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Three Essays on Sustainable Operations Management

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A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Business

THREE ESSAYS
ON
SUSTAINABLE OPERATIONS MANAGEMENT

(Thesis format: Integrated-Article)

by

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ABSTRACT

This dissertation consists of three essays on sustainable operations management. The unifying theme in this work is the focus on sustainability-related risks originating from an organization's internal operations or its supply chain, operational-level initiatives for managing such risks, and the determinants and subsequent outcomes of those initiatives.

The first essay focuses on safety and environmental risks and looks into the role of a safety-oriented culture in effectively managing them. Building on the safety culture literature and organizational support theory, a conceptual model is developed suggesting that a safety-oriented culture enhances an organization's financial performance and sets the stage for successful implementation of environmental and safety practices, which in turn, result in improved environmental and safety performance. The hypothesized relationships are empirically examined and validated using the data collected through a survey of 251 Canadian plants.

The second essay is a conceptual paper focusing on supplier sustainability risks which materialize when buying organizations face their stakeholders' negative reactions to their suppliers' misconducts related to natural environment or society. The purpose of this paper is to explain the underlying factors of buying organizations' operational-level responses to such risks. Drawing on agency/management control and resource dependence theories, a contingent conceptual framework is developed that explains how three major factors ─ i.e., supply managers' perceived risk, dependence structure of buyer-supplier relationship, and the slack resources available to supply managers ─ interact to affect supply managers' choice among four risk management strategies: monitoring-based or collaboration-based sustainable supplier development (risk mitigation), supplier phase-out (risk avoidance), and taking no actions (risk acceptance). This framework also suggests that these contingent risk management strategies improve buying organizations' financial performance directly or indirectly through enhancing their organizational reputation.

Finally, the third essay presents a vignette-based experiment conducted with a

sample of 200 U.S.-based supply managers to empirically test and validate a set of propositions put forth in the second essay. Specifically, this study investigates and confirms the effect of three factors, i.e., supply manager's perceived risk, supplier dependence on the buying organization, and slack resources available to supply managers, and their interactions on supply managers' choice among the four risk management strategies.

Keywords: Sustainable operations management; Sustainability-related risks; Safety management; Environmental management; Safety culture; Organizational support theory; Buyer dependence; Supplier dependence; Agency theory; Management control theory; Resource dependence theory; Perceived risk; Slack resources; Financial performance; Environmental performance; Safety performance; Survey; Vignette-based experiment.

CO-AUTHORSHIP STATEMENT

I hereby declare that this dissertation incorporates some material that is a result of joint research. Essay 1 was coauthored with Professor Stephan Vachon and published in the Journal of Business Ethics: "HAJMOHAMMAD, S. & VACHON, S. 2014. Safety culture: A catalyst for sustainable development. *Journal of Business Ethics*, 123, 263-281". This paper was developed from my term paper submitted for the Research Method course. As the first author, I took the lead on this paper, including: formulating research questions, conducting the literature review, selecting the theoretical lens, and composing the current text after performing hypothesis development, data analysis, and interpretation of the results. Professor Vachon provided me with the survey data used in this paper and gave me constructive feedback throughout the paper development and publication process. I certify that I have obtained permission from the copyright owners to include this published paper in my dissertation. Please refer to Appendix C for the copyright releases.

In addition, Professor Vachon contributed as an adviser throughout the research process for essays 2 and 3, and also by editing and refining the complete drafts.

With the above exceptions, I certify that this dissertation and the research to which it refers, is fully a product of my own work.

DEDICATION

To my loving parents for giving me the strength and encouragement to follow my dreams!

To my best friend and life companion, Safa, for persistently supporting me, every step of the way, to make those dreams come true!

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I have been incredibly fortunate to have the opportunity to participate in Ivey's PhD program. This long and challenging journey would not have been possible without the help and support of many people, some of whom I would like to acknowledge by name.

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This dissertation would not have been possible without my husband, Safa, and his multi-dimensional support. Understanding me best as a PhD himself, he has been my best friend and great companion; he has loved, encouraged, entertained, and helped me to get through this tough period in the most positive way. Safa: thank you for simultaneously brandishing a sword to fight the demons of my doubts, fears, and insecurities, and a magical wand to bring joy and happiness to my life in so many different ways. There is no way I would have been able to do this without you! I truly feel blessed in having the opportunity to share my life with you and I am excitedly looking forward to all the adventures that we have yet to enjoy together.

Sara Hajmohammad

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Chapter I

Chapter I. Introduction

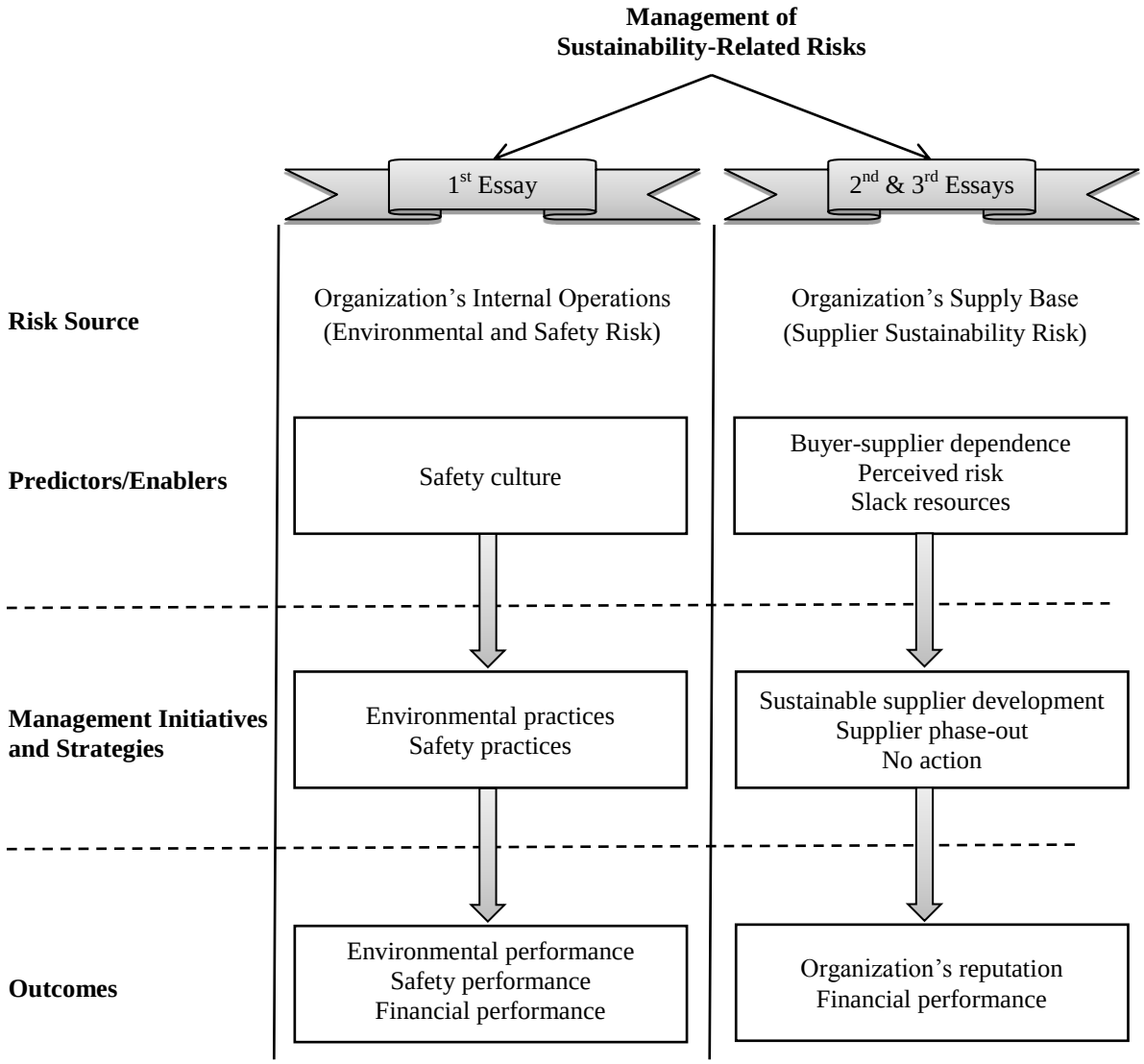
During the past three decades, sustainable development ─ "a development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987) ─ has become an important strategic objective for organizations and a prominent topic in the management literature. Based on this concept, companies should operate in a way that secures their long-term economic performance by avoiding short-term behaviors which are socially detrimental or environmentally wasteful (Porter and Kramer, 2006). The organizations caught up in social or environmental scandals increasingly face stakeholders' adverse reactions and reputational damage followed by substantial market share/revenue losses and recalls/litigation costs (Fombrun et al., 2000). Hence, their growing interest in sustainability can be attributed to the increasing internal and external pressures to conform to stakeholders' expectations to avoid the risk of losing sales or damaging their reputation and jeopardizing their survival (Sarkis et al., 2010, Ehrenfeld, 2005, Seuring and Müller, 2008). In addition, organizations have realized that they can enjoy cost savings and gain long-term competitive advantage by being concerned about the future of people and planet and through the creation of unique sustainability-oriented processes (Hart, 1995).

Among organizations' business processes, operations process is usually the area which employs the most personnel and has the highest footprint and impact on the natural environment. Therefore, proper management of social and environmental aspects of organizations' operations can be a critical success factor in their journey toward sustainable development (Kleindorfer et al., 2005). Sustainable operations management (OM) extends the efficiency-oriented boundaries of traditional OM to broader considerations of sustainable development. It is defined as the set of capabilities that allows an organization to design and manage its operational processes and products to perform well on all three dimensions of sustainable development, i.e., economic, environmental, and social performance (Gimenez et al., 2012). It encompasses the management of human resources and workplace health and safety as well as the management of organizations' impacts on local communities and natural environment

(Kleindorfer et al., 2005).

With the growing number of organizations taking the outsourcing and globalization path, one of the challenging aspects of sustainable operations is that the boundary of organizations' responsibilities often extends beyond their direct control and includes their extended supply chain, i.e., the focal buying organizations and their upstream and downstream suppliers (Corbett and Kleindorfer, 2001, Linton et al., 2007). In other words, organizations are "no more sustainable than [their] supply chain[s]" (Krause et al., 2009) and should not only address sustainability within their internal operations but also diffuse it across their supply chains.

Figure I-1. Dissertation conceptual framework



This dissertation consists of three essays on sustainable operations management. The unifying theme in this work is the focus on the sustainability-related risks (whether they originate from organizations' internal operations or their suppliers' activities), the initiatives which organizations undertake at the operational level to deal with such risks, and the enablers/predictors and subsequent outcomes of such initiatives. Sustainability-related risks are defined as the conditions or potentially-occurring events with negative social or environmental impacts that may provoke harmful stakeholder reactions (Hofmann et al., 2014).

This chapter proceeds with an outline of each essay and is closed by a discussion of their overarching contributions to the OM literature. Figure I-1 illustrates the conceptual structure of the dissertation and how the essays fit together.

1. First Essay- "Safety Culture: A Catalyst for Sustainable Development"

The first essay, presented in Chapter II, is an empirical paper focusing on environmental and safety risks originating from organizations' internal operations and the "enabler" role of a positive safety culture in managing such risks and improving the organizations' performance. The purpose of this paper is to address two major research questions: "*Are the organizations promoting occupational safety for their employees more likely to join the green movement?*" and, "*Does an organization's safety culture have a spillover effect on its environmental endeavors and financial performance?*".

In doing so, this paper draws on the safety culture literature and organizational support theory (Eisenberger et al., 1997) to develop a conceptual model which suggests that a positive safety culture, encompassing two critical components of management commitment and employees' participation/empowerment, enhances organizations' financial performance and sets the stage for successful implementation of environmental practices, which in turn, result in improved environmental performance. It is also hypothesized that safety culture is positively associated with the safety performance both directly and indirectly through implementation of safety practices.

This conceptual model is tested by the empirical primary data collected through a mail survey of 1,001 Canadian manufacturing plants. The plant is selected as the level of analysis because it is generally where many safety and environmental issues are

evaluated and operational decisions are implemented. The data extracted from 251 complete responses is then analyzed using the Partial Least Squares (PLS) method (Ringle et al., 2005). The results reveal that a safety-oriented culture not only improves the safety performance through adoption of safety practices but also sets the stage for the organization to join the green movement and adopt green technologies and successfully implement green practices. It is also found to have a significant direct effect on the financial performance, providing empirical support for the concept of reciprocity norm and organizational support theory in the workplace safety context.

2. Second Essay- "Managing Supplier Sustainability Risk: Strategies, Predictors, and Outcomes"

The second essay, presented in Chapter III, is a conceptual paper which focuses on sustainability-related risks originating from buying organizations' supply base, namely supplier sustainability risks. Such risks materialize through adverse stakeholder reactions (Hofmann et al., 2014) and occur when buyers are held responsible and accountable by customers, NGOs, or other salient stakeholders for their suppliers' misconducts related to the natural environment or society (Foerstl et al., 2010). Based on anecdotal evidence, some buying organizations may try to mitigate these risks through sustainable supplier development (SSD) initiatives, such as monitoring their suppliers or collaborating with them, to improve their environmental or social performance. Some buying organizations, however, may take extreme measures and avoid the risks all together by phasing out the risky suppliers while others may decide to accept the risks by taking no actions and addressing them after their occurrence.

Given this background, this paper aims to take one of the first steps toward building a theory of supplier sustainability risk management by addressing a broad research question: "*Why and how and under what conditions buying organizations respond to supplier sustainability risks?*". More specifically, because of the crucial role of supply managers as the decision makers in the supply chain context (Ellis et al., 2010, Tazelaar and Snijders, 2013), this study focuses on the strategies they undertake at the operational level (Pagell and Gobeli, 2009). Since supplier sustainability risk is an inter-organizational phenomenon, the exchange relationship between a buying organization

and a specific supplier is considered as the context and the buyer–supplier transaction as the unit of analysis. The focal decision is the supply managers' decision to select among the four mentioned risk management strategies.

To craft a theory of responses to this type of risk, the proposed conceptual framework draws on the resource dependence (Pfeffer and Salancik, 2003) and the agency/management control (Eisenhardt, 1989, Ouchi, 1979) theories and suggests that the supply managers' choice among the four risk management strategies is contingent upon their perceived supplier sustainability risk and the buyer-supplier dependence structure. This framework also suggests that these risk management strategies improve buying organizations' financial performance directly or indirectly through enhancing their organizational reputation. Finally, it is proposed that pursuing desirable strategies that fit the external environment contingencies (i.e., risk and dependence) to deliver positive performance and reputational outcomes significantly depends on the slack resources available to supplier managers to implement those strategies.

3. **Third Essay- "Managing Supplier Sustainability Risk: The Interacting Effect of Supplier Dependence, Perceived Risk, and Slack Resources"**

The third essay, presented in Chapter IV, focuses on a sub-model of the conceptual framework developed in the second essay to be empirically validated. Specifically, this study investigates the effect of three factors, i.e., supply manager's perceived risk, supplier dependence on the buying organization, and slack resources available to supply managers, and how they interact to form supply managers' choice among the four risk management strategies.

