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## The Private Sector and the Role of Risk and Responsibility in Securing the Nation's Infrastructure

James K. Hayes and Charles K. Ebinger

#### Abstract

Society faces many common challenges that the corporate sector can play a large role to help address. Security against terrorism is one such challenge and is an important pre-condition to sustainable development. Moreover, since terrorism often operates outside of the jurisdiction of state authorities, it is becoming clear that governments cannot address this issue alone. In the United States, for example, there is a large portion of the nation's infrastructure that owned by the private sector. Using data obtained from 158 survey responses from security professionals in the public and private sector, our structural equation model determined that while prior field surveys indicate that there are many factors that influence the size of security spending (including a sense of social responsibility and attitude toward risk), the most important factor is the cost-benefit analysis that companies themselves undertake. These results may apply to many situations, such as global warming, piracy and pollution control, in which cooperation from the private sector is needed to address threats whose risk is difficult to assess.

**KEYWORDS:** critical infrastructure, private sector

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#### INTRODUCTION

Governments of the world face extraordinary challenges, both financial and administrative, that are taxing their ability to govern. The provision of security is one such issue and has become more prominent as war and terrorism threaten societies across the globe, undermining an important pre-condition for growth. Many societies view security as a government function but as terrorism makes this challenge more complex; it has become clear that governments cannot address this issue alone. Indeed, since the terrorist attacks of September 11, 2001 the government of the United States has spent billions of dollars on various measures to protect against subsequent attacks.

There is, however, a significant amount of a nation's infrastructure that is outside of the direct domain of government because it is owned by the private sector. These assets, from water treatment plants and refineries to research universities and shopping malls, are privately owned yet also represent points of critical vulnerability through which a terrorist organization is able to inflict direct or indirect harm to the national interest. In many instances, expenditures by the private sector to secure these assets go beyond day-to-day operational needs, taking on many aspects of a public good. The government wants to encourage this expenditure yet little empirical work has been done on the motivation of corporations to spend on protection against terrorism at their facilities. This study follows up on a previous qualitative analysis to understand how corporate decisions about security implementation are made. Previous field research (Hayes, 2008) supports the notion that a trade-off exists between addressing the priorities of the market against the need to protect private critical infrastructure (Amin, 2004).

Economists identify many possible explanations for why a private sector participant will or will not invest in a public good such as terrorism protection, including, among others, self-interest, altruism and societal norms (Nyborg & Rege, 2003). In a prior qualitative study of this phenomenon, four factors emerged from interviews with fifteen senior level security and business professionals from the private sector and government. These factors, (i) financial considerations of terror protection, (ii) understanding the risk posed by the terrorist threat, (iii) perceptions regarding the shared responsibility of government and firms in dealing with catastrophes and (iv) government funds available to address these catastrophes influence the degree of expenditures on protection. The participants involved in the qualitative study suggested that private sector security efforts would focus primarily on addressing day-to-day threats to the business (such as vandalism and theft) because they fit within the operational framework of the company, and that terrorism protection might be improved as a result. Specifically, several respondents noted that the private sector's lack of focus on catastrophic events derives not only from a sense that the level of risk and, therefore, understanding of the potential costs, are difficult to determine but also the belief that the government will step in to cover losses in the event of a catastrophe.

The insights arising from this study highlight the complex decision process that the private sector must undertake when determining its level of terrorism protection. Figure 1 provides a depiction of the discussion of this responsibility in the context of this study. Two axes relating both to the ownership of the assets and the impact of the terrorist attack define its zones. Internal assets are those that are owned by the firm and external assets belong to third parties. Likewise, the impact of a terrorist attack can be internal, damaging the company's facilities or external where there is significant harm to people or assets outside of the company's facilities. External damage includes damage caused to third parties because of the destruction of the company's facilities.

Zone I considers the damage that results when the assets attacked belong to the company and the damage is confined to the company. Under these circumstances the interview sample was nearly unanimous that the responsibility for both protecting against the occurrence of the attack and for any recovery rests with the private sector. Zone II represents views on private sector responsibility for protection when the company does not own the assets under attack but sustains collateral damage to its facilities. Again, there was a broad consensus that the private sector bears responsibility for preparing for this risk through such measures as physical protection and insurance and recovering from any damage sustained. Zone III represents the condition in which the firm does not own the assets suffering the terrorist attack and all of the damage is to facilities external to the firm. Here there was unanimous agreement within the sample that the firm had no specific responsibility to fund the recovery from the event.

Zone IV represents the condition wherein damage to the company's assets causes damage to people or facilities that are external to the company. This area, representing the externalized or social cost of a terrorist attack, generated considerable disagreement among the respondents and represents the core analytical issue.



