. Belo*	Newspaper worker shoots co-worker	1
07/15/02	Safeway*	Meat cutter shoots and kills his supervisor	1
08/03/02	Exxon-Mobil	Customer shot by sniper while pumping gas	1
08/04/02	Royal Dutch Petrol	Customer shot by sniper while pumping gas	1
08/09/02	Sunoco, Inc.	Customer shot by sniper while pumping gas	1
08/14/02	Home Depot	Customer killed by sniper in store parking lot	1
02/25/03	Labor Ready	Employee goes on a shooting spree	4
06/29/03	Albertson's*	Former employee kills co-workers with sword	2
07/01/03	Modine Mfg.*	Employee shoots three, wounds five	3
07/08/03	Lockheed-Martin*	Worker kills five/wounds eight at plant shooting	5
07/09/03	Verizon*	Employee shoots supervisor	1
07/25/03	Marriott*	Fired employee kills former boss	1
08/10/03	MBNA*	Former employee shoots former supervisor	1
02/13/03	McDonalds	Shooting after an argument in parking lot	1
02/23/04	Wendy's	Employee shot by estranged husband	1
11/02/04	Pilgrim's Pride*	Former employee shoots former supervisor	1
03/13/04	IHOP	Student killed in restaurant parking lot	1
06/18/04	WalMart	Two police officers killed during standoff	2
07/02/04	ConAgra*	Disgruntled employee shoots co-workers	7

*Workplace killings perpetrated by an employee or former employee of the company.

ination interval into the analysis. Nonetheless, a pre-event window of 10 trading days is provided in order to help establish the presence of any trends in the data prior to the workplace homicides. The use of a short pre-event window has the distinct advantage of allowing the parameter generating estimations to incorporate the very latest market index and company stock returns into the empirical analysis. Accordingly, the market model parameters were estimated over event days $t = -160$ to $t = -11$, relative to the $t = 0$ date of each workplace homicide data point. The developed market model parameters were then used in conjuction with the CRSP value-weighted stock market index to extrapolate the stock returns for each company that would have been expected to be observed in the absence of each event.

Once obtained, the daily stock price effects of each workplace homicide, or *abnormal returns* (*AR*), as they are termed in the literature, are defined as the actual daily stock returns observed by each company less the expected stock returns generated by the model. By extension, the *mean abnormal return* (*MAR*) for each event day *t* is merely the arithmetic average of each of the individual company-specific abnormal returns registered on each event day. Finally, the *mean cumulative abnormal return* (*MCAR*) is defined as the cumulative total of the individual daily mean abnormal returns registered between any two specified event dates of interest.

A 61-day event examination window, beginning with event day $t = -10$ and ending with event day $t = +50$, was analyzed for evidence of stock price changes in response to the workplace homicides. Tests over single event days and tests over specified event intervals (e.g., $t = 0$ to $+10$) were performed.

Since the underlying mechanics of event study methodology are now well established in the risk management literature, details concerning the actual statistical procedures employed are not reproduced here due to space considerations. All of the event study calculations were performed using the EVENTUS program for personal computers developed by Cowan Research, L.L.C. Interested readers are encouraged to contact the authors for details on the actual mathematical procedures employed in the calculation of the abnormal returns and their associated test statistics (*Z*).

EMPIRICAL RESULTS

Event Analysis

Table 3 presents a summary of the daily mean abnormal returns (*MAR*) and their associated test statistics (*Z*) for selected event days over the interval from $t = -10$ to $+50$ for the workplace homicide sample. In addition, Table 3 reports the number of events in the sample (40), the number of firms

registering positive abnormal return changes ($N+$), and the associated binomial proportionality test statistic (Z) for this fraction of firms for each event day. Under the null hypothesis of no workplace killings wealth effect, the mean abnormal returns for each event day should approximate zero, whereas the fraction of sample firms registering abnormal return increases should approximate the random chance probability of 0.5.