A vignette-based experiment methodology is used to assess the effects of high and low levels of perceived supplier sustainability risk as well as high and low levels of supplier dependence within two organizational contexts where the amount of slack resources is either high or low. Drawing from real supplier sustainability risk events, two basic scenarios are developed about two fictitious mid-sized multinational companies with safety-related or environment-related risks within their supply base. Full-time supply managers currently working for US-based medium- or large-size organizations in manufacturing or retail trade sectors are targeted as our key respondents. The data

collected from 200 supply managers is further analyzed through two different set of data analyses: MANCOVA and logistic regression.

The results reveal that SSD initiatives (collaboration-based and monitoring-based) are more likely to be used by supply managers to mitigate the supplier sustainability risk in buyer dominant situations (i.e., high supplier dependence). However, supply managers are more likely to avoid the risk and phase out the supplier or accept the risk and take no actions if the supplier is not highly dependent on the buying organization. In addition, in high supplier dependence situations, the likelihood of using collaboration-based risk mitigation strategy (as opposed to the monitoring-based one) increases when supply managers perceive a high level of risk threatening their organization. The results also confirm that the level of slack resources moderates the defined predictor-outcome relationships in risk management decision making: as the amount of available slack resources decreases, the participants become more inclined to (1) choose monitoring-based rather than collaboration-based risk mitigation strategy to deal with high risk suppliers in buyer dominant situations, or (2) take no actions and accept the risk rather than avoid it by terminating the relationship even when they perceived a high level of risk in independent buyer-supplier relationships.

4. Contributions

In addition to the individual contributions of each essay which will be further discussed in Chapters II, III, and IV, the overarching contributions of this dissertation to the OM literature are four-fold. Firstly, the three essays collectively consider all three elements of sustainability, i.e., people, planet, and profit (Elkington, 1998) and individually examine at least two elements simultaneously to address a significant gap in the OM literature. While theoretical discussions of sustainability tend to cover all three elements, the majority of empirical studies have focused on environmental issues and overlooked the social component of sustainability (Kleindorfer et al., 2005, Linton et al., 2007). In addition, only a few empirical studies have simultaneously looked at social, environmental, and economic aspects of sustainability (Thornton et al., 2013, Pagell and Gobeli, 2009, Pagell and Wu, 2009, Pagell et al., 2010, Pullman et al., 2009, Gimenez et al., 2012, De Brito et al., 2008), whereas almost all other studies investigate these aspects

in a standalone fashion (Seuring and Müller, 2008).

Secondly, this dissertation takes a broad approach towards sustainable operations in line with Kleindorfer et al. (2005) who adapted the work by Hayes and Wheelwright (1984) on operations strategy to the context of sustainable operations and identified internal versus external strategies. Specifically, It takes the leap from investigating the intra-organizational sustainability-related initiatives in the first essay to the examination of the strategies aimed at managing sustainability issues within the supply chain in the second and third essays. Further, the three essays will collectively extend the current understanding of sustainable operations management by exploring it through two relatively new perspectives, i.e., "safety management" and "risk management".

Thirdly, this dissertation responds to the ever-growing need for drawing on established organizational theories to describe, explain, and predict operations and supply chain phenomena (Ketchen and Hult, 2007b, Sarkis et al., 2011) as it draws on three organizational theories (organizational support, agency/management control, and resource dependence theories) to better explain the underlying factors within the sustainable operations arena.

Finally, top management intentions can be quite different from the decisions made at the operational level when it comes to being more sustainable (Wheeler et al., 2002). Hence, this dissertation responds to Pagell and Gobeli's (2009) call for more research on sustainability at the operational level. In doing so, the first essay examines individual plants and not companies as the unit of analysis to be closer to day-to-day decisions at the operational level. The second and third essays also target supply managers, and not top management, as the decision makers in the supply chain context and the operational-level strategies, and not corporate-level ones, for managing the supplier sustainability risks.

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Chapter II

Chapter II. Safety Culture: A Catalyst for Sustainable Development[1]

1. Introduction

During the past three decades, sustainability has become an important strategic objective for businesses. Based on this concept, companies should operate in ways that secure their long-term economic performance by avoiding short-term behaviors which are socially detrimental or environmentally wasteful (Porter and Kramer, 2006). The organizations' growing interest in sustainability can be attributed to the increasing internal and external pressures (Sarkis et al., 2010) and to the risk of losing sales and even jeopardizing their survival (Ehrenfeld, 2005). In addition, organizations have realized that they can enjoy cost savings and gain long-term competitive advantage by being concerned about the future of people and planet and through the creation of unique sustainability-oriented processes (Hart, 1995).

This paper focuses on the internal dimension of "sustainable operations management" as defined by Kleindorfer and colleagues (2005), and how it affects the financial, environmental, and social performance of the organization. This dimension consists of (i) the management of human resources, health and safety at work, and adaptation to change, and (ii) the management of environmental impacts and natural resources. Specifically, the emphasis is on environmental management and workplace safety. Although both of them became important social responsibility issues during the 1970s, the green movement seems to have gained much more scholarly attention and despite their similarities, to date, there has been a lack of research to establish a link between the two (Cantor, 2008). The number of occupational safety research publications in top operations management journals has also remained extremely low (Das et al., 2008, De Koster et al., 2011). There are limited evidences in the operations management literature to show that managerial attention to employees' safety actually leads to improved performance (Das et al., 2008), yet the need for improving workplace safety is pressing. Each year, millions of people suffer disabling injuries and thousands are killed

[1] A version of this chapter has already been published (HAJMOHAMMAD, S. & VACHON, S. 2014. Safety culture: A catalyst for sustainable development. *Journal of Business Ethics,* 123**,** 263-281.)

at workplaces throughout the world. In the United States, nearly 4,690 work-related fatalities and 3.1 million nonfatal occupational injuries and illnesses have been reported in 2010 (Bureau of Labor Statistics, 2010). The Occupational Safety and Health Administration (OSHA) estimates that organizations pay almost $1 billion per week to injured employees and their medical care providers (Cantor, 2008).

In order to fill the gap in the current literature regarding the conjunction of occupational safety and ecological sustainability, this study attempts to address two major research questions: *"Are the organizations promoting occupational safety for their employees more likely to join the green movement?"* and, *"Does an organization's safety culture have a spillover effect on its environmental endeavors and financial performance?"* In doing so, we draw on the safety culture literature and organizational support theory (Eisenberger et al., 1997) to explain how the employees motivated by organizations' safety culture and their management commitment in improving workplace safety help the organization enhance its financial performance and effectively adopt environmental practices and improve its environmental performance. Similar to McFadden et al.'s (2009) proposed culture-initiative-outcome model for patient safety in the healthcare industry, we also suggest that a positive workplace safety culture encompassing two critical components, that is, management commitment and employees' participation/empowerment, positively affects its safety performance both directly and indirectly through implementation of safety practices. We examine these issues by applying a survey methodology and collecting primary data from a sample of 251 Canadian manufacturing plants.

This paper contributes to the operations management literature in many ways. First, by linking workplace safety and financial performance, this study provides a foundation for future research on making a business case for safety management. Second, a theoretical model is developed linking safety culture to safety and environmental management practices and performance. More specifically, the model suggests that a positive safety culture can improve organizations' safety and environmental performance both directly and indirectly through the adoption of related processes and practices. Third, it highlights the important role of individuals, both managers and employees, in achieving all three sustainability objectives, that is, improving social, environmental, and

financial performance. Finally, unlike other sustainable operations management studies which focus on the environmental sustainability as the entry point for operationalizing sustainability, this paper introduces the commitment to safety and establishing a positive safety culture as the starting point towards achieving sustainable development.

In the next section, we integrate two streams of literature on environmental and safety management and define the six constructs of interest. We then propose nine hypotheses building on the organizational support theory, safety culture literature, and prior empirical studies in sustainability domain. After presenting the research methodology and data analysis results, we discuss our findings and their theoretical and managerial implications.

2. Literature Review

2.1. Safety culture

The concept of safety culture (SC) was first coined in the International Nuclear Safety Advisory Group's (INSAG) summary report on the Chernobyl accident, published by the International Atomic Energy Agency (IAEA) in 1986. Although it has been widely used since then, there is no clear cut definition of the term safety culture and numerous definitions have been developed in the academic literature for it (Choudhry et al., 2007). It is used to describe an organizational culture in which safety is understood to be, and is accepted as, the top priority (Cooper, 2002). Cooper (2000) refers to it as the observable degree of effort by which all organizational members direct their attention and actions toward improving safety on a daily basis, while Richter & Koch (2004) describe it as the shared and learned meanings, experiences, and interpretations of work and safety which guide people's actions towards risk, accidents, and prevention. In a nutshell, a strong safety culture is formed when the values espoused by management are consistent with the behavior of the employees (Vredenburgh, 2002) and when safety is regarded by everyone as being an issue that concerns everyone (Choudhry et al., 2007).

Researchers have carried out empirical studies to determine the indicators which reflect safety culture (Mearns et al., 2003, Ostrom et al., 1993). Despite several inconsistencies in the idiosyncratic labeling of safety culture indicators, two factors — employees' participation and management commitment to safety — appear to be

replicated across several studies (Cox and Cheyne, 2000, Vecchio-Sadus and Griffiths, 2004, Fernández-Muñiz et al., 2007, McFadden et al., 2009). Hence, in this study, a positive safety culture is defined as one in which managers are committed to and reinforce safety as an organizational priority and employees adhere to the safety rules and guidelines and participate in their establishment and improvement.

2.2. Safety practices

Safety practices (S PR) are the policies, procedures and activities implemented or followed by the management of an organization targeting safety of their employees (Kirwan, 1998). They are the essential elements permitting an effective management of safety in organizations and are designed to comply with the existing applicable legislations. Numerous studies have attempted to identify specific safety management practices that improve safety performance in terms of accident and incident rates (Shannon et al., 1997, DePasquale and Geller, 1999, McFadden et al., 2009). They have revealed that organizations with lower accident rates are characterized by a few of the following factors: management's active involvement in safety initiatives; frequent safety training for employees; hazard identification and assessment; horizontal and vertical communication about safety issues; frequent safety inspections; safety-oriented reward systems; thorough investigation and statistical analysis of accidents and incidents; and empowerment of the workforce.

These practices can be categorized into two mutually exclusive groups of control and prevention. The former includes safety-related initiatives which are aimed at reducing the adverse impacts of accidents/incidents after their occurrence. Emergency response plans and actions are among these practices. The second group, however, includes the activities that are intended to prevent incidents/accidents occurrence, such as hazard identification and assessment, safety training, reporting incidents/accidents and statistical analysis of the collected data, and system redesign for improving the workplace safety. The latter type of practices is of interest in this study. Therefore, we define safety practices as the set of procedures/activities which aim at preventing incidents/accidents occurrence.

2.3. Environmental practices

Upon the enactment of various environmental regulations in the 1970s, organizations have allocated significant capital and operating budgets to control the adverse environmental impact of their products and processes. Environmental practices (E PR) encompass the techniques to reduce, minimize, or eliminate the negative impacts of organizations' operations, products or services on the natural environment (Shrivastava, 1995a, Rao and Holt, 2005). These practices are classified into three categories of pollution prevention, pollution control, and management systems (Klassen and Whybark, 1999a). While all three categories aim at improving environmental performance, practices which address pollution at the source are generally recognized to generate other benefits (Hart, 1995). This type of practice is of interest in this paper. Therefore, we define environmental practices as the techniques and procedures that lead to pollution reduction at the source (Thoumy and Vachon, 2012). They include efforts to analyze product life-cycle, prevent pollution, reduce wastes, or recycle materials.

2.4. Organization's performance

In line with sustainable development perspective, we define the organizations' performance along three dimensions: environmental performance (E PE), safety performance (S PE), and financial performance (F PE). The concept of safety performance refers to the extent to which organizations are able to prevent accidents and incidents or decrease their adverse impacts (De Koster et al., 2011). Environmental performance is defined as the extent to which an organization improves its performance in respect to its environmental responsibilities (Kleindorfer et al., 2005). Financial performance refers to the degree to which an organization achieves profit-oriented outcomes and reduces its overall costs.

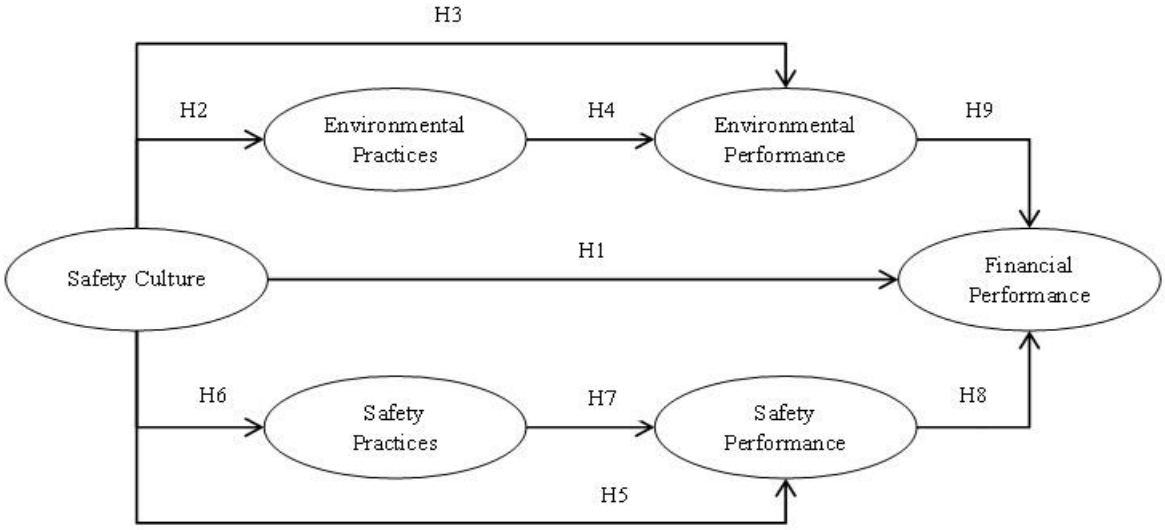
3. Conceptual Model and Hypotheses Development

In this section, drawing from safety and sustainability literatures and organizational support theory, we present our hypotheses on the interrelationships between six constructs of interest.

3.1. Safety culture and financial performance

Organizational support theory (Eisenberger et al., 1997), derived from social exchange theory (Blau, 1964), assumes that employees form general beliefs about how much their organization values their contributions and cares about their well-being. Central to this theory is the norm of reciprocity: when one person treats another well, the norm of reciprocity obliges the return of favorable treatment (Gouldner, 1960). Hence, the employees' perceived organizational support increases their willingness to further contribute to the organization's success and helping the organization reach its objectives (Eisenberger et al., 2001).

Figure II-1. Conceptual model



Applying this theory to the safety context, it can be posited that a positive safety culture stemming from management commitment has the potential to create a positive exchange relationship between the organization and its employees. When employees believe that top management cares about their personal safety and well-being, they will choose to reciprocate by developing affective commitment to the organization (Rhoades et al., 2001), putting forth discretionary effort on behalf of the firm (Piercy et al., 2006), and involving in more pro-social behaviors like aiding fellow employees, offering constructive suggestions, and gaining knowledge and skills that are beneficial to the organization (Meyer and Herscovitch, 2001). They will be more willing to pursue organizational goals and to remain with the organization (Meyer et al., 1990) which leads

to decreased absenteeism and turnover rates (Harrison et al., 2006) and increased productivity and customer satisfaction (Patterson et al., 2004, Mathieu et al., 2006). They will also feel more satisfied with their jobs (Rhoades and Eisenberger, 2002). All of these employees' reactions to their perceived organizational support lead to improved job performance, which in turn positively influences the organizational profitability and performance (Ostroff, 1992, Podsakoff and MacKenzie, 1997, Sun et al., 2007, Subramony, 2009).

