Assessing the Collateral Benefits of Security and Risk Management Focused Supplier Management

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Abstract: The investment in supply chain security and risk management (SCS&RM) has been characterized by huge initial expenditure while financial and other justifications are lacking. Even though an array of collateral benefits of such investments has been studied, the literature is more practitioner-oriented and descriptive in natural. It neither provides any profound academic insights nor gives managers any helpful solutions to their problems. This paper starts the first step to provide an in-depth understanding of these collateral benefits. It assesses the collateral benefits of security and risk management focused supplier management routines and subsequent effects on firm performance. Specifically, the paper assesses three collateral benefits: supply chain responsiveness, supply chain resilience, and customer satisfaction. The paper contributes to the literature by summarizing the dimensions of security and risk management focused supplier management and by providing a more rigorous view of SCS&RM benefits. The finding from this study can potentially enhance our understanding of SCS&RM from a practitioner as well as an academic perspective.

Keywords: supply chain security and risk management, collateral benefits, supplier management, firm performance

I. Introduction

Increasing globalization exposes many firms to potential natural and man-made disasters. While a disaster has a low probability of occurrence, it has significant consequences if it does occur. A good example is the famous Hurricane Katrina in 2005. It is estimated that the hurricane cost the U.S. economy well in excess of $200 billion dollars [4]. The calamity affected the nation's shoreline management policies and resulted in many firms' redesign of their onshore facilities [37]. Another illustrative example is a fire at the Philips's mobile phone chip plant in 2000. The fire only lasted for 10 minutes but caused Ericsson's (Philips's major customer) departure from the mobile phone terminal business without affecting its rivals' (such as Nokia and Motorola) profitability [46] [35]. Should a disaster occur only firms that are equipped with supply chain security and risk management (SCS&RM) routines can effectively manage the supply base in a sustainable manner [23] [31].

Investment in SCS&RM, however, is characterized by huge initial monetary outlays, while financial and other justifications are lacking. Russell and Saldanha [41] estimated that the costs to secure supply chains globally may reach $151 billion dollars annually. Given the probability that a disaster will occur is relatively low and given an even lower probability that such a disaster will impact a firm, management teams hesitate to invest in SCS&RM initiatives. As a result, most SCS&RM practices are adopted to merely meet minimum legislative requirements [56]. Nevertheless, SCS&RM practices can lead to a number of benefits such as enhanced customer satisfaction, reduced cost, and improved product quality. Many firms may underestimate the value of SCS&RM investments because they do not fully realize or even recognize these benefits [40].

Moreover, it is not clear how these collateral benefits relate to one another [36]. While SCS&RM practices are believed to generate an array of collateral benefits [40] [45], little evidence exists. As Williams et al. state,

> "*Security is secure by nature (i.e. it is something that is not easily researched because not everyone will share details about it). So one of the difficulties researchers are likely to face is reluctance from organizations to participate in research… As a result, academic researchers will be challenged with gaining knowledge in this area*" [56, p. 275].

In other words, a gap between academic deductions and in-depth understanding of these collateral benefits exists. This study aims to fill this gap by assessing the collateral benefits of security and risk management focused supplier management.

Our research motivation is simple. Given the resource constraints within which most firms operate, it is meaningful, if not critical, to develop a good understanding of how security and risk management focused supplier management can affect supply chain performance (i.e. collateral benefits). Three of the commonly studied collateral benefits are supply chain responsiveness, supply chain resilience, and customer satisfaction. We limit the scope of the study to the three collateral benefits in part to amplify the importance of these collateral benefits, and in part to keep the manuscript parsimonious. We intend to (1) identify the dimensions of security and risk management focused supplier management; (2) propose propositions that link it to supply chain performance; and (3) explore the relationships among the three collateral benefits.