#### FIGURE 1 Responsibility Matrix

Figure 2 illustrates this problem as it relates to government attempts to increase the level of terrorism protection at the nation's privately held critical infrastructure assets. The responsibility for the protection of critical assets ranges from an extreme case where the private sector is totally responsible for providing protection to where the level of risk is so great that the government assumes total responsibility. The Department of Homeland Security (2003) recognizes that the government has an explicit responsibility for the protection of its own key structures and systems and certain special critical assets such as nuclear power plants and dams. We represent this view of government responsibility as point A in Figure 2 (see also Hayes, 2008).



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For other privately-owned critical assets the government places much of the responsibility on business, encouraging it to go beyond the normal costbenefit analysis to increase protection appropriate to the terrorist threat. However, as the Department recognized and our respondents concur, the private sector will provide security that is "...economically justifiable and sustainable in a competitive marketplace or in an environment of limited resources" (2003:20). This level of security is represented in Figure 2 by point B. We conjecture that there exists a "Zone of Vulnerability" in the area that exceeds the level of protection that both the government and the private sector see as corresponding with their explicit responsibility. The research question is to provide insight into how policy-makers can decrease this zone to arrive at a socially optimal level of expenditures to guard against a terrorist attack while relying on a market-based approach that is an important part of the national strategy for this protection.

#### **THEORETICAL FRAMEWORK & HYPOTHESES**

#### **Conceptual Model**

Figure 3 below provides the conceptual model that builds on the prior qualitative phase of analysis.



#### Figure 3: Determinants of Private Sector Spending on Terrorism Protection

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The analysis of the drivers of terrorism protection spending by the private sector gives rise to several key constructs that we will operationalize and measure to gain insight into the decision-making process. Financial considerations represent the cost-benefit analysis a profit-maximizing firm conducts when making investment decisions. This analysis typically balances the initial cost of implementation against the present value of future benefits from the investment to arrive at a net present value of the benefit. Sense of Social Responsibility is the propensity of a company to undertake a project or action based on its contribution to the common good, even if financial considerations do not justify the spending based on the firm's goal of profit maximization. Understanding of Risk is the ability of the firm to assess, subjectively or objectively, the probability of the occurrence of an event in order to analyze the financial, reputational or impact of the event on the firm. Industry Norms suggests that varying industries may address the risk of terrorism differently and this difference will be reflected in their expenditures. The chemical industry, for example, may believe that its facilities are at greater risk and, as a result, spend more for protection. Government Actions represents the extent to which the government intervenes to encourage spending on infrastructure security.

Milton Friedman (1970) famously noted that the only social responsibility of business is to increase profits for the shareholder. According to Friedman, the corporate executive serves as an agent of the shareholder and engaging in socially responsible acts would be imposing an involuntary tax on the owners of the company. He believed that certain socially responsible actions might serve the long-term interest of the corporation because they build goodwill with the community but derided these efforts as "window-dressing" because their root cause was self-interest. Bennett (2002) argues that many business schools continue to reflect this belief and in the process ignore the role that business can and should play in major areas of global concern such as fighting corruption and terrorism.

Economists have also weighed in with theories that describe the conditions under which firms may increase the supply of goods that are public in nature. Nyborg and Rege (2003) provide an excellent review of the predominant economic theories that may explain the motivations for a profit-maximizing firm to provide a public good such as terrorism protection. Our efforts to understand the motivation of these firms are guided by six bodies of literature that the authors believe help define the parameters of the private provision of public goods. These theories include the: i) Homo Economicus model; ii) Altruism model; iii) Social Norms model; iv) Fairness model; v) Commitment model and vi) Cognitive Evaluation theory. The distinguishing characteristic of the Homo Economicus model is its assumption that the individual cares only about the impact of a given action on his well being, completely disregarding the benefits that accrue to others. Financial considerations often take the form of investment analysis that will weigh the costs and benefits of implementing an anti-terrorism program in determining how much to spend. Consequently, a company that scores high on being well-run financially may spend less on terrorism since terrorism expenditures do not contribute directly to profitability. These considerations lead to the following hypothesis: H1: *Financial considerations (propensity to weigh the costs and benefits) will be correlated negatively with spending on security against terrorism*.