H1: The level of an organization's safety culture is positively associated with its financial performance.

3.2. Safety culture, environmental practices, and environmental performance

The similarities between workplace safety and environmental management are significant enough that they have been thought of as major components of the overall concept of sustainability in the operations management literature (Kleindorfer et al., 2005). Activist groups interested in both environmental and occupational health issues have recognized the similarities between the two and have formed labor-environmental alliances across the United States known as "blue-green coalitions" (Mayer, 2009). However, to date, there has been a lack of research to establish a direct link between environmental management and workplace safety. In this paper, we argue that organizations with a positive safety culture are more likely to adopt an environmental sustainability perspective, implement ecologically friendly practices, and improve their environmental performance due to a number of factors. First, a prime component of safety culture relates to management commitment to safety and how it is demonstrated to the employees. The motives and drivers behind management commitment to safety are quite similar to the ones for seeking improvements in environmental performance (Taubitz, 2010). As a result, managers who are motivated to enhance their organizations' workplace safety will also be willing to invest in environmental practices (Caprar and Neville, 2012). According to Corbett and Kleindorfer (2001), these drivers include enhancing corporate image and reputation (Vastag, 2004), increasing revenue and market share (Delmas, 2001), seeking regulatory compliance (Snir, 2001), avoiding liability and negligence (Wolf, 2001, Kleindorfer and Saad, 2005), and improving company's relations with local communities and other stakeholders (Rothenberg et al., 2001).

Moreover, by encouraging and committing to a positive safety culture, top management can serve as champion of change and alter the culture of the organization to be more flexible and responsive to changes (Daily and Huang, 2001), hence increasing the chances of environmental practices' success, that is, improved environmental performance.

Second, it is frequently argued in the environmental management literature that motivated and empowered individuals can bring the critical ideas and deliver the efforts necessary to improve their organizations' environmental performance (Starik and Rands, 1995, Zwetsloot and Marrewijk, 2004). One of the critical components of a positive safety culture is employees' active involvement and participation in safety-related activities, which results in their empowerment. Therefore, it is possible to conclude that an organization with a positive safety culture will be able to implement environmental practices more effectively and improve its environmental performance due to employees' motivation and active participation.

Third, workplace accidents are sometimes associated with environmental problems. For example, air pollution due to the release of chemicals into the air is not only undesirable from an environmental point of view, but it also has an adverse impact on the working conditions of employees and their safety and well-being (Chandrashekar et al., 1999). Hence, being committed to eliminating workplace hazards and risks sometimes requires the organizations to implement environmental practices to prevent waste and pollution, which in turn results in improvements in their environmental performance.

Finally, both environmental and safety management domains require large-scale behavior change for a meaningful impact to be realized. For example, the same mindset that underlies practices to prevent workplace injuries can be applied in efforts to reduce energy consumption (Cunningham et al., 2010). The organizations with positive safety culture are the ones who have successfully managed to change their managers' and employees' attitudes and behaviors to be safety-oriented. Hence, they do not need to reinvent the wheel to develop successful interventions for aligning the employees' behaviors with environmental sustainability objectives. They can harness the momentum

of the safety culture and adapt successful behavioral interventions from the safety domain to achieve improvements in environmental sustainability.

H2: The level of an organization's safety culture is positively associated with the degree of investments in environmental practices within that organization.

H3: The level of an organization's safety culture is positively associated with its environmental performance.

Further, it is expected that adopting the techniques and procedures which take into account the environmental considerations, namely environmental practices, reduce the organization's negative impacts on the natural environmental (Melnyk et al., 2003). For example, organizations participating in emission and energy consumption reduction programs will reduce their carbon footprint by introducing energy conserving operation processes, conservation-oriented maintenance, and installing energy efficient lighting fixtures. Moreover, with proactive environmental practices, organizations can eliminate environmentally hazardous production processes, redesign their existing product systems to reduce life cycle impacts, and develop new products with lower life cycle costs (Hart, 1995). Likewise, they can analyze and understand the impacts of their products and processes on the environment and improve their environmental performance by conducting life-cycle analysis (Matos and Hall, 2007). Several studies to date have provided empirical evidences to support the positive relationship between environmental practices and environmental performance in organizations (Klassen and Whybark, 1999b, Pullman et al., 2009, Russo and Fouts, 1997).

H4: The degree of investments in environmental practices within an organization is positively associated with its environmental performance.

3.3. Safety culture, safety practices, and safety performance

Developing and maintaining a positive safety culture is an effective tool for improving safety-related outcomes at work, such as decreasing accidents and injuries and increasing safety compliance and safety knowledge of employees (Vecchio-Sadus and Griffiths, 2004, Hofmann and Stetzer, 1996, Neal et al., 2000). Organizations' safety culture considerably affects the employees' involvement in unsafe behaviors which, based on the Domino Model of Accident Causation (Heinrich, 1931), is one of the major root causes of workplace accidents in different industries (Mearns et al., 2003, Oliver et

al., 2002, Brown et al., 2000). Sulzer-Azaroff (1978) suggests that employees are "naturally" reinforced to engage in unsafe practices by taking shortcuts to achieve immediate positive results (e.g., completing the tasks in shorter time). Positive safety culture counteracts this "natural" reinforcement by increasing employees' motivation to comply with safety rules and also by increasing their awareness of rules and the importance of following them (safety knowledge). In their survey study of 551 workers from two steel plants located in the southeastern US, Brown et al. (2000) demonstrate that a weak safety culture increases the presence of unsafe work behaviors through employees' perceived work pressure and perceived barriers to safety. Similar findings have been reported by other studies such as Thompson et al. (1998) and Seo (2005).

A few empirical studies in operations management literature have demonstrated that several aspects of a positive safety culture such as the creation of a blame-free environment, a commitment to be safety-centered, an openness about errors, and a safety-over-productivity attitude lead to exceptionally good safety outcomes (McFadden et al., 2009, McFadden and Hosmane, 2001, De Koster et al., 2011). The frequency and severity of occupational accidents and incidents are reduced through improved safety culture in terms of management commitment and employee participation and empowerment. Top management commitment has a dual effect on safety performance (Krause and Weekley, 2005). On the one hand, committed leaders allocate adequate resources to implement safety initiatives and safety enhancing systems. On the other hand, they influence employees' behaviors simply by demonstrating support for improving workplace safety. When employees observe their management commitment, they will be more willing to co-operate to improve safety performance (Hofmann et al., 2003). They will try to comply with regulations, to take the proper safety measures, and to actively participate in activities designed to promote improvements in their workplace safety. Therefore, management commitment enhances employees' commitment and decreases occupational injuries (Zacharatos et al., 2005). In addition, employees' participation and commitment to safety is likely to increase not only their personal safety consciousness (De Koster et al., 2011), but also the safety of the work environment, through actions on safety suggestions and the encouragement of safe behavior among coworkers (Michael et al., 2005).

H5: The level of an organization's safety culture is positively associated with its safety performance.

A culture which encourages shared vision of a strategy usually results in an internal drive and passion to develop new innovation and embrace change (Hamel and Prahalad, 2005). According to Shrivastava (1995b), an organization's sustainability initiatives and its strategy must be closely interwoven, rather than being separate programs that are managed independently of one another. Top management's verbal commitment must be supported by their actions to effectively influence the workplace safety performance. To be perceived as credible, their words should be supported by establishing safety-related practices in the organization and allocating money for safety supplies and initiatives.

H6: The level of an organization's safety culture is positively associated with the level of implemented safety practices within that organization.

The preventive safety programs and practices are regarded in several studies as the antecedent of the employees' perceptions about the importance of safety in their organization and hence contribute to performing tasks in a safe manner (DeJoy et al., 2004). Companies that have better safety initiatives in place and invest more money in safety management are expected to have better safety outcomes (Hoonakker et al., 2005). The extent to which these practices are implemented in an organization affects the probability, frequency, and severity of the accidents and incidents. For example, communication of safety information through either formal training or informal on-the-job discussions enhances employees' safety awareness and consciousness, decreases their involvement in unsafe behaviors and hence, improves organizations' safety performance (De Koster et al., 2011).

It also helps them to identify the hazards in the workplace, and the procedures available to prevent, correct or minimize their risks (Fernández-Muñiz et al., 2007). Employees' involvement in the hazard identification and risk analysis process is another behavioral-oriented technique that provides them with authority, responsibility, and accountability for required decisions which in turn reduce their involvement in unsafe acts and consequently, the accidents rate (Rundmo, 2000, Cox and Cheyne, 2000, Vredenburgh, 2002).

H7: The level of implemented safety practices within an organization is positively associated with its safety performance.

3.4. Safety, environmental, and financial performance

It is widely believed that there is a trade-off between efforts in safety and profitability/production, that is, safety preventive measures require expenses that are not in line with production objectives, and consequently have negative impacts on organizations' profitability and competitiveness (Carrillo, 2005). Conversely, researchers have suggested that accidents have adverse effects in terms of decreases in productivity and quality and deterioration of the firm's public image or employee morale, all of which lead to decreased financial performance (Rechenthin, 2004, Brown, 1996). Evidences of both arguments have largely been anecdotal in nature. Therefore, to make a business case for safety, the level of invested resources in safety management should be compared to its impact on the organization's profitability.

Proactive safety engenders an increase in the organization's costs through areas such as salaries paid for safety professionals, employees' training, and protective equipment purchase. On the other hand, investing in safety can make changes in the organization's processes and production technologies, which in turn can offer benefits in terms of savings in materials or energy, and hence cutting the real costs of such investment (Ashford, 1997). Lack of safety, however, can result in direct and indirect costs when accidents and incidents occur.

The direct costs include such things as medical expenses, disability payments, attorney fees and property damage repair costs. The larger indirect costs with a long-term negative impact on the organization's financial performance include increased insurance costs, increased operational costs due to disruptions to work progress, loss or injury of trained and experienced workers, and loss of production quality due to a non-experienced employee performing work normally handled by an experienced employee who has been injured and is away from work (Manuele, 2011, Brown et al., 2000).

In addition, accidents also undermine the organization's internal relationships, workers' morale and motivation or harm its public image and cause a severe deterioration in its public relations (Smallman and John, 2001). They can also cause organizations to

miss delivery dates causing financial losses due to the delay itself and due to deterioration in the customers' perception of the firm (Fernández-Muñiz et al., 2009). Finally, strong safety reputation helps companies attract and retain higher-quality employees and reduce the costs of recruiting and training of new employees (Howard-Grenville et al., 2003).

H8: An organization's safety performance is positively associated with its financial performance.

Similarly, many organizations perceive trade-offs between environmental performance and economic performance. Researchers and practitioners have tried for a long time to find out whether it "pays" to be green. A large number of studies have demonstrated that environmental management efforts and improved environmental performance can increase firms' revenues and lower their overall costs (Melnyk et al., 2003, Angell and Klassen, 1999a, King and Lenox, 2002, Ambec and Lanoie, 2008). Improved environmental performance reduces the amount of waste, the consumption of various production inputs including energy and materials, and the number of components in products (Rothenberg et al., 2001).

Elimination of spills and other environmental damages prevents expenses associated with lawsuits and legal settlements (Karpoff et al., 2005). Pollution prevention can also allow a firm to avoid the cost of installing and operating pollution control devices and to reuse materials through recycling (Quazi et al., 2001, Hart, 1997). Waste reduction, another aspect of improved environmental performance, leads to better utilization of natural resources, improved efficiency and higher productivity, and reduces operation costs. Finally, an organization's strong environmental reputation, similar to safety reputation, results in lower costs for recruiting and training of new employees (Howard-Grenville et al., 2003).

In addition to its effects on costs, environmental performance can impact revenues either through gains in existing markets or access to new markets. Firms can benefit from their improved environmental performance as a powerful marketing tool which brings about increased revenue, market share, and new market opportunities (Klassen and McLaughlin, 1996, Rao and Holt, 2005). Examples of new

environmentally-conscious markets range from clothing produced with organic materials to hybrid vehicles. Hence, we expect that improved environmental performance in terms of lower levels of air emissions, waste water generation, solid waste disposal, and energy consumption contributes to better financial performance.

H9: An organization's environmental performance is positively associated with its financial performance.

4. Methodology

4.1. Data collection

Data from a sample of 1,001 Canadian manufacturing plants located in Ontario and Quebec provinces was collected through a mail survey distributed in April-May 2011, following a procedure inspired by Dillman (2000). We chose the plant as the level of analysis because it is generally where many safety and environmental issues are evaluated and operational decisions are implemented. The sample was randomly selected utilizing the Canadian Scott's Directory and included the plants with more than 100 employees (as it was reported by this database) from the industries included in the North American Industrial Classification Systems (NAICS) codes 315 to 337, excluding process-based industries such as paper, petroleum, and chemical products. These codes include leather goods, textile products, clothing, wood products, furniture, plastic and rubber products, machinery, transport equipment, electrical equipment, and fabricated metal industries. A follow-up phone call was made a couple of weeks after the mailing to confirm the reception of the questionnaire and to encourage participation. A total of 251 usable responses, mostly from plant managers, were collected from that effort, that is, a response rate of 25%.

4.2. Survey questionnaire and measures

The survey instrument used for this research includes a total of 32 items measured on a seven-point likert-type scale for the six main constructs (listed in Appendix II-A). As noted earlier, safety culture construct represents management commitment to reinforcing safety as organizational priority and employees' adherence to the established safety rules and guidelines and their participation in workplace safety activities. In this study, safety culture was measured by seven items adapted from a

previously published safety climate survey (Sexton et al., 2003). Similar to McFadden et al.'s approach (2009), we only included seven of the original 19 items which measured safety culture at the organizational level and were most closely aligned with our definition of safety culture in Section 2.1. A seven-item scale captured the degree and level of implementation of seven activities that aim to improve workplace safety, such as taking input from all stakeholders on hazard identification/assessment and incident/accident reduction methods, reporting incidents/accidents without blame, open-ended discussion groups, safety training for employees, statistical analysis of incidents/accidents data, and system redesign for safety. These items were taken from McFadden et al.'s scale (2009) for patient safety initiatives and modified based on OHSAS 18001 (British Standards Institution, 2007) principles of a workplace safety management system. Safety performance was also measured by a five-item scale taken from McFadden et al.'s scale (2009) for safety outcomes. These items were modified to assess the changes in the workplace safety performance of the plant over a two-year period on five different dimensions, that is, severity, frequency, and impact of incidents/accidents, as well as increased awareness and understanding of incidents/accidents and their root causes.

The extent of environmental practices was assessed using a five-item scale which captured the extent to which resources have been invested in five programs related to environmental management over the previous two years: ISO 14001 certification, pollution prevention, recycling of materials, life cycle analysis, and waste reduction. Environmental performance was measured by a five-item scale, in terms of improvements in the amount of air emissions, waste water generation, solid waste disposal, consumption of hazardous/harmful/toxic materials, and energy consumption over a two-year period. Lastly, financial performance was measured by a three-item scale, in terms of the level of a plant's average return on investment, average profit, and profit growth compared to the industry average over a two-year period.