The manuscript contributes to the body of literature in several ways. First, this is the first paper, to our best knowledge, that exploits the relationship between security and risk management focused supplier management and supply chain performance. We expect that the findings will provide a better understanding for both practitioners and academicians on how security and risk management focused supplier management can affect supply chain performance. Second, we point out two dimensions (i.e. active management across tiers and crisis management mechanisms) of supplier management which are important to SCS&RM but were overlooked in the supplier management literature. The theoretical deduction of the two dimensions will enhance the understanding of the domain of supplier management in the context of SCS&RM. Third, this study provides practical managerial implications. For example, the cognition of the collateral benefits of security and risk management focused supplier management allows firms to realize the valuable returns and dispels their concerns in making SCS&RM investments.

The rest of the paper is organized as follows. In section 2, we review the related literature. In section 3, we introduce a model and develop propositions that link SCS&RM practices to collateral benefits. In section 4, we present discussion and managerial implications. We end this paper by offering research limitations and directions for future research in section 5.

II. Literature Review

The study is concerned with collateral benefits which are derived from security and risk management focused supplier management. It is located at the intersection of two streams of research: supplier management with security and risk consideration and collateral benefits from SCS&RM practices. We discussed each, in turn, below.

Security and risk management focused supplier management

Although there is a large body of literature regarding supplier management and its impacts on firm performance, only a handful of papers study supplier management with security and risk considerations. Due to the focus of this paper, we will narrow our review on these papers. For fairly comprehensive descriptions of general supplier management, we refer the reader to Weber et al. [54], de Boer et al. [9], and Krause et al. [26].

When it comes to security and risk management focused supplier management, Handley and Benton [18] propose that supplier selection includes two major tasks: evaluating a supplier's capacity (e.g. lead time, responsiveness, etc.) and evaluating potential security and risk issues that a supplier may encounter (e.g. financial health, long-term survival perspective, etc.). The traditional capacity-focused criteria can be myopic as they may not meet a firm's long run needs due to the increasing uncertainty of today's business.

Having realized the importance of SCS&RM, Sheu et al. [47] highlight the need to incorporate voluntary security initiatives (such as C-TPAT) into supplier assessment process. They argue that supplier assessment reflects a firm's and its customers' requirements and expectations to the supply base. Appropriate assessment allows firms to identify potential security glitches effectively and provide "prescriptions" that result in prevention of potential supply chain disruptions.

Peleg-Gillai et al. [36] further advocated four types of supplier development strategies that can be employed to secure supply chains: (1) increase competitive pressure and resilience by using multiple sources; (2) build evaluation and certification systems that affect SCS&RM; (3) offer incentives for supplier improvements in security, and (4) conduct direct buyer involvement. Though much of the literature suggests that close relationships with suppliers are desirable, Goffin et al. [13] indicate that a proper buyer-supplier relationship is contextual: building close relationships can lead to advantages to buyers, but this approach is definitely not a panacea for the whole supply base. However, it is not clear whether a close relationship is desirable in the context of SCS&RM as a close relationship reduces the cost of securing supply chains, while a loose relationship (implies multiple sources) promotes resilience.

Beside these traditional dimensions of supplier management, one emerging component of supplier management in the SCS&RM literature is active management of suppliers across tiers. Eggers [10] has illustrated that some firms are reluctant to adopt SCS&RM initiatives. For example, many US ports have only implemented a few practices to meet requirements and carry out no SCS&RM programs [53]. One major reason for this reluctance is that a supply chain is only as secure as its weakest link [19]. An upstream supplier who does not commit to the security effort can allow a serious security breach of the whole chain. As a result, supply chain security becomes ineffective. The converse is also true. A recent study using game theory [2] demonstrates that when firms realize that their supply chain partners are involved in security and risk management initiatives, they are more willing to invest in SCS&RM. Therefore, SCS&RM is not a simple task that can be achieved by an individual firm but rather a joint project that requires commitments across the supply chain [36]. In other words, active monitoring of suppliers across tiers is necessary.

Another emerging content of supplier management in the SCS&RM literature is crisis response mechanisms. Studies regarding crisis response mechanisms can be divided into two groups based on the methodology applied to resolve security and risk issues. The first group advocates prevention. It suggests the development of uniform best practices [14] [30].