Porter and Kramer (2002) argue that Friedman is correct only under a certain set of assumptions: i) that social and economic objectives are separate and distinct and ii) that corporations provide no greater benefit as donors than that provided by individual donors. The authors, while focusing on corporate philanthropy, argue that the firm should undertake socially responsible actions that improve "competitive context." They define competitive context as the quality of the business environment in which the firm operates that is comprised of factor conditions, the context for strategy and rivalry, demand conditions and the presence of related and supporting industries. Identification of a set of common beliefs in the benefit of others and fairness leads to hypothesis two: H2: *A sense of social responsibility, the notion that a company should undertake certain actions because they are important to the community around it, will have a direct, positive effect on the propensity of a company to make expenditures on terrorism protection.* 

The Social Norms model examines the effect of the establishment of rules of behavior that are enforced by positive or negative sanctions (Rege, 2004). A critical assumption in this model is that individuals exhibit preferences for social approval. The Commitment model (Sen, 1977) goes beyond fairness and stands the Homo Economicus model on its head by suggesting that people may make choices that make them worse off because of a sense of duty or loyalty. These models suggest our third hypothesis: H3: *Industry characteristics and norms will mediate the effect of a sense of social responsibility on a company's spending on terrorism protection.* 

The Cognitive Evaluation theory (Frey, 1997) posits that if an individual receives incentives to perform a task, such as providing a public good, the motivation to perform the task decreases because he views the incentives as controlling. A number of scholars have attempted to address the issue of how the government can have an impact on the provision of public goods by the private sector. Warr (1983) and Bernheim (1986) suggest that any government attempt to increase the supply of a public good will be neutral because any increase in the government's effort will be offset by a corresponding decrease in private provision. The government will essentially crowd-out private expenditures. Andreoni (1988; 1993) disputed this result, arguing that if there is some private

value to the act of giving, a phenomenon described as a "warm glow" effect, government contributions will only incompletely crowd out private contributions. Bergstrom, et. al. (1986) similarly showed that the government can exert a positive impact on the provision of public goods by the private sector and that its own expenditures will only partially crowd out private sector expenditures. These insights lead to hypothesis four: H4: *Government actions in the area of terrorism protection will have a direct positive impact on a company's own expenditures on terrorism protection*.

Finally, no discussion of expenditures on protection against terrorist attack is complete without considering the impact of risk perception on such expenditure. Fischoff, et. al. (1978) performed a psychometric study of perceived risk and found that people have a comprehensive view of risk that includes a number of important dimensions. This perception of risk influences the precautionary measures the public demands against the risk and is therefore an important determinant on spending to control this risk. Concern regarding the impact of risk attitude on spending leads to hypothesis five: H5: *A company's understanding or perception of the risk of a terrorist attack will have a direct, positive impact on its expenditures for terrorism protection.* 

#### METHOD

#### Sample

The data source for this study is the subscriber database of Government Security News (GSN) magazine. GSN magazine is one of the largest publications in the U.S. focused on physical facilities, IT and homeland security. Two hundred and twenty three responses were received from this group. Of the surveys received, 158 were deemed completed sufficiently to use for the study. The responses included a mix of both private and public sector participants.

#### Measurement

We attempt to measure these factors by drawing upon scales extant in the literature to approximate the dimensions of the terrorism protection issue that we seek to address. Measures include the following:

#### Financial Considerations Measures

*Excellence in Business (EXCEL)*: This construct comprises those managerial practices and principles that lead to sustained performance (Sharma, S., et. al., 1990). For the purpose of this study excellence in business is utilized as a useful

proxy for the firm's ability to balance the trade-off between good and bad investments and, more importantly, between risk and investment to avoid risk. The EXCEL scale is a 16-item scale designed to measure the eight attributes of excellence. All items are scored on Likert-type scales, in this case a 7-point scale, from strongly disagree to strongly agree.

#### Sense of Social Responsibility

Attitude on the Social Role of Corporations: This construct is defined as threedimensional, involving opinions about a) the corporation as a public institution versus beliefs that corporations have predominantly individual rights, b) whether the actions of the corporation should be guided by personal conscience (intuition) or social responsibility (rationality) and c) whether it is legitimate for outside policymakers to influence the policies and goals of the corporation (Williams, 1982). The scale consists of 23 items, each using a 5-place scale from strongly disagree to strongly agree. For this study the items were changed to a 7-place scale to conform to the scaling used for the other measures.

#### Understanding of Risk

*Perceived Risk*: The risk ladder measures the individual's attitude toward the likelihood of mortality from a catastrophic event (Fischoff, et. al., 1978). It is a numerical base that asks respondents to estimate the annual number of deaths per million for certain events in order to gain a measure of perceived risk. The survey has 22 questions measuring degree of risk aversion, perceived exposure to risk, perceived severity of risk, experience, controllability of risk, precautions already taken, perceived responsibility and the value of eliminating risk.