In addition to the variables presented above, we also examined three control variables to avoid any unjustifiable influence of alternative factors, other than those included in our model, on the plant's performance. First, we controlled for plant size because the safety, financial and environmental performance gains or failures we observe

may be explained by this factor as opposed to the mechanisms we model. On one hand, larger firms may have greater adverse environmental impacts or larger number of accidents/incidents and consequently be under more external pressure to improve their performance. On the other hand, they might have larger resource pools to invest in environmental technologies or safety practices and consequently higher levels of environmental/safety improvement (Vachon and Klassen, 2006a). In our study, plant size is measured as the number of employees (logarithmized). The second possible confounding effect relates to the complexity of a plant's internal processes. Plants with a higher level of complexity could be prone to lower levels of performance. The number of plant's product lines is taken as a proxy for the level of plant complexity. Finally, we controlled for the percentage of unionized shop floor workers, as it can affect a plant's safety performance.

4.3. Post-hoc tests of data appropriateness

We assessed nonresponse bias using t-tests to compare the early and late waves of responses (Lambert and Harrington, 1990, Armstrong and Overton, 1977). Two groups of 63 surveys were chosen from the first and last waves of surveys received (i.e., the upper and lower quartiles of the returned surveys), and t-tests were performed on the responses of the two groups on four demographic-related as well as ten randomly-selected items in the dataset. The t-tests yielded no statistically significant differences, suggesting that nonresponse may not be a problem to the extent that late respondents represent the opinions of non-respondents.

To minimize key-informant bias, we contacted each plant by phone prior to sending the survey to identify the manager most knowledgeable about the financial, environmental, and safety issues (Kumar et al., 1993). Although responses from multiple informants may have been preferred, we believe that our informants were positioned to make the assessment asked of them. In addition, we checked for common method bias to assure that the observed relationships between variables are not confounded by the respondents' social desirability, leniency, acquiescence, and other social, psychological, and measurement factors. To reduce the likelihood of common method bias, the dependent variables were placed after the independent variables in the survey to

diminish, if not avoid, the effects of consistency artifacts (Podsakoff et al., 2003). In addition to this precaution taken during the survey design, Harman's single factor post hoc test (Harman, 1976) was performed. The exploratory factor analysis revealed seven factors with eigenvalues greater than 1.0 that accounted for 63.67% of the total variance. The first factor only accounted for 29.4% of the variance. These results suggested that common method bias was not a serious problem in our study (Podsakoff et al., 2003).

Finally, in order to establish the validity of the answers provided by the single respondents and to enhance the rigor of research, the survey data on environmental performance were compared to the objective data which is publicly available from National Pollutant Release Inventory (NPRI) provided by the federal government of Canada (Environment Canada, 2010). This database contains information on more than 300 pollutants released and transferred from individual plants across Canada (air, water, land and injected underground and transferred offsite to disposal, treatment, sewage, energy recovery and recycling). Of the 251 plants in our sample, we were able to identify 56 of them in the NPRI database. In line with our definition of environmental performance in the survey data to be the improvement of plant's environmental impacts over a two-year period (i.e., 2008-2010), we took three different measures of change in pollutant release over the same period from NPRI data of the 56 plants in our sample (Henri and Journeault, 2010). These measures include changes in onsite air emissions, changes in total onsite emissions, and changes in total onsite and offsite emissions. Nonparametric Spearman Rank Correlation test shows positive and significant correlations between the mean score of environmental performance as provided by the respondents and each of the abovementioned measures (correlations of 0.436, 0.406, 0.385; $p < 0.01$). Hence, the self-rated improvement in environmental performance is positively correlated with the improvement in the level of pollutants released from 2008 to 2010. These results are in line with Dixon-Fowler et al.'s (2013) meta-analysis findings which indicate that the use of self-report measures of environmental performance does not result in different outcomes than the use of archival data.

Given that the majority of the firms in our sample were privately owned and also because the unit of analysis was the plant, unfortunately, a meaningful validation of financial performance data with a third party secondary data source was not possible.

Moreover, manufacturing plants' accident/incident records were not publicly available and hence, we could not validate the safety performance data.

5. Data Analysis

Partial Least Squares (PLS) method and, more specifically, SmartPLS 2.0 (beta) software (Ringle et al., 2005) was selected as the modeling technique for testing the proposed conceptual model in this study for a number of reasons (Peng and Lai, 2012). The environmental management and safety management concepts have seldom been examined in one single study, and there are no well-established theories that can directly serve as the theoretical foundation of their hypothesized relationships, making PLS an appropriate analysis tool for the exploratory nature of this study. Second, PLS performs better relative to covariance-based structural equation modeling (CBSEM) techniques in testing complex models with small sample sizes. To test the hypothesized relationships using CBSEM techniques, the minimum required sample size would be 350 cases, while the minimum sample size of 60 cases is enough for PLS analysis (Tanaka, 1987, Chin and Newsted, 1999). Finally, unlike CBSEM, PLS does not assume multivariate normality in the data, making it useful where observations do not fit with this restriction. Kolmogorov-Smirnov and Shapiro-Wilk tests show that the variables in this study are not normally distributed (Statistics: 0.113-0.354 and 0.711-0.941; $p < 0.01$). Multivariate kurtosis of 136.803 with critical ratio value of 23.231 further confirms the data's departure from multivariate normality requirement for using CBSEM techniques (Byrne, 2010).

As stated earlier, the items related to safety culture, practices, and performance constructs were adopted from McFadden et al.'s (2009) study with a healthcare context and applied to a manufacturing context in this study. Therefore, constructs' uni-dimensionality was tested prior to PLS data analysis to purify the measurement scales. The sample of 251 cases was randomly split in half for uni-dimensionality pre-test (Sample 1) and data analysis (Sample 2) to avoid the problem of capitalization on chance due to specification searches and model modifications aiming at improving the measurement models (MacCallum et al., 1992).

5.1. Uni-dimensionality of constructs

Uni-dimensionality refers to existence of a single concept underlying a group of measures (Gerbing and Anderson, 1988). Following Kim, Kumar, & Kumar (2012), uni-dimensionality of the six constructs was assessed through confirmatory factor analysis (CFA) employing IBM SPSS Amos 19 (Arbuckle, 2010) software.

The measurement model for each construct was estimated first. Then, the constructs were combined into pairs and each pair was estimated separately. The measurement model including all constructs was estimated last. At each step, we assessed whether or not the model fit the data by examining the t-values, standardized residuals, modification indices, and a number of goodness-of-fit indices. These indices are reported for pair-wise and total measurement models in Table II-1.

Table II-1. Fit Indices for pair-wise and total measurement models (CFA)

Model	χ^2 (df)	χ^2 /df	GFI	CFI	NFI	RMR	RMSEA
(1) SC and S PR	56.618 (42)	1.348	0.925	0.983	0.938	0.066	0.054
(2) SC and S PE	43.869 (33)	1.329	0.935	0.984	0.939	0.044	0.052
(3) SC and E PR	20.844 (29)	1.097	0.959	0.995	0.950	0.083	0028
(4) SC and E PE	31.474 (26)	1.211	0.945	0.984	0.918	0.072	0.042
(5) SC and F PE	18.421 (19)	0.970	0.965	1.000	0.967	0.055	0.000
(6) S PR and S PE	56.943 (41)	1.389	0.918	0.983	0.942	0.062	0.057
(7) S PR and E PR	32.988 (24)	1.374	0.946	0.986	0.951	0.077	0.056
(8) S PR and E PE	59.466 (33)	1.802	0.916	0.956	0.908	0.105	0.081
(9) S PR and F PE	31.588 (25)	1.264	0.947	0.992	0.961	0.081	0.047
(10) S PE and E PR	13.584 (18)	0.755	0.973	1.000	0.972	0.060	0.000
(11) S PE and E PE	45.638 (25)	1.826	0.924	0.955	0.907	0.055	0.083
(12) S PE and F PE	16.733 (18)	0.930	0.967	1.000	0.974	0.035	0.000
(13) E PR and E PE	13.632 (12)	1.136	0.970	0.991	0.933	0.067	0.034
(14) E PR and F PE	15.995 (8)	1.999	0.959	0.979	0.960	0.105	0.091
(15) E PE and F PE	18.380 (13)	1.414	0.957	0.984	0.950	0.051	0.058
Measurement Model	310.697 (280)	1.110	0.844	0.983	0.852	0.092	0.030
Recommended value		< 3.0	>0.9	>0.9	>0.9	<0.07	<0.08

During this stage, six items were dropped due to their low loadings or high cross-loadings to establish uni-dimensionality of all six constructs (S PR-3, SC-5,6, E PR-1,2 and E PE-3). A comparison of the goodness-of-fit statistics to the recommended values of these fit indices reveals an adequate fit of the modified measurement models to data.

5.2. Estimation of measurement model

After establishing the uni-dimensionality of the constructs and identifying their measurement models' structure, the next step is to test the measurement models in PLS and assess reliability, convergent, and discriminant validity of the constructs (Fornell and Larcker, 1981). The reliability study indicates the degree of internal consistency between the multiple variables that make up the scale, in other words, the extent to which the indicators or items of the scale are measuring the same concepts. In PLS, alternative ways of judging multiple-item consistency, rather than Cronbach's alpha, are used. The methods look at (1) the reliability of the individual items that make up the measure, and (2) the composite reliability of the items as a group (comparable to Cronbach's α). Individual item reliability is assessed using the item's loading on the construct. A common rule of thumb is to accept items with more explanatory power than error variance (Carmines and Zeller, 1979), that is, with loadings greater than 0.7 (Fornell and Larcker, 1981).

Table II-2: Reliability and convergent validity

Items	Loadings	Composite Reliability	AVE	Items	Loadings	Composite Reliability	AVE
S PR		0.89	0.57	**SC**		0.89	0.61
S PR-1	0.81			SC-1	0.86		
S PR-2	0.78			SC-2	0.86		
S PR-4	0.71			SC-3	0.83		
S PR-5	0.78			SC-4	0.75		
S PR-6	0.66			SC-7	0.57		
S PR-7	0.79						
S PE		0.91	0.68	**E PE**		0.80	0.50
S PE-1	0.79			E PE-1	0.71		
S PE-2	0.76			E PE-2	0.72		
S PE-3	0.90			E PE-4	0.73		
S PE-4	0.84			E PE-5	0.67		
S PE-5	0.83						
E PR		0.85	0.65	**F PE**		0.93	0.81
E PR-3	0.68			F PE-1	0.88		
E PR-4	0.87			F PE-2	0.92		
E PR-5	0.86			F PE-3	0.90		

Of the 26 items in the various scales, four of them were below this threshold with minimum loading of 0.57, which were kept in the measurement model to retain the content validity of their underlying constructs. All factor loadings were also statistically significant ($p < 0.01$). Further, composite reliability assesses the inter-item consistency,

which should also have a minimum value of 0.7. All of the scales demonstrated acceptable performance on this basis (see Table II-2).

Table II-3: Discriminant validity

Constructs	SC	S PR	S PE	E PR	E PE
Safety Practices	8.164[a]				
Safety Performance	22.328	10.861			
Environmental Practices	11.500	6.028	13.693		
Environmental	45.445	39.724	44.738	23.354	
Financial Performance	40.877	29.58	37.193	24.203	30.322

[a] Chi-square differences between each constrained model and unconstrained model. Difference in degree of freedom=1. All of the differences on pair-wise comparisons of the scales were significant at p-value of 0.05.

The standard for acceptable convergent validity is that the construct's average variance extracted should exceed 0.5, indicating that the items share at least half of their variance with the construct (on average). Again, as depicted in Table II-2, all scales performed acceptably on this basis. Discriminant validity addresses the potential problem of having measures for one construct overlap the conceptual territory of another construct. To test the discriminant validity, we ran a series of nested measurement model comparisons in which we constrained the covariance between each pair of constructs to one (Bagozzi and Yi, 1988) employing IBM SPSS Amos 19 software. The chi-square difference tests for all pairs of constructs were statistically significant at p-value of 0.05 (Table II-3).

Table II-4: Correlation matrix

	SC	SPR	SPE	EPR	EPE	FPE	PS	PC	PU
Safety Culture	**0.782**								
Safety Practices	0.644	**0.760**							
Safety Performance	0.375	0.421	**0.826**						
Environmental Practices	0.327	0.355	0.291	**0.806**					
Environmental Performance	0.270	0.267	0.333	0.405	**0.709**				
Financial Performance	0.223	0.0926	0.131	0.062	0.053	**0.900**			
Plant Size (PS)	0.143	0.208	0.146	0.010	0.253	-0.018	---		
Plant Complexity (PC)	0.064	0.126	0.104	0.083	0.106	0.041	0.035	---	
Plant Unionization (PU)	-0.179	-0.010	0.059	-0.114	0.082	-0.118	0.257	-0.016	---

Note: The diagonal elements are the square roots of the average variance extracted (AVEs); the off-diagonal elements are the inter-construct correlations.

In addition, the square roots of the average variance extracted for all constructs were greater than all of the inter-construct correlations (Table II-4), which is the evidence of sufficient discriminant validity (Chin, 1998). Lastly, the examination of items' cross-loadings table revealed that each item loading in the table was higher on its assigned construct than on the other constructs, supporting adequate convergent and discriminant validity (Table II-5). In conclusion, analysis of measurement models shows that the underlying items have sound measurement properties.