Firms with well developed security and risk standards usually achieve better performance. The second group emphasizes proactiveness. Studies in this group illustrate that proactive firms can utilize their product design [31], interactions between competitors [43], and lessons from the quality revolution [29] to restore operations from supply chain crises. A review of the two groups of strategies is provided by Tang [51] in which the author proposes nine robust strategies for mitigating supply chain disruptions.

In sum, the literature suggests that security and risk management considerations should be embedded into supplier management strategies and proposes how firms should implement security and risk management routines. However, the studies individually address only a part of security and risk management focused supplier management and do not synthesize supplier management dimensions in the context of SCS&RM, which is a major contribution of this paper.

SCS&RM collateral benefits

Another related stream of literature addresses the collateral benefits derived from SCS&RM practices. Most studies of security practices are practitioner-oriented and descriptive in nature [29] [44]. They discuss SCS&RM issues but do not provide an in-depth theoretical understanding of what supply chain security is and how security and risk management practices affect firm performance. Closs and McGarrell [7] first introduce a fairly comprehensive concept of supply chain security management and offer guidelines of its implementation. In their report, they propose a new way of thinking about SCS&RM and suggest that there are potential benefits can be abstracted from SCS&RM practices.

Building on Closs and McGarrell [7], Rice and Spayd [40] study an array of collateral benefits from SCS&RM practices and routines. Their study addresses the industry concern that government action to impose tougher security-related standards and processes erodes trade efficiency by adding cost and complexity. The authors argue that there has been a great deal of speculation in this area, but very little data. The primary goal of their study, therefore, is to build a framework for executives, researchers, and government officials to ask questions, conduct research, and make decisions about how to approach investments in SCS&RM. Nevertheless, the study illustrates that there is increasing evidence and logic that meaningful benefits, including improved supply chain security, reduced supply chain disruptions, reduced overall cost, and improved efficiencies, are created from prudent SCS&RM investments.

Peleg-Gillai et al. [36] further extend the SCS&RM literature and argue that better security drives business values. In their paper, they first provide an overview of SCS&RM initiatives and subsequent collateral benefits. Then, these collateral benefits are further categorized into five groups: (1) inventory management and customer services, (2) visibility, (3) efficiency, (4) resilience, and (5) customer relations. To support their results, the authors collect information from both manufacturers and logistics services providers. The virtue of this study is that firms participated in the study also quantified numerous collateral benefits they received. The findings clearly indicate that significant business value accrues from SCS&RM investments. However, the limitation of this study is that the sample size is very small (n=7) and all companies involved are industry leaders.

To sum up, the SCS&RM literature proposes that a number of collateral benefits can be accrued from security and risk management related practices. However, the label of SCS&RM represents a rather diverse category or collection of operational practices. Here, we build on these previous works and explore the collateral benefits of security and risk management focused supplier management.

III. Theory development

The relationships among security and risk management focused supplier management and three subsequent collateral benefits are the subjects of exploration of this study. The hypothesized structural model is shown in figure 1. The rationale of this model, the theoretical underpinning, and the resulting propositions are discussed below, starting with security and risk management focused supplier management.

Security and risk management focused supplier management

General supplier management is an organic system of supplier selection, supplier assessment, and supplier development strategies and activities [33]. For supplier selection, firms must consider a supplier's capability of meeting short term goals and potential ability of fulfilling future demands. Promoting long-term buyer-supplier relationship indiscriminately may actually decrease performance [49]. After selecting qualified suppliers, organizations need further continuous evaluation of suppliers' performance. The buying firm's assessment of suppliers was considered a catalyst for performance improvement [38]. Effective assessments of firms' supply bases enable buyers to identify supply chain disruptions in an efficient manner, and thus reduce overall costs [28].

In addition, to stand in today's dynamic environment, firms also have to implement supplier development practices in order to capture the value of buy-supplier cooperation. Supplier development includes proactive customer efforts to improve "suppliers' capabilities for the long-term mutual benefit of both parties" [15, p.3]. Good supplier development promotes cooperative and collaborative buyer-supplier relationships [32] and improves overall supplier performance [26] [42]. In order to realize the success of supplier management, firms must have well developed strategies for supplier selection, assessment, and development activities and balance the efforts among these strategies.