As shown in Table 3, there would appear to be essentially no evidence that workplace homicides, considered in total, are economically or statistically important events for the affected firms. With the single exception of the abnormal return for event day $t = +30$, no negative results presented in the table are significant at the 5 percent level or less. Neither the abnormal returns, nor the simple fraction of firms registering negative abnormal returns in response to the shootings, are different from what would be expected simply by random chance. However, this null result is subject to an important caveat, for it is possible that insignificant event returns over single event days may conceal important trends in the data that are subsequently revealed by statistical evaluations over longer, multiple-day event windows.

To explore this possibility formally, tests of the mean cumulative abnormal returns (and the fraction of firms registering positive abnormal returns) are performed over successively longer multi-day event windows. The results of these tests are presented in Table 4.

Unlike the case in Table 3, there is evidence presented in Table 4 that workplace homicides may be important economic events for targeted firms. In particular, both the mean cumulative abnormal return and the simple fraction of firms registering decreases in the cumulative abnormal return levels are statistically significant at the 5 percent level or less for the interval from event days $t = 0$ to $t = +30$. This potential "delayed reaction" is by no means unique to the case of workplace homicides. Indeed, many event studies of complex events characterized by evolving informational content (e.g., product recalls, the Chernobyl nuclear accident, the Texaco racial discrimination case, the Three Mile Island nuclear accident) have documented a similar return pattern as uncertainty regarding the specifics of the events in question (e.g., previously unknown mitigating factors, legal filings) is resolved over time.[6] In the present instance, it is quite reasonable to assume that information disseminated via on-going criminal or civil investigations may filter out over time and that some of this information may be of significant (and negative) importance to investors. Overall, the average firm involved in a non-robbery-motivated workplace homicide lost about 3.8 percent of its market value over the 30 days following the killings.

Table 3. Mean Daily Abnormal Returns and Test Statistics (Z) for the Full Sample (N) of Workplace Homicides, Number of Firms with Positive Abnormal Returns on Each Event Day (N+), and Binomial Proportionality Test Statistic (Z)

Event day	Mean abnormal return	Z-statistic	N	N+	Z-statistic
–10	0.0049	1.134	40	25	1.655
–5	0.0026	0.888	40	26	1.971*
–4	–0.0007	–0.154	40	22	0.706
–3	0.0059	2.167*	40	28	2.604**
–2	–0.0004	–1.228	40	19	–0.243
–1	0.0005	0.380	40	20	0.000
0	0.0007	0.321	40	19	–0.243
1	–0.0030	–0.950	40	17	–0.875
2	–0.0006	–0.444	40	20	0.000
3	0.0003	0.579	40	19	–0.243
4	0.0010	0.881	40	21	0.390
5	–0.0013	–0.357	40	16	–1.191
10	0.0005	0.015	40	16	–1.191
20	0.0027	1.448	40	22	0.706
30	–0.0082	–2.419*	40	16	–1.191
40	–0.0020	–0.592	40	19	–0.243
50	0.0044	0.359	40	16	–1.191

*Significant at the 5 percent level, two-tailed test.
**Significant at the 1 percent level, two-tailed test.

Cross-Sectional Regression

In order to further examine several issues with respect to the studied workplace homicides, a multiple regression analysis was employed. For this regression, the cumulative abnormal return level registered by each of the target companies over event days $t = 0$ to +30 served as the dependent

Table 4. Mean Cumulative Abnormal Returns and Test Statistics (Z) for the Full Sample (N) of Workplace Homicides, Number of Firms with Positive Abnormal Returns for the Tested Interval (N+), and Binomial Proportionality Test Statistic (Z)

Event interval	Mean cumulative abnormal return	Z-statistic	N	N+	Z-statistic
–10 to –1	0.0160	1.476	40	23	1.023
0 to +2	–0.0030	–0.620	40	20	0.000
0 to +5	–0.0031	0.012	40	19	–0.243
0 to +10	–0.0164	–1.457	40	17	–0.875
0 to +20	–0.0160	–1.038	40	15	–1.508
0 to +30	–0.0370	–2.129*	40	9	–3.405**
0 to +40	–0.0345	–1.452	40	15	–1.508
0 to +50	–0.0308	–1.563	40	15	–1.508