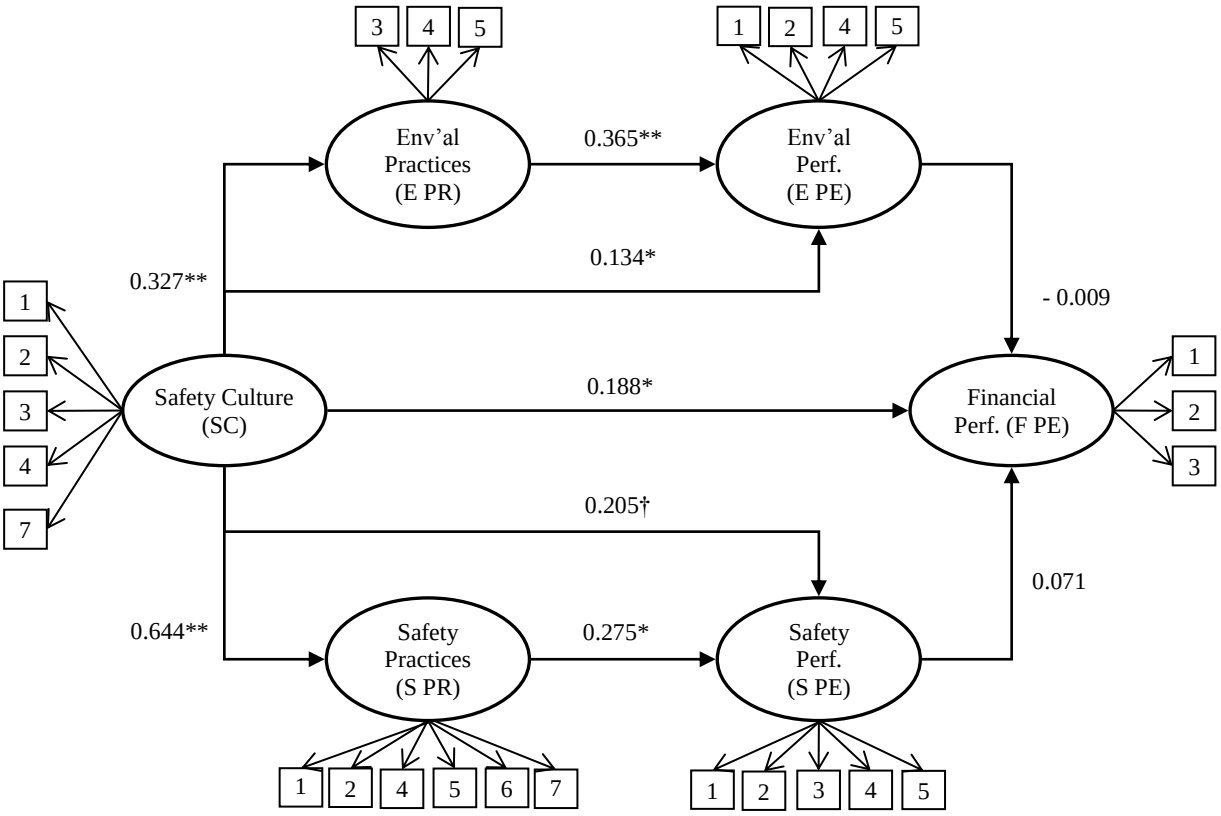
Table II-5: Items' loadings and cross loadings

	SC	S PR	S PE	E PR	E PE	F PE
SC-1	**0.856086**	0.574074	0.335555	0.203486	0.193460	0.227667
SC-2	**0.861346**	0.636442	0.400247	0.299042	0.260134	0.189557
SC-3	**0.833518**	0.517873	0.272859	0.365991	0.182012	0.214257
SC-4	**0.751196**	0.403083	0.253265	0.192810	0.264597	0.095844
SC-7	**0.571110**	0.302853	0.138098	0.194353	0.152026	0.115093
S PR-1	0.505175	**0.810734**	0.412488	0.302197	0.277991	0.105624
S PR-2	0.469439	**0.780191**	0.366759	0.291825	0.320267	0.022419
S PR-4	0.426686	**0.712782**	0.329754	0.296235	0.248036	0.053277
S PR-5	0.578305	**0.780517**	0.278958	0.285101	0.120648	0.113758
S PR-6	0.348686	**0.657853**	0.183378	0.253216	0.140738	0.071565
S PR-7	0.554295	**0.788583**	0.304574	0.196274	0.105100	0.050754
S PE-1	0.249454	0.280278	**0.790960**	0.145808	0.267561	0.074865
S PE-2	0.231601	0.270760	**0.761963**	0.226765	0.165912	0.005269
S PE-3	0.349595	0.387367	**0.904002**	0.290938	0.295493	0.099822
S PE-4	0.397617	0.422307	**0.836836**	0.317523	0.350376	0.193498
S PE-5	0.276561	0.336743	**0.832791**	0.187636	0.255772	0.119907
E PR-3	0.011611	0.044205	0.061323	**0.679766**	0.255566	-0.030949
E PR-4	0.362132	0.363395	0.282157	**0.869028**	0.380516	0.091470
E PR-5	0.285333	0.332682	0.278294	**0.855550**	0.321731	0.043062
E PE-1	0.232116	0.236627	0.221394	0.222662	**0.707168**	-0.013022
E PE-2	0.240499	0.129715	0.213679	0.319833	**0.725124**	-0.035886
E PE-4	0.177320	0.168694	0.285507	0.311707	**0.730406**	0.064413
E PE-5	0.118834	0.217479	0.225827	0.295025	**0.672866**	0.127352
F PE-1	0.198687	0.115876	0.141765	0.051190	0.017266	**0.879212**
F PE-2	0.177816	0.032216	0.097317	0.022261	0.014962	**0.923632**
F PE-3	0.220380	0.095946	0.113804	0.087719	0.100661	**0.897033**

5.3. Estimation of structural model

The PLS structural model was assessed using bootstrapping procedure (Efron and Tibshirani, 1993) with 250, 500, and 1000 times of resampling. The magnitude and statistical significance of the structural paths were consistent across the three rounds of bootstrapping. Figure II-2 and Table II-6 show the path coefficients and the explained construct variances.

Figure II-2. Operational model with path coefficients



† < 0.10 Level of Significance
* < 0.05 Level of Significance
** < 0.01 Level of Significance

The R^2 values of 0.25, 0.21, and 0.06 indicate that the model explains a fair amount of variance for environmental, safety, and financial performance, respectively. As demonstrated in Figure II-2, the links between safety culture and financial performance, environmental practices, and safety practices are significant (t-values equal to 2.03, 4.12, and 12.68, respectively) offering evidence for hypotheses H1, H2, and H6. Environmental practices are also significantly related to environmental performance (t =

4.57), providing statistical support for H4.

The significant safety culture-safety performance and safety practices-safety performance paths provide support for hypotheses H5 and H7 (t = 1.77 and t = 2.32). Sobel test (Preacher and Hayes, 2004) further demonstrates that the former relationship is partially mediated by safety practices (Sobel = 2.28; $p < 0.05$). Similarly, the significant safety culture-environmental performance path provides support for hypothesis H3 (t = 2.04) and Sobel test confirms that this relationship is partially mediated by environmental practices (Sobel = 3.06; $p < 0.01$). As to hypotheses H8 and H9, Figure II-2 and Table II-6 show that the safety and environmental performance do not significantly relate to financial performance. With regards to the three control variables included in the model, only plant size can significantly affect environmental performance.

Table II-6: PLS structural model results

	Standardized Coefficient	t-Value[a]
Safety Culture → Financial Performance	0.188	2.028*
Safety Performance → Financial Performance	0.071	0.071
Environmental Performance → Financial Performance	-0.009	0.086
Plant Size → Financial Performance	-0.034	0.385
Plant Complexity → Financial Performance	0.022	0.183
Plant Unionization → Financial Performance	-0.078	0.815
Safety Culture → Safety Performance	0.205	1.770†
Safety Practices → Safety Performance	0.275	2.317*
Plant Size → Safety Performance	0.036	0.439
Plant Complexity → Safety Performance	0.056	0.858
Plant Unionization → Safety Performance	0.087	0.974
Safety Culture → Environmental Performance	0.134	2.039*
Environmental Practices → Environmental Performance	0.365	4.571**
Plant Size → Environmental Performance	0.203	2.218*
Plant Complexity → Environmental Performance	0.062	0.978
Plant Unionization → Environmental Performance	-0.096	1.048
Safety Culture → Safety Practices	0.644	12.684**
Safety Culture → Environmental Practices	0.327	4.119**

Variance explained in the endogenous variables			
Financial Performance	$R^2 = 0.061$	Safety Practices	$R^2 = 0.415$
Safety Performance	$R^2 = 0.209$	Environmental Practices	$R^2 = 0.107$
Environmental Performance	$R^2 = 0.250$		

[a] ** = $p < 0.01$, * = $p < 0.05$, † = $p < .10$.

Overall, the conceptual model that we originally proposed gained adequate support from the data. The safety culture proved to be related to the environmental,

safety, and financial performance through direct and indirect paths defined in the model.

6. Discussion

The significant results for the direct and indirect relationships between safety culture and all three dimensions of organizational performance (i.e., financial, environmental, and safety performance) lend support for the concept of reciprocity norm and organizational support theory in workplace safety context. Organizational support theory (Eisenberger et al., 1997) is built upon the underlying concept that employees' perceived organizational support stimulates their felt obligation to return the profitable treatment they receive from their organization by caring about the organization's success and helping the organization reach its objectives.

Our results suggest that organizations with a positive safety culture, where (i) top management is concerned about employees' safety and well-being and (ii) employees are empowered and actively involve and participate in safety-related activities, are more likely to gain better financial, environmental, and safety outcomes as a result of their increased employees' commitment in pursuing organization goals and objectives.

These results are also in accord with total quality management literature (Kaynak, 2003, Samson and Terziovski, 1999, Nair, 2006, Curkovic et al., 2000), as well as human resource management literature (Huselid et al., 1997, Jayaram et al., 1999, Subramony, 2009), pointing out the beneficial effects of management commitment and employee empowerment on organizational performance.

Our results also contribute to the workplace safety, sustainability, and operations management research in several ways. This is the first study to provide empirical evidence for the relationship between safety, environmental, and financial dimensions of sustainable development in one model. Prior research and managerial practices regarding sustainability in operations management emphasize the environmental issues as the entry point for operationalizing sustainability. Our results, however, suggest that commitment to safety and establishing a positive safety culture as the starting point towards achieving a sustainable business can yield great benefits not only in terms of improved safety performance, but also with regards to improvements in firms' environmental and financial outcomes.

Our results also reaffirm the proposed safety chain concept put forth by McFadden et al. (2009) for patient safety in healthcare industry as we provide empirical evidence for their safety culture-initiative-outcome model in a manufacturing context. More specifically, this study demonstrates that a culture of safety within the workplace is tied to the successful implementation of safety practices and, ultimately, to improved safety performance in terms of reduction in the frequency, severity, and impact of incidents/accidents, as well as heightened awareness and understanding of incidents/accidents and their root causes. We have also extended their model and explored the connections among safety chain variables with financial performance and ecological sustainability. More specifically, given the similarities between a safety-oriented and an environmental-friendly culture, our theoretical model and empirical results suggest that McFadden et al.'s model can be extended to environmental management domain. In other words, a strong safety culture directly relates to successful implementation of green practices and improved green performance of the firm.

Our study is also consistent with a recent stream of studies in Corporate Social Responsibility (CSR) domain which focuses on the details of CSR activities and on how firms can maximize the beneficial effects of CSR on their financial outcomes (Basu and Palazzo, 2008, Margolis and Walsh, 2003, Tang et al., 2012, Houghton et al., 2009, Kim et al., 2010). Specifically, our findings provide partial support for Tang et al.'s (2012) study, suggesting that two "CSR engagement strategies" can increase the overall CSR benefits to the firm: (i) pursuing an "internal CSR" activity (in our case, safety culture) as the entry point of CSR engagement rather than an "external CSR" activity, and (ii) engaging in other "related" CSR dimensions with similar resources, skills, and knowledge requirements (in our case, environmental management) at the next steps.

Unfortunately, the research reported here is of a purely cross-sectional snapshot and we are unable to test and account for the lags between the development of the safety culture and the existence of practices and performance changes, which is a limitation of all such studies. Therefore, we suggest that two further streams of field research are needed. The first is to conduct in-depth case studies to detail the impact of safety culture and improvement initiatives on the performance dimensions internally used by the firms, to determine the rich fabric of how the culture and these initiatives lead to performance

changes. Secondly, to increase the rigor of the study, a set of longitudinal studies are required to measure the extent of safety-oriented culture and the implementation level of safety and environmental practices and their impact on organizational performance across a three to five year period, examining the relationships and their development through time. These studies can collect secondary panel data for companies whose CSR and performance information are available on databases such as Compustat and Environmental, Social, and Governance factors (ESG) in addition to gathering primary survey data from the same companies.

Lastly, the surprising findings of no significant relationship between safety/environmental performance and financial performance merit some discussion. One reason for the lack of such effects could well lie in a possible lagged relationship between these performance constructs, as suggested by Hart and Ahuja (1996). Their results provide some evidence that it may pay firms to be green, but only after a time lag. Specifically, they found that it takes up to two years for improved environmental performance in terms of emission reduction to improve accounting profitability measures, such as return on sales (ROS), return on assets (ROA), and return on equity (ROE). Therefore, our somewhat puzzling findings might not be surprising after all. Moreover, this lagged effect could be due to reputation considerations. For example, a firm that is sued in time period t may experience an immediate stock price reaction (Klassen and McLaughlin, 1996, Konar and Cohen, 2001), but the accounting returns may only be affected several years later if the litigation results in substantial legal or compliance costs. Similarly, although a firm may emit toxic chemicals in one year, this information is only released to the public with at least a one-year lag, which in turn takes one more year for it to affect the firm's revenue and profit. Unfortunately, we did not perform a longitudinal study and cannot empirically investigate this suggestion. This will remain a topic for subsequent research.

We must also acknowledge some other limitations of our study. First, reliance on single-respondent perceptual data is a potential shortcoming of survey methodology, creating grounds for bias. While any potential bias of this kind cannot be explicitly ruled out, earlier research suggests no major concerns (Vachon and Klassen, 2006b, Sarkis et al., 2010, Hajmohammad et al., 2013, Ellis et al., 2010, Jiang, 2009b, Gadenne et al.,

2009). Moreover, studies suggest that self-reported data are highly consistent with more objective measures, especially when the respondents are at the appropriate level within the organization (Ketokivi and Schroeder, 2004, Miller and Roth, 1994). Besides, validation of our survey data on environmental performance with NPRI objective measure confirms that there is no major bias in the single respondent self-reported data in this study. Second, the plants included in this study were selected from a limited range of industries with moderate levels of safety and environmental risks. Indeed, our findings might not be completely applicable to industries with lower levels of workplace hazards/adverse environmental impacts. Exploring the effect of industry type - with regards to safety and environmental concerns - on our proposed model is a fruitful avenue for future research (Baird et al., 2012).

In addition, the findings of this paper suggest other areas for future research. For example, it would be interesting to explore the connections between our proposed model and firms' competitive advantage. Given that safety culture is shown here to be an important driver of sustainability, additional longitudinal research should examine whether it leads to, or is associated with, emergence of an environmental-friendly culture within the organizations.

7. Conclusion

This paper addresses Brown (1996) and Cantor's (2008) almost-unanswered calls for workplace safety research in operations and logistics management, and puts the anecdotal trade-off between safety and productivity/profitability into question. The arguments advanced in this paper illuminated how two aspects of safety culture, that is, management commitment and employee participation, could directly enhance the three dimensions of the organization's performance, i.e., safety, environmental, and financial performance. Specifically, we demonstrated that safety culture influences safety performance indirectly through the mediating effect of safety practices. We also showed that organizations with a safety-oriented culture were more likely to join the green movement, adopt green technologies and successfully implement green practices, and subsequently, improve their environmental performance.

This study is distinct from previous works in the CSR and sustainability fields in

that it looks into the inter-relationships between safety and environmental management constructs and suggests using safety as an entry point for operationalizing sustainability for an organization. Further, it emphasizes on both the human benefits (safety performance) and the business case (environmental and financial performance) of achieving this broader conceptualization of sustainability. It also uses survey data from validated and reliable scales specifically designed to measure the defined constructs rather than the standard MSCI ESG (also known as KLD) data which is often the source of proxy variables for CSR-related constructs in CSR literature.