#### Industry Characteristics/Norms

*Reference Group Influence*: This factor is defined as "the influence from an actual or imaginary individual or group conceived of having significant relevance upon an individual's evaluations, aspirations, or behavior. According to Park and Lessig (1977) reference group influence has three components: informational influence, utilitarian influence and value expressive influence. Since one of the hypotheses of this study is that industry norms can influence a company's attitudes toward its responsibility to avoid any collateral damage that might occur at terrorism at its facility, this measure is used to model this influence.

#### Security Spending

The survey participants were asked to estimate the amount that their firm spends on security specifically to guard against terrorism, by selecting from among six categories ranging from a score of one for spending from zero to \$500,000 to six for spending above \$1.5 million, in \$250,000 increments.

#### Government Help

The survey participants were asked whether or not their organization received financial assistance from the government for spending on security. The responses allowed were "yes", "no" and "not sure".

#### **Data Analysis**

The method of analysis of the data involved a four-step process. First the individual items were assessed using explanatory factor analysis to identify the constructs proposed to test the hypotheses. Since existing scales were adapted for this study, their use in this analysis was no guarantee that they would perform identically to their original purpose. Indeed, the constructs chosen were adapted from a variety of marketing studies and used together in this research in a way unanticipated by the previous authors. It was therefore considered prudent to conduct a confirmatory factor analysis to understand how the items loaded onto the constructs when used together in this way. Finally, a structural equation model using AMOS was developed to understand the relationships among the variables. Also, in order to perform moderation analysis factor scores were calculated for the resulting latent variables using the regression imputation method in AMOS.

We first tested the adequacy of the data for factoring by examining the Kaiser-Meyer-Olkin (KMO) statistic and conducting Bartlett's test of sphericity. The KMO measures the degree to which the correlations between pairs of variables can be explained by the other variables, thus providing a measure of the ability to derive factors from the items. A larger value indicates greater factorability. The Bartlett's Test examines the null hypothesis that the variables are uncorrelated. The KMO in this case was 0.863, well above the 0.50 level for judging adequacy for factoring using this statistic. Similarly, Bartlett's Test yielded a Chi-squared of 3927.60 with 861 degrees of freedom which was significant at greater than 0.001 level of significance. This result allows us to reject the null hypothesis that the variables are uncorrelated, again indicating the suitability of the data for factor analysis.

The extraction method used for exploratory factor analysis was the Maximum Likelihood method. Once the initial extraction was completed, the result was rotated using a Promax rotation method. Both operations were performed using SPSS 16 statistical software. The program was constrained to extract four constructs (Government Action was a dummy variable), consistent with our theoretical model for the data. An examination of the communalities showed initial values greater than 0.30 for all items except Risk 1, 3 and 5 and CSR 8. The pattern matrix, suppressing values less than 0.20 showed good results.

The initial factors were verified using confirmatory factor analysis to assess their validity and reliability in the context of the current research. Table 1 below indicates that the CFA yields acceptable results. Although the RFI is only 0.78, the NFI, TLI and IFI are each above 0.80 with the latter exceeding 0.90. Moreover, the RMSEA shows a moderately strong fit at 0.069. Average variance explained for each of the measures exceeds both the highest variance shared and the average variance shared, providing evidence of discriminant validity. The large amount of variance explained for financial considerations and social responsibility suggest good convergent validity for these measures although the evidence is weaker for industry norms and risk attitude. The reliability measures suggest that construct reliability ranges from excellent for financial considerations and social responsibility to moderate for industry norms and risk attitude. We also checked for common method bias as suggested by Podsakoff, et. al. (2003). The findings allow the conclusion that while common method bias is present, it is not a significant problem in this study.

As a final exercise, we calculated factor scores for the latent variables for risk attitude, industry norms, financial considerations and social responsibility. This computation was conducted using the regression imputation method in AMOS 7.0 and proved helpful in the *post hoc* analysis of moderation effects.