*Significant at the 5 percent level or less.
**Significant at the 1 percent level or less

variable, since this interval is the only interval tested that shows evidence of statistically significant price movements and therefore likely contains the most relevant information for inclusion in the analysis. Given the relatively small sample size (40 events), the number of variables included in the regression model obviously cannot be large. Accordingly, three independent variables were selected for the model.

The first variable, MARKET VALUE, was included to capture the influence of differences in corporate scale on the results achieved. Generally, *ceteris paribus*, the sign of this variable would be expected to be positive if the primary determinant of the economic damages from a workplace homicide are "fixed" in nature vis-a-vis corporate size. That is, for any given fixed economic loss (e.g., sales losses, plant closing costs, wrongful death settlement costs), the relative magnitude of that loss must decline as corporate size increases. Conversely, if the losses that accrue following a workplace homicide are primarily "variable" or, perhaps more correctly, "intangible" in nature, then the direction of the relationship between a workplace homicide and share responses is more difficult to specify. Indeed, to the extent that losses due to lawsuits are a primary driver of the share price responses to workplace homicides, then it is easily possible to envision scenarios in which the larger company will suffer the larger

relative losses. Stated somewhat differently, there would seem to be little doubt but that trial lawyers (and civil juries) simply assume that larger companies (i.e., those that can classified as a "big business") are better able to afford much larger relative payments following any given loss. Reputational damages from the loss of "security" on the part of employees or other stakeholders may also be relatively larger for the biggest firms. Given the lack of an unambiguous hypothesis with respect to the relationship between corporate scale and workplace homicide losses, the correlation between the mean shareholder wealth effects following workplace homicides and the variable MARKET VALUE cannot be determined a priori.

The number of people killed in any particular workplace attack is also obviously a variable of interest in the present context. Attacks that result in the death of one individual are clearly less "newsworthy" and less costly from a risk management perspective than those in which large numbers of individuals are killed. Few people would suggest that a workplace killing was impossible at their place of business (homicides have occurred even inside hospital operating rooms), so a single killing is not likely to translate to large corporate intangible losses. However, as the number of people attacked rises, negative media coverage and the suspicion that "surely something could have been done to stop it" will increase. Accordingly, the correlation between the variable NUMBER KILLED and abnormal changes in stock prices around the time of workplace homicides is hypothesized to be negative.

Finally, whereas the locus of responsibility in the case of a truly random homicidial event is difficult to establish, the same cannot be said in the case of a homicide committed by a current or former employee of the affected company. Indeed, in these instances, sentiments that the killings "could have been prevented, if only…" the company had exercised greater judgment in its screening and hiring decisions, undertaken more aggressive steps to identify problem employee(s) and diffuse a volatile workplace environment, or been more diligent in its security preparations are both reasonable and unavoidable. In other words, it is possible that it is one thing if a deranged gunman walks into the home office and starts firing indiscriminately because his "cable TV got shut off." But it may be something entirely different (and be a much more serious risk management problem) if one of the company's *own employees* is the one pulling the trigger. As such, the relationship between the dummy variable EMPLOYEE (current or former employee = 1; 0 = otherwise) is hypothesized to be negative.

One independent variable conspicuously absent from the regression equation is the total dollar value of the payments made by the targeted company to survivors and their families as a result of the killings. Unfortunately, the values of these payments are frequently not publicly available

Table 5. Cross-Sectional Regression Analysis of the Workplace Homicide Cumulative Abnormal Returns over Event Days $t = 0$ to $t = +30$ and Selected Variables

Variable	Coefficient	Coefficient *t*-statistics	Significance
CONSTANT	2.48495	0.80114	0.42831
NUMBER KILLED	–0.30722	–0.74893	0.45877
MARKET VALUE	–2.8E–08	–1.29111	0.20490
EMPLOYEE	–8.45393	–2.59836	0.01349
		F-statistic:	2.30604
		Significance:	0.09313
		R^2:	0.16119
		Adjusted R^2:	0.09129

since the vast majority of out-of-court settlement agreements mandate nondisclosure of the terms of the agreement.