On the practical level, the proposed model provides the organizations' managers a path for designing or rethinking their approaches towards sustainability and a guideline for making the best out of their established environmental and safety management systems. To keep up with the worldwide quest for sustainability in various industries, many organizations have sought to become environment-oriented and establish environmental management systems such as ISO 14001, after becoming customer-oriented and implementation of quality management systems such as ISO 9001 during late 20th and early 21st centuries. This study provides empirical support that both financial and environmental outcomes are tied to the safety culture, suggesting that organizations desiring to make environmental and financial improvements need to focus their attention on this infrastructural issue as the first step and emphasize the important role of the individuals' commitment, empowerment, and participation. Our results suggest that managers interested in improving environmental and safety performance of their plants in parallel to their financial gains should follow a systematic approach in creating a culture of safety prior to pursuing ecological sustainability. Once employees' safety becomes a priority within the organization and employees participate in building a safe workplace environment, organizations can transfer the gained momentum to successfully adopt environmental technologies, implement safety practices and, ultimately, improve their safety/environmental performance.

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Appendix II-A: Survey Items

Constructs and their Scale Items*	Mean	S.D.
Safety Culture (SC)		
To what extent does your plant exhibit each of the following organizational characteristics? (1=not at all, 7=great extent)		
SC-1: Senior management listens to and cares about employees' safety concerns.	6.24	0.89
SC-2: The plant's management is driving the workforce to be a safety-centered organization.	6.16	0.88
SC-3: The plant's management acts upon the employees' suggestions regarding safety matters.	5.93	0.99
SC-4: The plant's employees encourage each other to report any safety concerns they might have.	5.19	1.33
SC-5: Employees' safety is constantly reinforced as a priority.	Dropped	
SC-6: The plant's management knowingly compromise safety concerns for productivity.	Dropped	
SC-7: The plant's employees adhere to the established safety rules and guidelines.	5.26	0.99
Safety Practices (S PR)		
To what extent has your plant implemented the following practices as a means to reducing safety incidents/ accidents? (1=not at all, 7=great extent)		
S PR-1: Taking input from all stakeholders on hazard identification and assessment.	5.59	1.12
S PR-2: Taking input from all stakeholders on incident/accident reduction methods.	5.52	1.16
S PR-3: Reporting incidents/accidents without blame.	Dropped	
S PR-4: Open-ended discussion groups (discuss openly about incidents/accidents).	5.39	1.33
S PR-5: Safety training for employees.	5.75	1.11
S PR-6: Statistical analysis of incidents/accidents data.	5.18	1.59
S PR-7: System redesign for safety (restructuring the functioning of equipment, technology, procedures, etc.)	5.71	1.12
Environmental Practices (E PR)		
Over the last two years, to what extent has your plant invested resources (money, time, and people) in programs in the following areas? (1=not at all, 7=great extent)		
E PR-1: ISO 14001 certification.	Dropped	
E PR-2: Pollution prevention.	Dropped	
E PR-3: Recycling of materials.	4.88	1.55
E PR-4: Life cycle analysis.	2.68	1.64
E PR-5: Waste reduction.	4.57	1.59
Safety Performance (S PE)		
Over the last two years, to what extent have the following safety performance indicators changed? (1=much worse, 7=much better)		
S PE-1: Frequency of incidents/accidents.	5.21	1.08
S PE-2: Severity of incidents/accidents.	5.26	1.15
S PE-3: Understanding of incidents/accidents.	5.39	0.98
S PE-4: Awareness of possible incidents/accidents.	5.56	0.90
S PE-5: Impact of incidents/accidents.	5.27	1.05
Environmental Performance (E PE)		
Over the last two years, to what extent has your plant's environmental performance changed in the following areas? (1=much worse, 7=much better)		
E PE-1: Air emissions.	4.63	0.89
E PE-2: Waste water generation.	4.65	1.01
E PE-3: Solid waste disposal.	Dropped	
E PE-4: Consumption of hazardous/harmful/toxic material.	4.78	1.04
E PE-5: Energy consumption.	5.04	1.07
Financial Performance (F PE)		
Rate the following plant's performance over the last two years against the industry average. (1=well below, 7=well above)		
F PE-1: Average returns on investments.	4.57	1.15
F PE-2: Average profits.	4.39	1.33
F PE-3: Profit growth.	4.40	1.25

Chapter III

Chapter III. Managing Supplier Sustainability Risk: Strategies, Predictors, and Outcomes[1]

1. Introduction

Over the years, suppliers' questionable practices with regard to sustainability-related[2] issues such as climate change, labor regulations, and workplace safety standards are increasingly projected to the buying organizations (Jiang, 2009a). The buyers[3] caught up in such social or ecological scandals face stakeholders' criticism and adverse publicity followed by substantial recalls and litigation costs, market share and revenue losses, and reputational damage (Parmigiani et al., 2011). At the same time, with the revolutionary growth of the social media industry making bad news travel globally at the speed of a tweet, the adverse consequences of such events has increased dramatically (Eccles et al., 2007). Several anecdotes from the literature suggest that trying to separate the actions of suppliers from their responsibility does not protect the buyers – as popular brand powerhouses like Nike, Nestlé, BP, and Apple have discovered the hard way over the past two decades. The study by Lefevre et al. (2010) shows that buyers, on average, face 12% reduction in their market capitalization after a sustainability-related problem is detected within their supply chains. Thus, suppliers' ecological or social misconducts pose an inherent risk to buyers, coined as *"supplier sustainability risk"* (Foerstl et al., 2010).

Surprisingly, however, supply chain risk management (SCRM) literature has largely neglected this type of risk (Seuring and Müller, 2008), except for a few recent studies (Foerstl et al., 2010, Hofmann et al., 2014, Klassen and Vereecke, 2012).

As with any other type of risk, buyers' ability to manage supplier sustainability risk is critical to their long-term competitiveness (Eccles et al., 2007). In doing so,

[1] An abridged and refined version of this chapter has been submitted for publication to Journal of Supply Chain Management.

[2] Throughout this paper, we use the term 'sustainability' to refer to ecological and social aspects of an organization's operations.

[3] Throughout this paper, we use the term "buyer" to refer to the buying organization contracting work to a "supplier" organization. The term "supply manager" refers to a middle manager in the buying organization, who is responsible for managing the relationship with one or multiple groups of supplier organizations.

anecdotal evidence suggests that buyers may apply *sustainable supplier development* initiatives, such as *monitoring* the suppliers (like Ford and GM) (Zhu et al., 2007) or *collaborating* with them (like IKEA) (IKEA, 2012) to improve their social or ecological performance and mitigate the risk. In certain cases, buyers like Staples may take extreme measures and avoid the risk all together by *phasing out* the supplier (Grant and Ando, 2008). On the other hand, the re-emergence of events such as the massive collapse of Rana Plaza in Bangladesh in April 2013, killing more than 1,100 workers at the textile sweatshops which were suppliers to international brands including Primark, Bon Marche, and Joe Fresh suggests that, in some cases, buyers simply accept the risk and practice damage control by *taking no actions* and addressing the risk after its occurrence (Reuter et al., 2010). The question remains as to "*Why, how and under what conditions buyers respond to supplier sustainability risks within their supply chains?"*.

To answer this question, this paper aims to take a step toward building a theory of supplier sustainability risk management. More specifically, given the crucial role of supply managers as the decision makers in the supply chain context (Ellis et al., 2010, Tazelaar and Snijders, 2013), we focus on the strategies they undertake at the operational level (Pagell and Gobeli, 2009). Since supplier sustainability risk is an inter-organizational phenomenon, we adopt the exchange relationship between a buyer and a specific supplier as the context and the buyer–supplier transaction as the unit of analysis in our study. The focal decision is the supply managers' decision to select among four abovementioned risk management strategies.

We draw on resource dependence (Pfeffer and Salancik, 2003) and agency/management control (Eisenhardt, 1989, Ouchi, 1979) theories to explain different responses to supplier sustainability risk. Each of these theoretical lenses provides valid, yet incomplete, insights into the factors that affect the supply managers' choice. The agency and management control theories explain how the uncertainties and risks inherent in a buyer-supplier relationship affect the control mechanisms used by supply managers to mitigate the supplier sustainability risks at suppliers' facilities. The resource dependence perspective, however, emphasizes the supply managers' ability to implement the intended control mechanism, as their choice may be constrained given the dependence structure of their relationship with the other party. Integrating these different

foci, our conceptual framework suggests that supply managers' response to supplier sustainability risks is contingent upon their perceived risk as well as the level of buyer and supplier dependence on each other. We further extend this framework to include the slack resources available to supply managers and how it can shift their choices toward options which require fewer resources for implementation.

The contributions of this paper to the supply chain management literature are three-fold. First, despite the growing number of studies in sustainable supply chain management and supply chain risk management areas, their literature streams have unfolded largely independent of one another with few exceptions (Cousins et al., 2004, Kocabasoglu et al., 2007) and the issues that exist at their intersection have remained largely unexplored (Krysiak, 2009). Specifically, the majority of studies on supply chain risks tend to address two general categories of supply risk, i.e., coordination risks (Souza et al., 2004) and disruption risks (Craighead et al., 2007). The present paper contributes to these literatures by explicitly focusing on supplier sustainability risk and the contingent operational-level strategies used to manage it.

The second contribution of this study is to the sustainable supply chain management (SSCM) literature. Whereas prior studies have established that supply chain characteristics affect buyers' approach toward SSCM, the mechanisms underlying such relationships, explaining why and how they exist, have not been investigated. For instance, Awaysheh & Klassen (2010) suggest that product visibility as well as distance from suppliers are positively related to the use of supplier socially-responsible initiatives. Another example is Klassen & Vereecke's (2012) case study which proposes that monitoring or collaborative initiatives with regard to social issues in supply chains are prompted by increased accountability to stakeholders and by comparing actual social performance with regulatory, customer, and community expectations. Our study, however, suggests that such initiatives are basically employed as risk mitigation strategies and explains the conditions under which each of them is more likely to be used.

Third, by integrating the agency/management control and resource dependence theories, this paper responds to the ever-growing need for drawing on established organizational theories to describe and predict supply chain phenomena (Ketchen and

Hult, 2007a, Sarkis et al., 2011).

The following section begins by reviewing the literature on supplier sustainability risk management and positioning the paper within the wider SCRM literature. Section 3 provides the theoretical underpinnings of the proposed conceptual framework and its related propositions. We conclude by discussing the paper's implications and limitations in Section 4.

2. Supply Chain Risks and Sustainability

Supply chain risk management literature is generally concerned with "pure risks" within supply chains which, in contrast to "speculative risks", involve the situations where no gain relative to the starting position is possible as the outcome of the risk event (Yates and Stone, 1992). In other words, supply chain risk refers to the possibility of unpredictable events resulting in negative consequences for the firm under investigation in a supply chain (Narasimhan and Talluri, 2009). In an attempt to differentiate supply chain risks from other adverse events in the business, early studies on SCRM developed various supply chain risk typologies or taxonomies based on risk sources (i.e., the events through which supply chain risks materialize) or consequences (Manuj and Mentzer, 2008, Oke and Gopalakrishnan, 2009).

A review of the literature indicates that studies focusing on the upstream supply chain risks (i.e., supply risks as opposed to demand risks) are traditionally concerned with the events negatively affecting the interconnected flows of material, information, and funds in supply chains (Sodhi et al., 2012). Such risks are classified into two categories: (i) coordination risks, materializing through incoordination between supply and demand, such as delays, forecast inaccuracies, or procurement failures (Souza et al., 2004), and (ii) disruption risks, materializing through unexpected internal or external process failures or disruptions, such as equipment malfunctions, strikes, or natural hazards (Kleindorfer and Saad, 2005). In contrast, "supplier sustainability risks"[4] (Foerstl et al., 2010) materialize through adverse stakeholder reactions (Hofmann et al., 2014) and occur when buyers are held accountable by customers, NGOs, or other salient

[4] Throughout this paper, we maintain the term "supplier sustainability risk" as it has already been used within the SCRM literature. Alternatively, these risks could also be coined as reputational risks (Jiang et al., 2009; Roehrich et al, 2014) because of their detrimental direct effects on the buyer's reputation.

stakeholders (Mitchell et al., 1997) for their suppliers' misconducts related to natural environment or social communities (Amaeshi et al., 2008, Parmigiani et al., 2011).

Our review of SCRM literature indicates that supplier sustainability risk is an emerging notion with different scopes and definitions. It was first identified by Cousins et al. (2004) as the driver of environmentally-oriented supplier management initiatives to avoid reputational loss. However, Foerstl et al. (2010) were the first to coin the term and define it as "the risk of corporate reputational damage to the buying firm, caused by supplier [sustainability-related] misconduct[s]" (p. 118). Klassen & Vereecke (2012), further, focused on the social sustainability risks within supply chains and highlighted their adverse effects on buyers' costs and revenues. Only recently, however, a concise conceptualization of supplier sustainability risk based on a theory-driven approach was provided by Hofmann et al. (2014), which lays the basis for our study (p. 168):

> *"[a sustainability-related] condition or a potentially occurring event",* located within a buyer's supply base, that *"may provoke harmful stakeholder reactions."*

Based on this literature, we suggest that the source-consequence mechanism underlying a specific supplier sustainability risk is as follows: a sustainability-related problem occurs in buyer's supply base, this event is detected and noticed by concerned stakeholders, and stakeholders regard it as illegitimate and unacceptable and hold the buyer responsible for the event. As such, supplier sustainability risk is the cumulative likelihood of these events and their consequences (Roehrich et al., 2014). Hence, the level of supplier sustainability that buyers face depends not only the probability and immediate consequences of suppliers' misconducts, but also on other factors such their size and visibility in the marketplace (Bowen, 2002), location of their supply base (Reuter et al., 2010), salience of concerned stakeholders (Parmigiani et al., 2011), and their industry (Neef, 2004).

2.1. Managing supplier sustainability risk

The purpose of supply chain risk management is to address the likelihood of supply chain risks and their consequences by analyzing the risk sources and implementing proactive or reactive risk management strategies to protect the

organizations from such unexpected events and their adverse effects (Yates and Stone, 1992, Ritchie and Brindley, 2007). Although they may try to do this in a number of ways, their responses would fit into three generic categories of risk management strategies: avoidance, acceptance, and mitigation (Ritchie and Brindley, 2007, Blome and Schoenherr, 2011).

In an attempt to develop a new concept for supplier sustainability risk management, Hofmann et al. (2014) introduced four functions which fully integrated stakeholder management into the buyer's supply chain risk management system: (i) stakeholder involvement function to identify those stakeholders that are most important to buyer's specific business environment, (ii) translator function to process implicit stakeholder expectations and explicate them into more clear assessment criteria, (iii) supplier management function to convert these criteria into strict operating instructions and enforce them throughout the supply chain, and (iv) stakeholder management function to interact with the stakeholders and present them with the buyer's efforts toward meeting their expectations. The focus of this study is on operational-level actions which supply managers undertake to manage the supplier sustainability risk within their supply base. So, the scope of our risk management framework is limited to the actions pursued by the supplier management function in Hofmann et al.'s framework. Foerstl et al. (2010) suggest that such actions include *supplier phase-out* and *sustainable supplier development*.

2.1.1. Supplier phase-out (risk avoidance)

By implementing supplier phase-out, supply managers terminate their relationship with their incumbent risky supplier and switch to another alternative supplier with a clean sustainability record. Hence, supplier phase-out fits into the category of risk avoidance strategies which entails the elimination of risk by withdrawing from the risky situations (Jüttner et al., 2003). In other words, it is geared toward driving the risk event probability to zero by removing the risk source. Some organizations immediately inhibit further business undertakings with suppliers by blacklisting them in their order placement system once a misconduct is detected at their facilities (Reuter et al., 2010). For example, in June 2013, Wilmar International Ltd., the world's largest palm oil trader, decided to

cut ties with all Indonesian suppliers who were found to clear land for cultivation with illegal fires (Yun et al., 2013).