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	Standardized	Standardized		Construct Chronbach's				
CONSTRUCT/ITEM	Loading*	S.E.	C.R.	Reliability	Alpha	AVE	HVS	AVS
FINANCIAL CONSIDERATIONS				0.984	0.964	0.56	0.371	0.174
EXCEL1	0.772	0.098	11.447					
EXCEL2	0.690	0.120	9.796					
EXCEL3	0.884	0.100	14.113					
EXCEL4	0.914	0.099	14.915					
EXCEL5	0.908	0.103	14.760					
EXCEL6	0.721	0.096	10.400					
EXCEL7	0.841	0.106	13.013					
EXCEL8	0.806	0.106	12.180					
EXCEL9	0.842	0.091	13.032					
EXCEL10	0.807	0.108	12.221					
EXCEL11	0.637	0.103	8.826					
EXCEL12	0.680	0.096	9.585					
EXCEL13	0.736	0.114	10.694					
EXCEL14	0.727	0.107	10.518					
EXCEL15	0.810	0.094	12,273					
EXCEL16	0.836	0.106	12.894					
SOCIAL RESPONSIBILITY				0.848	0.827	0.589	0.219	0.166
CSR1	0.751	0.131	10.564					
CSR2	0.918	0.126	14.085					
CSR3	0.787	0.108	11.267					
CSR5	0 574	0 135	7 502					
CSR6	0.443	0.109	5.561					
INDUSTRY NORMS				0.660	0.725	0.396	0.292	0.184
NORMS3	0.538	0.086	6.238					
NORMS4	0.701	0.128	8.352					
NORMS5	0.637	0.131	7.536					
NORMS6	0.661	0.115	7.847					
RISK ATTITUDE				0.727	0.619	0.441	0.371	0.277
NORMS7	0.542	0.102	6.814					
NORMS8	0.838	0.092	11.281					
NORMS9	0.852	0.084	11.499					
RISK4	0.208	0.115	2.428					
RISK5	0.168	0.154	1.959					
Goodness of Fit Statistics			FACTOR CO	RRELATION N	MATRIX			
Chi-Squared (DF) 686-339	(394)							
NFI 0.805	()		FinCon	CSR	Norms Ri	sk		
RFI 0.784		FinCon	1					
IFI 0.906		CSR	0.113	1				
TLI 0.895		Norms	0.040	0.219	1			
CFI 0.905		Risk	0.371	0.167	0.292	1		
RMSEA 0.069			0.071	0.207	0.252	-		
10.90 0.060								
HI 90 0.077								
PCLOSE 0.000								
Goodness of Fit Statistics   Chi-Squared (DF) 686.339   NFI 0.805   RFI 0.784   IFI 0.906   TLI 0.895   CFI 0.905   RMSEA 0.060   HI 90 0.077   PCLOSE 0.000	(394)	FinCon CSR Norms Risk	FACTOR CO FinCon 0.113 0.040 0.371	RRELATION M CSR 1 0.219 0.167	MATRIX Norms Ri 1 0.292	sk 1		

Table 1CFA Summary Results

\* All estimates were significant at the 0.001 level except RISK4 (0.015) and RISK5 (0.050).

#### RESULTS

Figure 4 below shows the hypothesized structural equation model as specified using the AMOS Graphics structural equation modeling software. Table 2 summarizes the results of this analysis and identifies the statistically significant relationships. These results show a good fit to the data for this model although the low  $R^2$  for security spending indicates that there is a significant amount of variation that is not explained by the drivers and may reflect the low variability of security spending. NFI and RFI were 0.79 and 0.77, respectively. ILI and CFI were each above 0.90, indicating a good fit and TLI was 0.89. The RMSEA result, at 0.066, shows a moderate fit for the model. We note from the table that there are five statistically significant relationships in the base model: (i) financial considerations on spending, (ii) government help on spending, (iii) risk attitude on financial considerations, (iv) norms on risk and (v) norms on social responsibility. As noted, there is a direct effect of financial considerations on security spending and this effect is positive and statistically significant. This is an important result since it shows that profit-maximizing behavior is not at odds with increases in security spending and there must be another culprit. This conclusion strongly contradicts H1 since the sign of the coefficient is positive, not negative as predicted. For the most part, firms consider security spending to be part of the "investment" that a company must make to be successful and well-run firms will make that investment.

There is also a statistically significant and positive direct effect of risk on financial considerations. Again, this result is important since it shows that firms take into account the threat of terrorism on the financial well being and reputation of the firm and that inability to perceive risk is not to blame for the failure of firms to spend money on terrorism protection. Following the methodology suggested by Mathieu and Taylor (2006), we next check for direct effects on security spending, and mediation through financial considerations, for the other independent variables.

We first tested Norms, Risk and Responsibility without Financial Considerations by setting the path between Financial Considerations and Security Spending to zero. This methodology allowed testing the direct effect of these independent variables on Security Spending. As table 3 below shows, none of the other independent variables showed a direct effect on security spending, indicating that we must reject H2 and conclude that a sense of social responsibility has no direct effect on security spending. Consequently, there will be no mediated effect of these variables through financial considerations since there is no direct effect to mediate. The second step suggested by Mathieu and Taylor is to examine the model for indirect effects. Here there emerged a statistically significant direct effect of Risk on Financial Considerations of 0.385. Since table 2 shows a direct effect of Financial Considerations on Security Spending of 0.190, we can calculate an indirect effect of Risk on Security Spending of 0.073 (0.385 X 0.190).