Table 5 presents summary statistics for the conducted regression. The relatively low R^2 and adjusted R^2 values of the model provide the first indication that workplace homicides are largely "individual" events. Despite the relatively low R^2 numbers, the *F*-statistic for the regression is significant at the 10 percent level.

The lack of significance of the variable NUMBER KILLED suggests that it is probably less important, from a risk management perspective *only, how many* people are killed in a workplace assault *than that an attack occurs at all.* Since the number of people killed in the attacks ranged from one to over 20 (with 10 of the 40 killings in the sample involving at least four fatalities), the lack of significance of this variable is likely not due to insufficient variability in the data set. Replication of the regression with the square root of the number of fatalities (to mitigate the influence of nonlinearity in the data set) and including the number of people both killed and wounded had no substantive impact on the results achieved. Similarly, the variable MARKET VALUE was not significant at conventional statistical levels.

In what constitute, by far, the strongest results presented in Table 5, the coefficient for the variable EMPLOYEE is both negative and highly statistically significant. This important finding is consistent with a priori reasoning and strongly suggests that workplace homicides perpetrated by current or former employees place target companies at a significant disad-

vantage vis-a-vis killings perpetrated by unrelated individuals. As noted above, in such cases as these, questions regarding the actions or the inactions of the targeted firm are probably unavoidable and highly indicative of significant liabilities to the firm and its investors.

Analysis of Random and Employer-Related Workplace Homicides

Given the strength of the employer-related result presented in Table 5, a separate pair of event analyses was performed. In these tests, the original sample was bifurcated such that workplace homicides of a "random" nature were separately analyzed from those in which the killer was either a current or former employee of the targeted company. Events included in the latter sample are noted in Table 2. The differences between these two types of workplace homicides and the implications of each for risk managers are discussed in greater detail below, followed by the results from these two distinct samples.

Without question, the most important difference between random and employer-related workplace homicides is the degree of control (both actual and perceived) the company exercises over the killer. Obviously, in the case of employees, the company chooses whom to hire and not to hire. Preemployment background checks can be conducted, and if an individual is hired, the employee can then be monitored and counseled and, if necessary, reported to relevant authorities if seriously antisocial tendencies or behaviors are observed or suspected.

Employers today are more likely to spend significant resources screening potential employees prior to hiring than in the past. Indeed, some employers have been found guilty of negligent hiring practices as a result of incidents that occurred after the employee was hired.[7] Consequently, the burden of proof in a civil court filing involving a workplace homicide has undoubtedly shifted against employers over the years.

Most employment-related killings are motivated by anger against a supervisor, former supervisor, or co-workers. The killing may be triggered by termination, reprimand, or perceived unfair treatment by the worker. Many techniques are available to attempt to prevent workplace violence episodes.[8] Even if these practices eventually prove incapable of eliminating a workplace homicide, the fact that "the employer did everything possible" to prevent such a tragedy from taking place may help to mitigate damage awards after workplace killings occur. Indeed, as many companies have learned over the years (and in many different instances), a failure to act prescriptively is often interpreted in civil courts as negligence of—or a lack of concern and compassion for—the well-being of the company's employees and customers.

In the case of random homicides, the company typically has little, if any, control over the killer. Most retail establishments, for example, must be open and accessible to the general public. Should a customer produce a weapon, it is likely to be very difficult for the company or its employees to intervene. Clearly, the employment of on-site and armed security guards and/or the establishment of effective (and, preferably, unobtrusive) mechanisms of access control can *reduce* the likelihood of workplace homicides, but likely can never *prevent* them entirely.