2.1.2. Sustainable supplier development (risk mitigation)

Sustainable supplier development (SSD) initiatives fit into the risk mitigation category (Ritchie and Brindley, 2007). Such initiatives are defined as the buyers' plans and strategies to integrate the ecological and social issues into supply management process to improve the ecological and social performance of the upstream suppliers (Bai and Sarkis, 2010, Krause et al., 2007). Therefore, they are the buyers' means for reducing the probability of supplier sustainability risk through enhancing supplier's ecological and social performance. The practices and activities that collectively define SSD can be classified in two categories: monitoring-based and collaboration-based initiatives (Vachon and Klassen, 2008, Zhao et al., 2007).

Monitoring-based SSD initiatives, also known as "buyer-to-supplier" mechanisms (Jiang, 2009a), focus on assessing the processes or actual performance of suppliers against specific characteristics or particular performance criteria to verify their compliance with the requirements. As part of this approach, buyers usually gather and process suppliers' information, set proper criteria, and assess the sustainability-related aspects of incoming goods and the suppliers that provide them through surveys and audits, and ask suppliers to report on different dimensions of their social and ecological performance (Seuring and Müller, 2008, Bowen et al., 2001). These are usually enforced through written social/ecological requirements within contracts (Neef, 2004, Ciliberti et al., 2008), requiring third-party certifications (Morali and Searcy, 2013), or imposing the buyers' codes of conducts on the suppliers (Andersen and Skjoett-Larsen, 2009). For instance, Bristol-Myers Squibb, IBM, and Xerox encouraged their Chinese suppliers to develop environmental management systems consistent with ISO 14001 and Ford, GM, and Toyota required their suppliers to obtain ISO 14000 certification (Zhu et al., 2007). In 2010, IBM extended its Social and Environmental Management System to its first-tier suppliers, requiring them to diffuse the same program to the sub-suppliers involved in the IBM supply chain (Friedman, 2013).

However, *collaboration-based SSD initiatives*, also known as "peer-to-peer"

mechanisms (Jiang, 2009a), aim at improving the suppliers' ecological and social performance through partnership, i.e., direct interaction with them and implementation of jointly-developed ecological and social solutions (Golicic and Smith, 2013). They encompass a broad range of activities like providing training programs to suppliers, compensating them for the costs associated with their compliance (e.g., joint investments in environmental friendly equipment), and sponsoring ecological or social summits to encourage the suppliers to share their information and experience (Vereecke and Muylle, 2006). For example, IKEA tries to change the mind-set of its suppliers particularly in developing countries by improving their knowledge and understanding of sustainability-related issues. It also provides financial supports to its suppliers in the form of a loan for their sustainability-related capital-intensive investments, such as a building wastewater treatment plants at their sites (Spence and Bourlakis, 2009).

2.1.3. No proactive actions: damage control (risk acceptance)

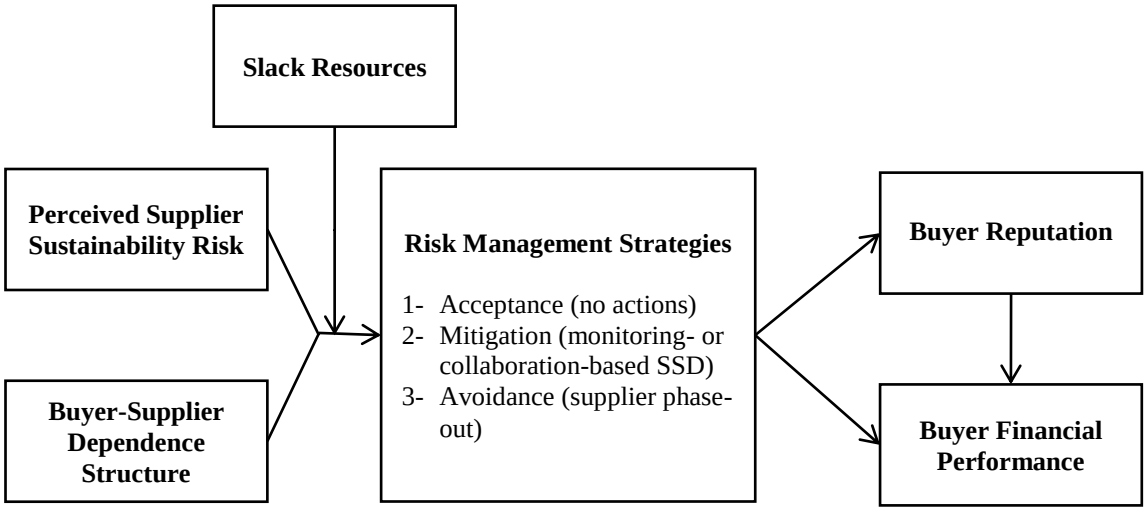
In addition to the proactive strategies suggested by Foerstl et al. (2010), we also include risk acceptance as a reactive strategy that buyers might use to manage supplier sustainability risk. Taking on this strategy, supply managers simply retain the risk by taking no preventive actions, budgeting for damage control, and dealing with the potential risk event should it happen at some point (Sodhi and Tang, 2012). A notable example is BP's oil spill case in Gulf of Mexico in 2010, causing an explosion that killed 11 of the 126 crew members and an oil spill that took 87 days to get under control. Although BP's chief contractors, Transocean, which owned the mobile drilling rig, and Halliburton, which was responsible for the cementing operations, shared the blame for many of the fatal mistakes, BP was ultimately responsible for the accident and paid close to $40 billion in fines, cleanup costs, and settlements, with an additional $16 billion due to the Clean Water Act (Broder, 2011).

3. Conceptual Framework for Managing Supplier Sustainability Risk

As mentioned in the previous section, there is no one way to manage the supplier sustainability risk and supply managers may select from amongst a range of risk management strategies. Based on resource dependence (Pfeffer and Salancik, 2003) and agency/management control (Eisenhardt, 1989, Ouchi, 1979) theories, we suggest that

two major predictors drive the supply managers' strategy choice: the level of supplier sustainability risk they perceive as well as the dependence dynamics of the specific buyer-supplier relationship.

Figure III-1. Conceptual framework



We further propose that the risk management strategies improve buyers' financial performance directly or indirectly through their enhanced organizational reputation. Finally, as illustrated in Figure III-1, we suggest that selecting desirable strategies that fit the external environment contingencies (i.e., risk and dependence) and the positive performance and reputational outcomes significantly depend on the slack resources available to implement those strategies.

3.1. Theoretical lenses

3.1.1. Agency and management control theories

Agency and management control theories (Eisenhardt, 1989, Ouchi, 1979) generally provide a useful framework for looking into the buyer and supplier interactions in supply chain context and understanding the buyers' responses to supply chain risks (Zsidisin and Ellram, 2003, Ketchen and Hult, 2007a). In this framework, the buyer serves as the principal delegating work to the agent, i.e., the supplier. Both agent and principal are motivated by self-interest (i.e., are opportunistic) and seek to receive as much possible utility with the least possible expenditure (Davis et al., 1997). These theories are concerned with two kinds of agent opportunistic behaviors that a principal

must control: pre-contractual opportunism, aka "adverse selection" (e.g., withholding and misrepresentation of information) and post-contractual opportunism, aka "moral hazard" (e.g., shirking and cheating behaviors) (Lassar and Kerr, 1996, Williamson, 1979).

Control is generally defined as any process used by an individual, a group, or an organization to affect or determine what another individual, group, or organization does under different situations (Tannenbaum, 1968). According to agency and management control theories, principals can take three distinct control mechanisms to keep their agents' behaviors in check: output, behavior, and input control mechanisms (Eisenhardt, 1989, Ouchi, 1979). Output controls focus on agents' performance, i.e. evaluating it against predetermined targets and giving them the authority to choose the means to achieve those goals (Ouchi, 1979). Behavior controls, on the other hand, concentrate on the transformation process of agents' work, i.e., the processes, tasks, and activities that are expected to lead to their performance outcomes (Ouchi, 1977). Although output controls mainly motivate agents through the use of incentives and behavior controls ensure of their motivation through close supervision, both mechanisms are centred on evaluation and feedback processes (Gencturk and Aulakh, 1995). However, input controls emerge from a socialization process between principal and agent, which results in shared beliefs and values (Patzelt and Shepherd, 2008). They influence the agents' behaviours in a way that their commitment to the relationship is enhanced, and adjust the antecedent conditions of their performance (i.e., their knowledge, skills, abilities, values, and motives) to ensure that they have the required ability to perform well (Snell, 1992, Ouchi, 1979).

The focus of this study is on the post-contractual stage, where suppliers' misconducts in terms of labor standards, ecological issues, or other sustainability-related concerns giving rise to supplier sustainability risks are considered as opportunistic behaviors which need to be controlled by the buyers (Moore, 2001, Jiang, 2009a). The premises of agency and control theories apply to such situations because: (i) suppliers may not share the same interests as the buyers (goal incongruence) and might have different risk preferences, (ii) there is information asymmetry between two parties, and (iii) there are costs associated with buyers' verification of suppliers' behaviors (Eisenhardt, 1989). A control mechanism, here, refers to any process or initiative used by

buyers to influence the behavior and performance of suppliers to decrease the likelihood of suppliers' opportunistic behaviors, i.e., their sustainability-related misconducts (Handley and Benton, 2013).

The more efficient these behaviors are controlled, the less supplier sustainability risk the buyer will face. Hence, control mechanisms perform as risk mitigation strategies. Output controls mitigate supplier sustainability risks by assessing suppliers' social and ecological performance against a set of pre-specified objectives such as a code of conduct. Behavior controls, however, reduce the risk by close monitoring and evaluation of suppliers' actions over time and providing constructive feedbacks for correcting the deviations (Handley and Benton, 2013). Hence, in this study, the combination of output and behavior control mechanisms resembles the monitoring-based SSD initiatives (Vachon and Klassen, 2006a, Golicic and Smith, 2013). In contrast, when buyers use input controls, they decrease the probability of suppliers' misconducts by contributing to suppliers' awareness building, encouraging them to promote a socially and ecologically responsible culture, and helping them develop related capabilities rather than a specific short-term outcome (Ciliberti et al., 2008). Therefore, in this study, the input control mechanisms are exemplified by the collaboration-based SSD initiatives (Golicic and Smith, 2013, Vachon and Klassen, 2008).

3.1.2. Resource dependence theory

The dependence concept in supply chains has been argued to be one of the key attributes influencing supply chain management issues such as buyer-supplier relationship (Cox, 2004), supplier development (Carr et al., 2008), and supply chain performance (Gulati and Sytch, 2007). According to resource dependence theory, organizations are not self-sufficient and depend on each other for resources, and such interdependency introduces uncertainty into their decision-making environment (Pfeffer and Salancik, 2003). As a result, they adjust their structure and behaviors to acquire and maintain their required resources and try to reduce their environmental uncertainties and dependencies by means of control mechanisms (Hillman et al., 2009). Resource dependence theory predicts that the type of such control mechanism depends on the level and nature of dependence they develop, and the relative power of all players (Pfeffer and

Salancik, 2003). Consequently, in a supply chain context, we expect that the buyers' risk management strategies applied as control mechanisms to deal with the supplier sustainability risks would depend on the buyer-supplier dependence structure of the specific relationship (Cox, 2004).

3.2. Risk management predictors

In order to develop a series of propositions linked to the front-end of the proposed conceptual framework, an approach composed of a series of systematic steps is needed. First, the concepts of perceived risk and buyer-supplier dependence structure are defined and presented in this section. These two concepts are then pulled together in Sections 3.3 and 3.4 to develop a series of contingency-based propositions.

3.2.1. Supply managers and their perception of risk

As discussed earlier, supplier sustainability risk is the cumulative likelihood and consequence of a series of events: occurrence of a sustainability-related misconduct in buyers' supply base, stakeholders' detection of the misconduct, and stakeholders' attribution of the misconduct responsibility to the buyers. There is no doubt that buyers' response to this cumulative risk may depend on many different factors, including the nature of suppliers' misconducts, their size, and ownership (Klassen and Vereecke, 2012), stakeholders' salience (Parmigiani et al., 2011), buyer's orientation toward sustainability (Pagell and Wu, 2009), the relevant laws and regulations in place (Jiang, 2009a), and the individual attributes of the decision makers, such as their experience as well as their sustainability-related values (Ellis et al., 2011).

However, behavioral research on decision-making in uncertain situations has shown that the effect of such factors on the decision outcome is mediated through the decision makers' perception of risk (Pablo et al., 1996, March and Shapira, 1987). More specifically, management responses to supplier sustainability risks are essentially not motivated by completely objective evaluations of risks but by their subjective risk perceptions (Ellis et al., 2010, Kocabasoglu et al., 2007), defined as their assessment of the risk inherent in a situation (Sitkin and Weingart, 1995). In the same vein, there are studies suggesting that one of the prevalent drivers of implementation of SSD initiatives by buyers is their managers' perception of the risks involved (Zhu and Sarkis, 2007,

Walker and Jones, 2012). Particularly, supply managers have been found to play a critical role in developing management systems (Angell and Klassen, 1999b) and to be the most significant driving force of extending sustainability-related initiatives throughout the supply chains (Ehrgott et al., 2011, Carter and Jennings, 2004).

Therefore, in this study, we focus on the level of supplier sustainability risk (the cumulative risk) perceived by supply managers as one of the major predictors of their choice amongst the four risk management strategies. In addition, since this study focuses on how the perceived supplier sustainability risk - rather than its determinants - influences the decision outcome, we do not differentiate between the risks associated with social and ecological aspects of sustainability.

3.2.2. Buyer-supplier dependence structure

Based on Cox et al.'s (2003) seminal work on supply chain dependence structure, there are four dependence regimes that buyers and suppliers can find themselves in: (1) *buyer dominance,* which implies that supplier is highly dependent on buyer and this is not reciprocated by the latter, (2) *interdependence,* which occurs when both buyer and supplier are highly dependent on each other, (3) *supplier dominance,* which is precisely the reverse situation of buyer dominance, and (4) *independence,* which indicates a situation where both buyer and supplier have little or no dependence on the other party.

Our conceptual framework suggests that the strategies selected by supply managers to deal with supplier sustainability risk heavily depend on the dependence regime of the specific buyer-supplier relationship because it signifies the power of buyer in implementing the strategy.

3.3. Managing supplier sustainability risk: buyer dominance or interdependence situations

High level of supplier dependence on the buyer has been shown to increase the buyer's relative power in the relationship, enabling it to significantly influence the actions and intentions of the supplier (Benton and Maloni, 2005, Bastl et al., 2013). The dependent suppliers are more likely to cooperate with the buyers (Carr et al., 2008) and

to make changes to their production processes and product specifications to meet their requirements (Hartley and Choi, 1996). More specifically, recent studies suggest that high supplier dependence is a traditional requirement for supplier's compliance to buyer's specific social and ecological standards and requirements (Locke et al., 2009, Pedersen, 2009). It follows that supply managers can mitigate the supplier sustainability risk either through monitoring-based or collaboration-based SSD initiatives when supplier is highly dependent on buyer, i.e., in "buyer dominance" or "interdependence" situations.