Although the SEM results in table 2 did not show a statistically significant relationship between Risk and Security Spending, the coefficient value of -0.089, with its negative sign, suggests that suppression of the effect of Risk on Security Spending is taking place when Financial Considerations are not part of the model. The other statistically significant relationships are between industry norms and risk attitude. Industry norms have a significant, positive relationship to risk attitude of 0.305. Taking into account the indirect effect of Risk on Security Spending (table 3); we can calculate a statistically significant, indirect effect of Norms on Security Spending of 0.022, an admittedly small effect.

		Base Model		Moderation RISK-CSR		Moderation RISK-NORMS	;	Moderation FINCON-CSR	
Dependent Variable	Independent Variable	Std. Coeff.	S.E.	Std. Coeff.	S.E.	Std. Coeff.	S.E.	Std. Coeff.	S.E.
Security Spending R-Squared = 0.060	Financial Considerations Social Responsibility Industry Norms Risk Attitude Government Help Risk X Responsibility Risk X Norms Norms X Responsibility FinCon X CSR	<u>0.190</u> -0.034 0.057 -0.089 <u>-0.163</u> NT NT NT	0.093 0.073 0.119 0.170 0.117	0.461 -0.031 0.048 -0.069 -0.144 NT NT NT NT	0.035 0.092 0.118 0.154 0.117	<u>0.430</u> -0.032 0.051 -0.075 <u>-0.150</u> NT NT NT	0.049 0.072 0.133 0.156 0.116	0.310 0.149 0.041 -0.069 -0.149 NT NT -0.234	0.095 0.074 0.119 0.169 0.117 0.018
Einanaial Canaidarations									
R-Squared = 0.143	Social Responsibility Industry Norms Risk Attitude Risk X Responsibility Risk X Norms Norms X Responsibility	0.075 -0.081 <u>0.386</u> NT NT NT	0.068 0.110 0.170	<u>-0.569</u> -0.002 <u>-0.299</u> 0.731 NT	0.134 0.105 0.217 0.016	0.032 <u>-0.564</u> <u>-0.283</u> NT <u>0.695</u> NT	0.070 0.126 0.194 0.015	0.074 <u>-0.081</u> 0.386 NT NT	0.068 0.110 0.170
Risk R-Squared = 0.093	Industry Norms	<u>0.305</u>	0.074	<u>0.307</u>	0.077	<u>0.260</u>	0.074	<u>0.305</u>	0.074
Social Responsibility R-Squared = 0.053	Industry Norms	<u>0.229</u>	0.135	<u>0.230</u>	0.131	<u>0.214</u>	0.134	<u>0.231</u>	0.135
Overall Fit Indices									
X <sup>2</sup> (d.f.) AGFI GFI NFI RFI IFI TLI CFI RMSEA LO 90 HI 90 PCLOSE		753.877 0.736 0.775 0.790 0.768 0.903 0.892 0.902 0.066 0.057 0.074 0.001	(450)	1380.493 0.691 0.735 0.674 0.642 0.761 0.734 0.758 0.109 0.102 0.116 0.000	(481)	1426.927 0.696 0.740 0.666 0.632 0.750 0.722 0.747 0.112 0.105 0.119 0.000	(480)	1331.250 0.691 0.736 0.680 0.648 0.769 0.743 0.766 0.100 0.113 0.000	(480)

Table 2SEM and Post Hoc Moderation Analysis Results

<u>Highlighted coefficients were statistically significant at p<0.05 or better.</u> Bold italicized coefficient is statistically significant at p<0.10. NT means NOT TESTED.

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#### **Post Hoc Analysis**

Since there was no statistically significant relationship between Norms and either Financial Considerations or Security Spending, H3 suggesting that Norms would mediate Social Responsibility to increase spending could not be supported. We decided instead to test for a moderation effect of these variables on spending. To test for moderation, interaction terms were created between social responsibility and industry norms on the one hand and financial considerations and security spending on the other. These variables were then each added to the model in Figure 3 to judge the effect on the results. A summary of the output from the three significant moderation models is provided in Table 2, above.

One aspect of the moderation question is to understand the impact of these factors on the degree to which financial considerations will factor into the decision to spend on security. Figures 5A and 5B below show the moderating effect of social responsibility on financial considerations within a given risk environment. Figures 6A and 6B show the same information for industry norms. We note from these figures that in low and medium levels of the moderator (social responsibility or norms), increasing risk leads to a decrease in the impact of financial considerations.