We posit that a firm's supplier management competences are critical to SCS&RM. SCS&RM requires a collection of efforts and skills, and commitments from all supply chain partners. As discussed in the previous section, active management of suppliers across tiers and crisis response mechanisms are necessary in the context of SCS&RM [36]. Traditional supplier management strategies that primarily focus on transactional costs tend to be myopic and need to be adjusted to meet new security and risk management requirements. Russell and Saldanha [41] have highlighted in their five tenets of security-aware supply chain operations that, now more than ever, companies need to know their oversea trading partners. They need different thinking to incorporate military concepts (such as agility and reservists) in the new environment and develop a reliable and flexible mechanism to manage crises. Moreover, security and risk management programs ought to be embedded into supplier selection and evaluation practices. Effective supplier management in the context of SCS&RM will require a firm to set appropriate security and risk management focused supplier selection criteria, assess suppliers' security performance, implement security and risk management initiatives, monitor suppliers across tiers, prepare for unexpected crises, and balance the efforts for these activities due to limited resources. Therefore, we propose:

Proposition1: Firms' security and risk management focused supplier management competence is obtained through the alignment of their supplier selection, supplier assessment, supplier development, active management across tiers, and crisis response mechanisms.

Supply chain responsiveness

Supply chain responsiveness refers to a firm's ability to move products in a speedy manner and quickly respond to market changes and uncertainties [12] [25]. Studies have illustrated that the capability of a firm's supplier base plays a vital role in achieving supply chain responsiveness [17].

In the realm of security and risk management focused supplier management, suppliers are encouraged to implement security and risk management initiatives. Though costly, these initiatives increase the velocity of product flows [7]. For example, firms with C-TPAT certifications can pass the US customs without being subjected to more frequent inspections. Improved product handling due to standardized security operation procedures reduces operation variability [36]. Lower variability is more likely to lower the number of working hours and reduce the chance for errors, and thus implies products and services can flow more swiftly through supply chains. Moreover, security and risk management focused supplier management requires suppliers to reserve dedicate capacity to cope with potential supply chain disruptions. Such reserved capacity, however, could be also utilized to increase manufacturing flexibility and thus build responsiveness [8]. Furthermore, these security and risk management practices advocate supplier commitment [40]. Suppliers' investments in buyer-specific equipments and other dedicated efforts lead to enhanced trust and fast response to market changes [16]. Through security and risk management focused supplier management, organizations can make their supply chain more flexible in response to uncertainties. Therefore, we expect:

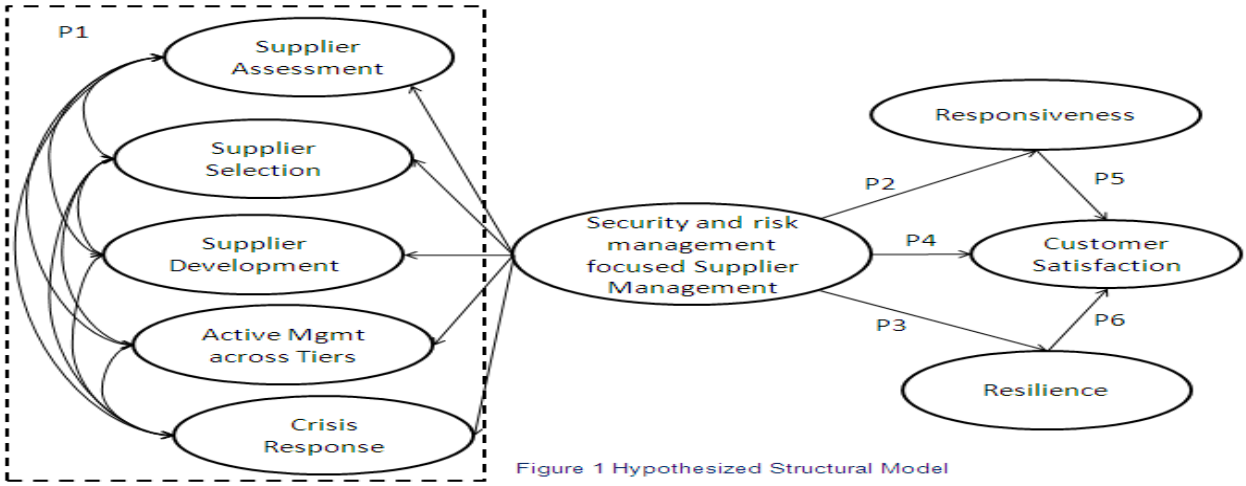

Figure 1 Hypothesized Structural Model

Proposition2: Firms with a high level of security and risk management focused supplier management competence are more likely to achieve a high level of supply chain responsiveness.

Supply chain resilience

Although both deal with uncertainties, supply chain responsiveness and resilience are different. The former one is driven by demand uncertainty. It reflects a firm's ambition to lead the competition in responding observed market changes. In this sense, resilience is more related to unobservable risks. It emphasizes robustness: a firm's capacity to survive, adapt, and then return to its original (or desired) state after being disturbed [11].

When working effectively, modern supply chains allow good to be produced and delivered in the right quantities to the right places in a timely manner. However uncertainties force organizations to operate under unexpected disruptions. Ineffective resilience planning can result in disconnections between supply chain operations and organizational goals [39]. In an endeavor to build resilience, companies have tried to either build close relationship with suppliers [5] or diversify their portfolio of locations and distribution systems [3]. Indeed, effective supplier management that designs and creates specialized features into supply chains does enhance resilience [39].

When it comes to SCS&RM, Closs and McGarrell [7] describe resilience as a supply chain's ability to withstand and recover from an incident. Security and risk management focused supplier management places high priority on managing uncertainty and emphasizes the ability to restore from disruptions [36]. It encourages firms to define plans that guarantee a continuous supply of critical components. It also requires working with key suppliers to establish alternative sources as part of the contracting process. Sheffi [45] [46] further points out that those security and risk management requirements promote (1) employment of redundant communications systems for critical incident management, (2) establishment of guidelines regarding appropriate response in case of security incidents, and (3) development of defined processes to restore operations. Therefore, we would expect:

Proposition3: Firms with a high level of security and risk management focused supplier management competence are more likely to achieve a high level of supply chain resilience.

Customer satisfaction

Customer satisfaction is best specified as a function of perceived quality [1]. Due to the increasing global trade and outsourcing business in the last few decades, the quality of products or services relies on not only a firm's internal capabilities but also those of its upstream suppliers [24]. Supplier management strategy allows buyers to transfer operational knowledge to their suppliers to reduce incoming material infects [33]. Moreover, good supplier management can affect supplier behaviors in a way that a supplier's future capabilities will meet customers' future needs [26] [34]. Consequently, firms (e.g. Proctor & Gamble) who are experts of supplier management are more likely to provide their customers with better product quality [48], and thus achieve a high level of customer satisfaction.

As public awareness of security increases, customers begin to recognize supply chain security an imperative capability to ensure product quality. They have concerns that their supply chains may be used by terrorists such that the potential loss will be too high to afford [29]. For example, food products are sensitive to handling, processing, and storage conditions; and mishaps that are introduced by terrorists can easily result in thousands of individuals getting sick over a short period of time [55]. Through security and risk management focused supplier management, firms encourage their suppliers to implement security-related initiatives and technologies. Better security and risk management leads to reduced damage and less contaminations during transportation [36]. Moreover, many total quality management practices are also embedded in SCS&RM practices. Better quality can therefore be expected [30]. Based on the reasoning, we propose:

Proposition4: Firms with a high level of security and risk management focused supplier management competence are more likely to achieve a high level of customer satisfaction.