The Luby's case from 1991 is an excellent example of a random workplace homicide. In this case, the killer, George Hennard, was mentally deranged. Hennard entered the restaurant in Killeen, Texas, during normal operating hours and opened fire, killing 23 people and wounding 20 others. Hennard's final act marked what remains the largest mass shooting in U.S. history. It is doubtful that even armed security personnel could have prevented this incident, particularly if Hennard had chosen the security guard(s) as his first target(s). As such, it is possible that corporate sympathy, rather than condemnation, may be the primary feeling on the part of many individuals following random homicides.

Tables 6 and 7 reproduce the mean shareholder wealth effects for the 21 random workplace homicides included in the original sample. The time periods and intervals examined are identical to those presented in Tables 3 and 4 above. As shown in Tables 6 and 7, there is essentially no evidence whatsoever that capital markets punish companies that are targets of *random* workplace homicides. Indeed, not only are the abnormal returns on the date of the killings and over the first few days following *positive* (one statistically so), but in no case do the test statistics for the mean abnormal returns over any of the examined event intervals ever drop below –0.5. Viewed as a whole, there is no evidence in this study that workplace homicides of a *random* nature are either economically or statistically important events for targeted companies.

In contrast to the results presented in Tables 6 and 7, analysis of the sample of 19 employer-related homicides (reproduced in Tables 8 and 9) provides stark evidence that workplace homicides perpetrated by either current or former employees result in both statistically and economically significant declines in the stock prices of target firms. While none of the individual abnormal returns just after the homicides are statistically significant (Table 8), all but one are negative and the percentage of firms registering abnormal return decreases is significant in one case. But the real impact of the homicides on stock prices becomes clear only over post-event intervals.

As shown in Table 9, with the single exception of the very shortest and very longest event intervals (and even these intervals approach signifi-

Table 6. Mean Daily Abnormal Returns and Test Statistics (Z) for Workplace Homicides Not Perpetrated by Individuals Who Were Employees or Former Employees, Number of Firms with Positive Abnormal Returns on Each Event Day (N+), and Binomial Proportionality Test Statistic (Z)

Event day	Mean abnormal return	Z-statistic	N	N+	Z-statistic
–10	0.0029	0.247	21	13	1.132
–5	0.0065	1.800	21	15	2.005*
–4	–0.0075	–1.613	21	9	–0.614
–3	0.0085	2.396*	21	16	2.441*
–2	–0.0068	–2.291*	21	10	–0.178
–1	–0.0004	0.102	21	10	–0.178
0	0.0025	0.603	21	12	0.695
1	0.0000	0.257	21	9	–0.614
2	0.0031	0.664	21	12	0.695
3	0.0083	2.095*	21	15	2.005*
4	0.0035	0.792	21	11	0.259
5	0.0007	–0.931	21	7	–1.487
10	0.0030	0.671	21	11	–0.614
20	0.0038	1.024	21	11	0.259
30	–0.0079	–1.604	21	9	–1.729
40	–0.0015	–0.334	21	10	–0.171
50	–0.0007	–0.440	21	6	–1.923

*Significant at the 5 percent level, two-tailed test.

cance at the 5 percent level), every interval examined is both negative and statistically significant at the 5 percent level. Nor are these results significant only in the statistical sense. Indeed, from event days $t = 0$ to +10, the mean decline in shareholder wealth of the employer-related workplace homicide firms approaches four percent ($MCAR = –3.96$ percent), while over the interval from $t = 0$ to +30 the decline was almost seven percent ($MCAR = –6.77$ percent). In addition, the simple fraction of firms registering abnormal declines is significant at the 1 percent level over the first 30 days following the shootings and at the 5 percent level when measured over the first 40 days. However, that the declines in shareholder wealth had reached a steady state by about event day $t = +30$ is also clear.