Relationship	Direct Effect	t-Value/ Signif.	Indirect Effect	t-Value Signif.
Security Spending				
Social Responsibility	-0.018	-0.211		
Industry Norms	0.031	0.304	0.022	
Risk Attitude	0.000	0.004	0.073	
Financial Considerations				
Social Responsibility	0.073	0.878		
Industry Norms	-0.078	-0.794		
Risk Attitude	0.385	3.646***		
Risk Attitude				
Norms	0.305	2.868***		

Table 3

\*p< 0.05; \*\* p<0.01; \*\*\* p<0.001

Given the positive relationship between financial considerations and security spending, one could conclude that security spending would also fall. At high levels of social responsibility and industry norms, the impact of financial considerations increases leading to higher spending but is only significantly different for firms that have a high (two standard deviations) level of social responsibility. Figure A on each dimension shows this impact for firms with moderate levels of social responsibility/industry norms while Figure B shows firms with higher levels of each.



Figure 5A

Figure 5B



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Figure 6A

Figure 6B



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Note that for socially responsible firms, or firms in industries with strong norms, low risk leads to lower financial considerations and security spending but these measures increase as risk increases. At high levels of risk this relationship changes and financial considerations begin to increase in importance. This result is important since, in all cases, "financial considerations" are positively correlated with security spending. The greater risk environment leads to more security spending but this increase occurs only in those businesses that have a greater sense of social responsibility or stronger industry norms.

Figures 7A and 7B below show a similar type of analysis examining the effect of social responsibility directly on security spending. Here greater social responsibility leads to a higher level of security spending at low levels of concern with financial issues but for the "best run" firms there is no difference in security spending regardless of the level of social responsibility. This combination of results suggests that above average spending on security is not a function of social responsibility but rather of being responsible across all dimensions of the firm's well being. Indeed, we note that firms that are not as well run will "under spend" for security and only for these firms does the level of social responsibility change the level of security spending.



Figure 7A



**Figure 7B** 

The analysis suggests that H4 was not supported since, although government spending shows a direct impact on security spending, the sign of the coefficient is negative. It is interesting to see the negative statistically significant relationship between government assistance and security spending. This relationship suggests that "crowding out" by government spending replaces private investment rather than supplements it. Finally, we must reject H5 since there is no direct statistically significant relationship of risk on security spending. We have shown through the moderation discussion, however, that risk attitude is an important element of security spending arises from an interesting interplay of factors. Risk has an indirect and positive effect on security spending when it exists as part of an overall program of financial management at well-run firms. In the absence of such an environment it has no statistically significant impact on security spending.

#### LIMITATIONS

The analysis contained in this paper is subject to a number of important limitations. The first of these limitations relates to the measures used. The measures are based on existing survey instruments that were intended for other purposes, largely marketing studies, and have been adapted for this purpose. The measure for risk perception is of special concern. While this measure is based on a well-established study (Slovic, et. al., 1978; Lindell and Earle, 1983) the analysis was looking at public perceptions of risk for nuclear power plant locations and used primarily college students instead of practitioners as a sample (Slovic, et. al., 1978; Weber, E., et. al., 2002). Also, since the amount of security spending reported by the respondent is only an estimate, there may be some amount of subjectivity to the response. The low response rate from the survey is a further limitation of this study since non-response bias is likely to exist in the results. Efforts to increase the response rate with follow up mailings were largely unsuccessful and the use of electronic mail to conduct the survey may have led to these poor results. It is also important to note that this dataset aggregates spending by both private and public entities and, given the small size of the dataset, was not able to disaggregate and analyze the responses of each segment An additional limitation of the study is that it is measuring separately. perceptions of risk and the social responsibility to respond to such risk at a single moment in time that is now over seven years removed from the galvanizing event. A final limitation noted here is the possibility of common method bias. While

# efforts have been made to reduce this risk through research instrument design, and statistical evaluation indicates that this bias is not a significant issue, the presence of such bias cannot be ruled out.

#### CONCLUSION

We have noted in previous studies that there is a tension between the private sector's view of its need to protect its assets and the government's view of the required amount of protection. While there are many factors that influence the amount of that spending, including the company's sense of social responsibility, the ability to assess and quantify risk properly and the actions that government takes to provide incentives to the private sector, the most direct factor appears to be the cost-benefit analysis that the companies themselves undertake, i.e. financial considerations. This result suggests that, for the most part, firms that consider security spending to be an "investment" issue are more likely to spend on security. Government and industry associations can also be a positive force here by assisting companies to understand that security spending is an investment and provide the risk data and other financial tools to allow the necessary cost-benefit analysis.