In addition, studies have linked supply chain responsiveness to customer satisfaction because now more than ever before manufacturers are under intense pressure to respond to global competition by satisfying ever-changing customer demands in a speedy manner [5]. Stalk et al. [50] show that fast response to customer requests is critical to firms' survival and the source of competitive advantage. Long lead times generate an array of related activities that lead to overhead costs resulting from planning errors, expediting, overtime hours, etc. By building flexible supply chains to streamline operations, organizations are able to reduce errors and increase productivity. Moreover, fast product flow implies that finished good has less idle time during transportation, and thus limited exposure to potential risks (e.g. terrorist attacks). Swift movement also improves product quality because less attrition occurs as products flow through the supply chain, especially for fast perishable products such as fresh produces. Indeed, research suggests that firms who are able to respond quickly to changes through strategies such as pursuit of security certification, vendor managed inventory, and inventory positioning within the supply chain can significantly improve customer satisfaction [17]. Therefore:

Proposition5: Firms with a high level of supply chain responsiveness are more likely to achieve a high level of customer satisfaction.

Moreover, supply networks are becoming more vulnerable as supply chains become longer and leaner. As cost-reduction and efficiency are now considered key business goals, global supply systems become increasingly vulnerable to events that previously may have caused only minor local disruptions [6]. Consequently, supply chain resilience becomes a key capability for which firms are seeking. There are at least two reasons that supply chain resilience protects customers' benefits. First, Hendricks and Singhal [20] [21] and Kilgore [22] reported that news of supply chain disruptions causes a greater decrease in the price of a company's stock than other types of announcements such as plant closings or delays in the introduction of new products. Resilient supply chains protect stock price and thus allow a stable financial environment where firms can assure a high customer service level. Second, anticipating, identifying, reacting and learning are all at the heart of supply chain resilience. The process of building resilience involves performance improvements. It encompasses all supply chain processes and resources that offer capabilities to overcome supply chain vulnerabilities. Only firms which are able to restore operation quickly from supply chain incidents can maintain consistent services and deliver better value to their customers. Therefore we expect:

Proposition6: Firms with a high level of supply chain resilience are more likely to achieve a high level of customer satisfaction.

IV. Discussion

Supply chain security and risk management is a journey, not a destination [7]. So is our study. In this study, we posit that security and risk management focused supplier management can positively affect supply chain performance. We also explore the relationships among those supply chain performance dimensions and argue that both supply chain resilience and responsiveness can lead to improved customer satisfaction. However, we acknowledge that our study is prone to several limitations which merit further discussion.

First, our study is conceptual in nature. We propose that security and risk management focused supplier management can theoretically underlie five dimensions of supplier management in the context of SCS&RM. However, we do not empirically validate our proposition. It is possible that more than one higher order constructs exist. For example, the five dimensions can be further divided into two groups: one group focuses on preventing security and risk incidents from happening; another emphasizes the ability of restoration if an incident does occur. If it is the case, then we would need to adjust our model accordingly.

Second, there may be conceptual overlaps within these constructs that are studied. For example, Tang and Tomlin [52] indicate that supply chain responsiveness can lead to resilience while Christopher and Rutherford [6] illustrate that supply chain resilience may result in responsiveness. Some operational practices fall into both categories of supply chain resilience and responsiveness practices. How to distinguish the two concepts and make the argument more rigorous is challenging.

Nevertheless, potential implications of this study are valuable. The study helps to justify the investments in SCS&RM. The cognition of the collateral benefits of security and risk management focused supplier management allows firms to realize the valuable returns and dispels their concerns in making SCS&RM investments. The finding from this study can potentially enhance our understanding of SCS&RM from a practitioner as well as an academic perspective.

V. Future research

Three directions are identified for future study. First, this study stimulates research interest and presents several research opportunities. Empirical examinations of proposed propositions can lead to a better way of thinking about supplier management in the context of SCS&RM and the challenges associated with its implementation. Second, this paper dedicates to SCS&RM issues from a buyer's standpoint. However, logistics services providers are also an important component of the global supply system. Therefore, the next step could be extending the project to include third party logistics (3PL) firms. Third, as to now, studies in SCS&RM by and large limit their scope to tangible products. However, intangible products, such as digital music and e-books are becoming more and more popular. One potential direction of extending this line of research is to look at intangible products and markets. What are the differences between tangible and intangible products in terms of security and risk management? Can intangible product manufacturers garner similar benefits from security and risk management focused supplier management as tangible products manufacturers did? We expect future research will help us address these questions.

References:

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