Table 7. Mean Cumulative Abnormal Returns and Test Statistics (Z) for the Workplace Homicides Not Perpetrated by Employees and Former Employees, Number of Firms with Positive Abnormal Returns for the Tested Interval (N+), and Binomial Proportionality Test Statistic (Z)

Event interval	Mean cumulative abnormal return	Z-statistic	N	N+	Z-statistic
–10 to –1	0.0071	1.144	21	11	0.259
0 to +2	0.0056	0.935	21	13	1.132
0 to +5	0.0181	2.031*	21	12	0.695
0 to +10	0.0046	0.307	21	11	0.259
0 to +20	0.0093	0.514	21	9	–0.614
0 to +30	–0.0092	–0.474	21	7	–1.487*
0 to +40	–0.0027	–0.015	21	10	–0.178
0 to +50	–0.0044	–0.298	21	10	–0.178

*Significant at the 5 percent level or less.
**Significant at the 1 percent level or less.

While both the timing and magnitude of the noted abnormal return declines in response to employer-related workplace homicides are unusual, they are by no means unprecedented in the literature. Indeed, research conducted on other complex, informationally rich, evolving events such as product recalls (e.g., Jarrell and Peltzman, 1985; Pruitt and Peterson, 1986; Rubin, Murphy, and Jarrell, 1988), the Texaco racial discrimination case (Pruitt and Nethercutt, 2002), the Three Mile Island and Chernobyl nuclear accidents (Bowen, Castanias, and Daley, 1983; Pruitt, Tawarangkoon, and Wei, 1987), the Exxon Valdez oil spill (White, 1996), and the MGM fire and subsequent announcement of the purchase of retroactive liability insurance (Baginski, Corbett and Ortega, 1991) all document large, yet delayed reactions. In each of these instances (and similar to the case of employer-related workplace homicides), important information regarding the events was disseminated relatively slowly through a series of media reports, police and other official press conferences, and criminal and civil court filings and discoveries. Only as the underlying specifics of each case became known—particularly with respect to apparent corporate liability, insurance limitations, and related issues—were stock market investors forced to reduce their estimates of the intrinsic values of the affected firms.

Table 8. Mean Daily Abnormal Returns and Test Statistics (Z) for Workplace Homicides Perpetrated by Individuals Who Were Employees or Former Employees, Number of Firms with Positive Abnormal Returns on Each Event Day (N+), and Binomial Proportionality Test for Statistic (Z)

Event Day	Mean Abnormal Return	Z-Statistic	N	N+	Z-Statistic
–10	0.0072	1.386	19	12	1.211
–5	–0.0016	–0.562	19	11	0.753
–4	0.0069	1.473	19	13	1.670
–3	0.0030	0.294	19	12	1.211
–2	0.0067	0.627	19	9	–0.165
–1	0.0014	0.443	19	10	0.294
0	–0.0013	–0.255	19	7	–1.083
1	–0.0064	–1.571	19	8	–0.624
2	–0.0048	–1.433	19	8	–0.624
3	–0.0086	–1.680	19	4	–2.460*
4	–0.0019	0.258	19	10	0.294
5	–0.0035	–0.505	19	9	–0.165
10	–0.0022	–0.522	19	7	–1.083
20	0.0015	1.194	19	11	0.753
30	–0.0086	–1.693	19	7	–1.083
40	–0.0025	–0.679	19	9	–0.165
50	0.0100	0.965	19	10	0.294

*Significant at the 5 percent level, two-tailed test.