The predominance of financial considerations in the decision process does not suggest that social responsibility and industry norms have no role to play. We have demonstrated that these factors are important moderators of security spending and help to promote societal goals when such goals can be placed in the context of the firm's self-interest. Interestingly, government support has a negative sign suggesting substitution of private spending rather than encouraging such spending. This finding suggests that government's role should be to provide tax and other incentives to business to encourage spending related to the business' assets and reserve grants for the protection of more public areas so that total protection increases. In addition, supplementing such incentives with a more aggressive regulatory framework, either directly through legislation or indirectly working with industry associations, may be necessary to inject these issues into the corporate profit function. Such policy initiatives should go a long way toward motivating corporate entities to invest in additional security for their at risk facilities.

#### Appendix I Codebook for Key Constructs

#### **Financial Considerations**

- EXCEL 1: My organization encourages people to develop new ideas.
- EXCEL 2: My organization has a small staff that delegates authority efficiently.
- EXCEL 3: My organization's top management believes that its people are of the utmost importance to its success.
- EXCEL 4: The organization's top management creates an atmosphere that encourages creativity and innovativeness.
- EXCEL 5: The organization instills a value system in all of its employees.
- EXCEL 6: The organization concentrates on activities where it has a high level of skill and expertise.
- EXCEL 7: The organization is flexible and quick to respond to factors that challenge its ability to succeed.
- EXCEL 8: The organization's values are the driving force behind its operations.
- EXCEL 9: The organization believes that listening to what stakeholders have to say is a good skill to have.
- EXCEL 10: The organization believes that after-the-sale service is just as important as making the sale itself.
- EXCEL 11: The organization's objectives are driven primarily by the goal of satisfying the stakeholders.
- EXCEL 12: The organization responds to competitive actions that threaten its success.
- EXCEL 13: We freely communicate information about our successful and unsuccessful stakeholder experiences across all of the organization's functions (finance, administration, etc.)

- EXCEL 14: The organization's strategies are driven by its beliefs about how it can create greater value for its stakeholders.
- EXCEL 15: All of our managers understand how everyone in our organization can contribute to creating stakeholder value.
- EXCEL 16: We share resources with other organizations.

#### **Social Responsibility**

- CSR 1: A large corporation is like a university because both have as their central purpose serving the public interest.
- CSR 2: The role of the president of a corporation is that of a public servant.
- CSR 3: The management of a corporation is responsible to many definable interests in society.
- CSR 4: The internal conduct of business affairs is not a matter for public involvement.
- CSR 5: Representatives of the public, as well as management, should have significant roles in determining the conduct of business affairs.
- CSR 6: The management of a corporation should do more than the law requires in its concerns with the social impacts of its actions.
- CSR 8: Right and wrong conduct for corporations can be meaningfully defined only by the law.
- CSR 9: Management should be the sole determinant of a corporation's objectives.
- CSR 10: Since most people are dependent on private industry for employment, corporations should be willing to sacrifice some efficiency in order to provide jobs.

#### **Impact of Industry Norms**

- NORMS 1: My organization seeks information about brands and products from an association of professionals or independent groups of experts.
- NORMS 2: The product or advisor the organization selects is influenced by observing a seal of approval of an independent testing or certification agency.
- NORMS 3: The organization's observation of what experts do influences its choice of a solution (such as observing the actions of other security agencies or governments abroad).
- NORMS 4: To satisfy the expectations of other members of the industry, the organization's decision to implement a particular security solution is influenced by their preferences.

- NORMS 5: The organization's decision to implement a particular security solution is influenced by the desire to satisfy the expectations of other members of the industry.
- NORMS 6: The desire to satisfy the expectations that others have of it has an impact on the firm's decision to implement a particular security solution.
- NORMS 7: The organization believes that the purchase or use of its security solutions will enhance the image that others have of it.
- NORMS 8: The organization believes that the people who implement terrorism protection are admired or respected by others.
- NORMS 9: The organization believes that the implementation of terrorism protection helps it show others what it is or would like to be.

#### **Perception of Risk**

- RISK 1: To what extent is the risk exposure to terrorist attack voluntary or involuntary?
- RISK 2: To what extent is the risk of death from a terrorist attack immediate or likely to occur slowly over the passage of time?
- RISK 3: Terrorism risks are known precisely by the organizations that are exposed to those risks.
- RISK 4: If the organization is exposed to terrorism it can, through skill and diligence, avoid serious destruction or death.
- RISK 5: Rate the extent to which the risk of attack from terrorists is an old and familiar threat or a new and novel threat.
- RISK 6: Rate the extent to which terrorism is a risk that kills people one at a time (chronic risk) or a risk that kills large numbers of people at once (catastrophic risk).
- RISK 7: Rate the extent to which terrorism is a risk that organizations have learned to cope with and can think about reasonably and calmly versus have great dread for on the level of a gut reaction.

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