The case of product recall announcements is especially relevant to the present study. First, with the notable exception of ethical drugs, the vast majority of product recalls are issued at a single, precisely known point in time and with little, if any, advance notice. Second, while the basic facts of the products being recalled are immediately disseminated, the underlying *causes* of and ultimate *economic consequences* of the recall (and, thus, its implications for stock market investors) may be only imprecisely deciphered and then typically only over a significant period of calendar time—often aided by disclosures mandated by official agencies or in response to civil court proceedings or the release of internal documents. For example, Pruitt and Peterson (1986) report that stock prices continued to react for almost two months following the average product recall announcement. Third, research on product recalls (e.g., Jarrell and Peltzman, 1985; Pruitt

Table 9. Mean Cumulative Abnormal Returns and Test Statistics (Z) for Workplace Homicides Perpetrated by Employees and Former Employees, Number of Firms with Positive Abnormal Returns for the Tested Interval (N+), and Binomial Proportionality Test Statistic (Z)

Event interval	Mean Cumulative Abnormal Return	Z-statistic	N	N+	Z-statistic
–10 to –1	0.0258	0.939	19	12	1.211
0 to +2	–0.0124	–1.882	19	7	–1.083
0 to +5	–0.0264	–2.117*	19	7	–1.083
0 to +10	–0.0396	–2.437*	19	6	–1.542
0 to +20	–0.0438	–2.047*	19	6	–1.542
0 to +30	–0.0677	–2.592*	19	2	–3.377**
0 to +40	–0.0697	–2.091*	19	5	–2.001*
0 to +50	–0.0599	–1.955	19	5	–2.001*

*Significant at the five percent level or less.
**Significant at the one percent level or less.

and Peterson, 1986) makes it quite clear that the vast majority of the economic losses attributable to recalling companies are due to indirect or intangible factors such as the destruction of corporate reputation rather than the direct economic consequences of the recall. Finally, the weath losses from product recalls are, on average, extraordinarily significant, averaging about six to seven percent of the recalling company's total market capitalization (Rubin, Murphy, and Jarrell, 1988). As discussed above, in each of these instances, the parallels between product recalls and employer-related workplace homicides could scarcely be more apt.[9]

CONCLUSIONS AND POLICY IMPLICATIONS

This paper adds to understanding of the impact of a special category of large, non-operating losses upon firm value—specifically, workplace homicides. Previous research on workplace violence has examined the demographic, behavioral, and loss control aspects of the issue. This paper provides a logical link between this literature and the literature on large losses by examining the equity market responses to non-robbery-motivated workplace killings.

The key finding of the study is the relationship between the employment status of the perpetrator and equity market responses. Since there were essentially no price responses whatsoever to killings perpetrated by individuals who were neither current nor former employees of the targeted company, it appears that the market is quite forgiving of what must otherwise be classified as "random" workplace killings. Business retail outlets must be open to the public, and it is difficult for a business to control "common areas" (e.g., parking lots, stairwells). A deranged person could just as easily commit a violent act at Firm A as at Firm B. Indeed, two of the worst events in the sample, the shootings at the Luby's Cafeteria and the McDonald's in San Ysidro, could just have easily occurred at any other restaurant in any other city.

In stark contrast to the lack of response to random workplace homicides, the market appears very unforgiving when an employee or former employee of the targeted company is the perpetrator of the killings. Since the representatives of a company make conscious choices about which individuals will be hired, the company obviously has an opportunity to interview each applicant and to perform an appropriate pre-employment background screening. For those individuals who are eventually hired, the firm can then monitor each employee's performance and can employ a wide variety of loss control measures in an effort to *prevent* workplace violence.

Unfortunately, as the results presented in this study clearly imply, when an employment-related homicide does occur, it is likely to prove a very strong signal to investors that the employer may have failed in one or more very significant ways—failed to properly screen potential applicants, failed to properly supervise its employees, or failed to have adequate loss control measures in place to reduce or prevent such violent acts.

As noted, employer-related workplace homicides undoubtedly result in significant direct and indirect costs. The equity losses documented in this study (about 7 percent on average) are almost certainly far larger in magnitude than the direct losses associated with the killings. Given that theory and practice suggest that investors abhor uncertainty and liberally discount equity values in its presence, it is likely that many market participants will simply assume that if the company cannot adequately discriminate between "normal" and "homicidal" employees in its daily hiring decisions, then perhaps there are other important areas where the company may also be at significant risk. In such instances, the large equity losses registered by target firms around the time of employer-related homicides may be viewed as signals of other potential future problems of equal or even greater economic consequence than the homicides themselves.

Given the equity losses documented in response to individual employer-related workplace homicides (which are almost identical in magnitude to the losses of the average product recall), the value of appropriate loss control investments and positive communication and interaction between the personnel and risk management departments of major corporate enterprises probably cannot be overstated. Clearly, if they prevent even one such instance, then value of the resources devoted to meaningful preemployment screenings, effective employee assistance programs and counseling, better designed work places, and other similar measures will have generated extraordinary dividends. Unfortunately, since it is exceedingly difficult, if not impossible, to measure the value of the incident that never occurs, the *real* cost of failing to adequately invest in homicide-mitigating strategies will almost always be obvious only in retrospect—only *after* the guy in the center aisle with a gun.

NOTES

[1] There are differences in how NIOSH and BLS collected and recorded workplace fatalities. Indeed, for the four years in which there is an overlap between NTOF and BLS data (1992–1995), different numbers of workplace homicides are recorded. For NIOSH data from 1980 through 1995, see NIOSH's publication, "Fatal Injuries to Civilian Workers in the United States, 1980–1995."

[2] As reported by J. Wiscombe, "Vigilance Stops Violence and Lawsuits," www.workforce.com/section/09/feature/23/33/53.

[3] As reported by M. Fickes (2005), "The Business Case for Workplace Violence Prevention," www.securitysolutions.com/mag/security_business_case/index.html .

[4] These cases are reported by D. F. Burke, "Preventing Violence in the Workplace," www.semmes.com/publications/laborarticles/preventingviolence.html. It is important to note that not all such litigation against an employer is successful. For example, in the Xerox case included in the sample, a judge in Honolulu barred the families of the shooting victims from suing the employer, citing the "exclusive remedy" doctrine under workers compensation. Under this doctrine, workers compensation benefits are supposed to be the "sole remedy" for workplace injuries and deaths. Of course there was uncertainty regarding whether the claim would be successful until it was dismissed by the judge. The sole remedy doctrine has eroded over time and obviously does not apply to customers who may be injured or killed at a work location. Customers (or their survivors) may also sue the business. Many such cases are settled out of court.

[5] It must be specifically noted that the exclusion of the four data points involving the Washington D.C.–area sniper shootings in 2002 has no impact whatsoever on the empirical results. Hence, since these data points met all the criteria for inclusion in the sample, they were included in the analysis. Again, excluding these four data points has no discernable impact on the results.

[6] See, for example, Pruitt and Peterson (1986) and Jarrell and Peltzman (1985) (product recalls); Pruitt, Tawarangkoon, and Wei (1987) (Chernobyl); Kalra, Henderson, and Raines (1995) (Bhopal); Pruitt and Nethercutt (2002) (Texaco racial discrimination case); and Bowen, Castanias and Daley (1983) (Three Mile Island) for similarly protracted event responses involving complex informational events.

[7] A negligent hiring case from Kansas is instructive. A plumbing firm hired a convicted felon who had a record of drug abuse. The worker used money from a customer to purchase crack cocaine, and later went back to the customer's home. He beat the customer to death and burglarized the customer's home. Survivors of the customer sued the plumbing company and won a $500,000 judgment (the maximum permitted under Kansas law) because the plumbing firm failed to run a background check on the employee (Keller, 2004).

[8] See Chapter 2, "Preventing Violence: Planning and Strategic Issues," in *Workplace Violence, Issues in Response* (2004). Techniques discussed include pre-employment screening, identification of behavior that may signal future problems, consideration of environmental factors (e.g., down-sizing, labor disputes, inadequate security, and lack of employee counseling), and the floor plan/physical layout of the workplace.

[9] See Fickes (2005) and Burke (2003) for discussion of the direct and indirect costs of workplace killings.

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