In these two situations, high level of supplier dependence translates into increased influence of the dominant buyers, allowing them to contractually set out socially or ecologically responsible conditions for suppliers (Cramer, 2008) and successfully implement their SSD strategies (Spence and Bourlakis, 2009, Pedersen, 2009, Hoejmose et al., 2013). As a result, suppliers will have to act in a responsible manner (Jenkins, 2006, Andersen and Skjoett-Larsen, 2009) or they will be excluded from the buyers' supply base (Perry and Towers, 2009, Gulati and Sytch, 2007). This conclusion is in line with Kraljic's (1983) strategic recommendation to buying organizations to exploit their full bargaining power so as to minimize the supply risks if they are the dominant player in the supply chain, or to get defensive and start looking for substitute material and suppliers if the supplier has the upper hand in the game. Hence, high supplier dependence is a precursor for implementing either of the SSD-based risk mitigation strategies.

> *P1: When supplier dependence on buyer is high (i.e., buyer dominance and interdependence situations), supply managers are more likely to mitigate the supplier sustainability risk through SSD initiatives rather than to avoid or to accept it (Cells A,B,E; Fig. III-2).*

3.3.1. Effect of perceived risk in buyer dominance situation

As outlined in P1, supply managers in a buyer dominance situation are more likely to mitigate the supplier sustainability risk either through monitoring-based or collaboration-based SSD initiatives rather than to avoid or to accept it. In this section, we draw on agency and management control theories to look into the effect of their perceived risk on their choice between these two risk mitigation strategies.

Based on the agency theory, behavior and output control mechanisms are used when the agents' performance ambiguity and the environmental uncertainties are at a low level and when there is not a substantial incongruence between agent and principal goals (Eisenhardt, 1989, Ouchi, 1980, Rowe et al., 2012). These conditions reflect a situation where the decision makers perceive a low level of risk. For instance, the global fashion brand Zara faces a relatively low level of supplier sustainability risk because almost 70% of its suppliers are based in Europe (Ghemawat and Nueno, 2006). Therefore, it suffices to merely enforce its code of conduct throughout its supply chain (Inditex, 2013). In contrast, its US-based competitor, Gap Inc., with the majority of its suppliers operating in Asia, has to take further steps, like pursuing a stakeholder engagement strategy (Smith et al., 2011) or providing a $20 million of capital to support fire safety improvements at supplier facilities (Gap Inc., 2013). Therefore, we can conclude that:

> *P1-a: In buyer dominance situations, supply managers are more likely to mitigate low level of perceived supplier sustainability risk through monitoring-based rather than collaboration-based SSD initiatives (Cell A; Fig. III-2).*

As the level of perceived risk increases, monitoring-based controls will not be a viable option for supply managers (Ouchi, 1977) since this mechanism limits their span of control (e.g., limited number of audits conducted at suppliers sites) and increases the probability of suppliers' misconducts, and thereby amplifies supplier sustainability risk (Ouchi, 1979, Handley and Benton, 2013). In addition, even with these initiatives in place, supplier deception may emerge since supply managers, at best, can take a snapshot of what is happening at a suppliers' facilities but often do not explore why it is happening or how the situation can be improved. An exclusive reliance on this strategy may create a system in which suppliers' main objective is to pass the audits, rather than to address the substantive issues that are the focus of the audit (Jiang, 2009a, Roth et al., 2008). Hence, monitoring-based SSD initiatives are not suitable for risk mitigation if supply managers perceive a high level of supplier sustainability risk.

Input control mechanisms, however, are shown to be used in situations where high levels of complexity and uncertainty create a high risk situation for the principal (Ouchi, 1980). When the need for goal congruence between the principal and agent is high, in other words, when the probability of agent's opportunistic behavior is

significant, employing input control mechanism is more appropriate (Rowe et al., 2012, Wilkins and Ouchi, 1983). In the same vein, when supply managers' perceived supply risk increases, they become more eager to develop closer relationships with their suppliers to deal with the uncertainty and risk because such relationships increase their social capital, promote effective communication, enhance the trust in their relationship, and improve suppliers' performance (Zsidisin and Ellram, 2003). Besides, suppliers are found to be more likely to perform in compliance with what buyers require in terms of sustainability issues when the buyers' governance efforts are toward persuasion and cooperation rather than threats and compulsion (Jiang, 2009a, Locke et al., 2009). Thereby, with collaboration-based initiatives in place, the high probability of suppliers' misconducts is more likely to decrease (Cousins and Menguc, 2006). In addition, buyers with a prior experience of reputational damage due to their suppliers' sustainability-related misconducts shift toward more cooperative relationship with their suppliers to properly diffuse their concerns and values (Spence and Bourlakis, 2009). This can be the result of an increase in the risk they perceive. A notable example is Nike's new approach toward supplier management: establishing close relationships with fewer but more capable suppliers, through frequent communication, information sharing, and joint problem-handling. To improve suppliers' compliance with its code of conduct, Nike moved from a market relationship to a collaborative partnership where suppliers had a deeper and more secure association with Nike and internalized its sustainability-related values and practices (Lim and Phillips, 2008). More recently, it has decided to provide its suppliers with its own state-of-the-art screening tools, called bluesign technologies, that will allow them to select more sustainable dyes, detergents, and chemicals for use in the textile manufacturing process (Fellow, 2013). Therefore, we can conclude that:

> *P1-b: In buyer dominance situations, supply managers are more likely to mitigate high level of perceived supplier sustainability risk through collaboration-based rather than monitoring-based SSD initiatives (Cell B; Fig. III-2).*

3.3.2. Effect of perceived risk in interdependence situation

The interdependence between buyer and supplier is likely to result in their long-term relationship with permanent inter-organizational linkages in order to ensure stable flow of resources (Casciaro and Piskorski, 2005). It creates an environment which fosters

partnership (Mentzer et al., 2000) and strategic alliance (McCarter and Northcraft, 2007). In general, the more mutually-dependent buyer and supplier are on each other, the more they will be willing to develop collaborative norms (Cai and Yang, 2008), i.e., to trust and commit resources (Lund-Thomsen and Lindgreen, 2013), meet frequently and share key information (Zacharia et al., 2011), and participate in joint planning and action (Gulati and Sytch, 2007). Besides, within an interdependent relationship, consequences of the risks associated with sustainability-related misconducts in supply chain can affect both buyer and supplier. Therefore, regardless of the level of supplier sustainability risk perceived, both parties will develop a mutual understanding of the importance of sustainability-related issues and will be more likely to mutually address the problems with a sense of common purpose (Hoejmose et al., 2013). Given this, we can conclude that buyer-supplier interdependence provides the ideal circumstances for the supply managers to pursue collaboration-based SSD initiatives to mitigate the supplier sustainability risk (Millington, 2008, Van Tulder et al., 2009).

> *P1-c: When both buyers and suppliers are highly dependent on each other (i.e., interdependence situation), supply managers are more likely to mitigate the supplier sustainability risk through collaboration-based rather than monitoring-based SSD initiatives, regardless of their perceived level of risk (Cell E; Fig, III-2).*

3.4. Managing supplier sustainability risk: independence or supplier dominance situations

In contrast to buyer dominance and interdependence situations, neither one of the two risk mitigation strategies can be effectively used when supplier dependence is low (Parmigiani et al., 2011), i.e., in supplier dominance or independence situations. In other words, buyers can only enforce sustainability-related requirements at their suppliers' facilities when they are in a good bargaining position and their threat to terminate the relationship will ensure that suppliers act according to their social and ecological expectations. When supplier dependence on the buyer is at a low level, however, the supply manager perceiving any level of supplier sustainability risk can neither shape or alter supplier's behaviors and practices nor can it use direct sanctions and threat of leaving to force the supplier to behave in a responsible manner (Pedersen and Andersen, 2006). This means that supply manager will normally have to either continue the

relationship with the supplier without initiating any actions with regard to social or ecological issues at the supplier facilities or phase out the supplier to avoid the supplier sustainability risk all together.

> *P2: When supplier dependence on buyer is low (i.e., supplier dominance or independence situations), supply managers are more likely to accept or avoid the supplier sustainability risk rather than to mitigate it (Cells C,D,F; Fig. III-2).*

3.4.1. Effect of perceived risk in independence situation

As outlined in P2, supply managers in independence situations cannot mitigate the supplier sustainability risk either through monitoring- or collaboration-based SSD initiatives when supplier is not highly dependent on the buyer (Carr et al., 2008). In such cases, they have to either phase out the supplier and avoid the risk or accept the risk and take no proactive actions. We suggest that for low levels of perceived risk, supply managers are more likely to take the "why bother" approach (Cousins et al., 2004), also named as "corporate self-responsibility" (Van Tulder et al., 2009), and suffice to comply with relevant sustainability-related laws and regulations and take no further actions. In other words, they would prefer to retain the relationship with the suppliers despite the risks associated with their misconducts and suffer the negative impacts if the risk materializes in future (risk acceptance).

> *P2-a: In independence situations, supply managers are more likely to accept low level of perceived supplier sustainability risk rather than avoid it (Cell C; Fig. III-2).*

However, the most ultimate risk management strategy, risk avoidance, is employed when supply managers perceive a high level of risk while their firm (i.e., the buyer) can exert low or no influence over the supplier to mitigate it. In these situations, they decide to exclude the risk by breaking off the relationship with the supplier. For example, Staples Inc., the largest U.S. office supplies retailer, terminated an 11-year relationship with Asia Pulp and Paper (APP) in January 2008 because APP failed to improve its ecological performance and remained as one of the preferred targets for ecological activists' campaigns (Grant and Ando, 2008).

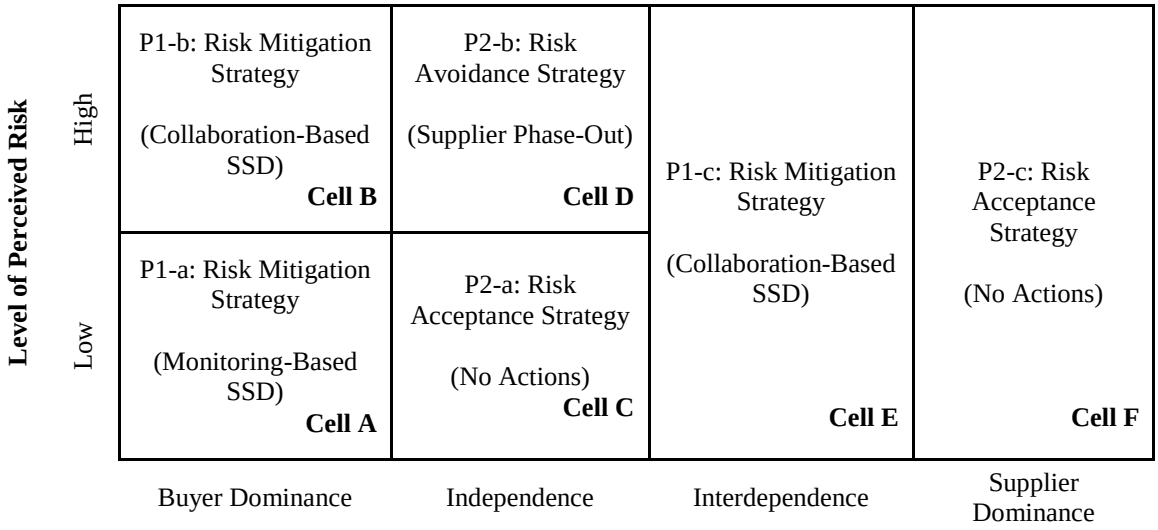
> *P2-b: In independence situations, supply managers are more likely to avoid high level of perceived supplier sustainability risk rather than accept it (Cell D; Fig.*

III-2).

3.4.2. Effect of perceived risk in supplier dominance situation

Finally, in dominant supplier situations in which buyers are highly dependent on suppliers who, in turn, are aware that buyers have limited alternatives, suppliers are likely to become complacent and do not respond to buyers' demands and requirements (Handfield and Bechtel, 2002). In such situations, on the one hand, the increased level of buyer dependence diminishes buyers' ability to enforce either form of SSD initiatives (Awaysheh and Klassen, 2010), which in turn amplifies the ability of powerful suppliers to resist to adhere to their social and ecological responsibilities (Hoejmose et al., 2013).

Figure III-2. Supply manager's choice among risk management strategies



On the other hand, buyers are locked into and held hostage to such a relationship where suppliers take the lead in establishing all relationship management policies (Narasimhan et al., 2009). In such a setting, buyers have limited room for manoeuvring and substituting suppliers with alternative sources to deal with the supplier sustainability risk (Wagner and Bode, 2008, New, 1996). Therefore, the buyers' scope for switching is reduced (Kim et al., 2008) and the only risk management strategy available to supply managers, regardless of the level of risk they perceive, will be to accept the risk and maintain the relationships with the suppliers as is.

P2-c: When buyer dependence on supplier is high and supplier dependence on buyer is low (i.e., supplier dominance situation), supply managers are more likely

to accept the supplier sustainability risk and take no action rather than to avoid it by phasing-out the supplier, regardless of their perceived level of risk (Cell F; Fig. III-2).

Figure III-2 provides a summary of the proposed relationships in Sections 3.3 and 3.4.

3.5. Effect of slack resources

As discussed in Section 3.3 and 3.4, perceived supplier sustainability risk is the primary factor to discriminate between two risk mitigation strategies in buyer dominance situation or between risk acceptance and risk avoidance strategies in independence situation. In addition, low level of supplier dependence restrains the supply managers' ability to mitigate the risk and shifts their choice toward risk acceptance or avoidance strategies. This situation combined with high level of buyer dependence leaves no choice for the supply manager but to accept the risk and take no actions. Finally, the mutual dependence of both partners on each other naturally forms their collaborative efforts and joint actions toward the risk situation.

In practice, however, buyers competing in the same industry with similar external dynamics such as stakeholders, supply bases, and buyer-supplier dependence structures appear to follow different risk management strategies. One explanation for this is that despite the similarities in their external environment, these organizations might differ in their resource endowments, especially the level of their organizational slack (Bowen et al., 2001, Voss et al., 2008). This is in line with Meszaros's (1999) study conclusions suggesting that managers utilize a form of threshold-based heuristic, namely "affordability heuristic" in their decision making, picking options that are not perceived to deteriorate their organizations' profitability. Therefore, the decision outcome of "which risk management strategy to adopt" may vary depending on the desired strategy to be affordable or not.

Based on Bourgeois' (1981) seminal definition, organizational slack is the cushion of actual or potential resources which is not consumed by the necessity of the continued daily operations of the organization and allows it to adapt successfully to the internal or external pressures and to initiate changes in strategy with respect to the

external environment. More specifically, it includes the resources available to the managers (in this case, supply managers) that enable them to adopt certain types of strategic actions (in this case, risk management strategies) to counter the external threats (in this case, the supplier sustainability risk) and to adjust to the required changes imposed by them (Sharma, 2000, Sharfman et al., 1988). Slack resources can take several forms including management time, excess skilled employees, discretionary budget, and unused capacity (Tan and Peng, 2003, Voss et al., 2008). These resources can ease the adoption of a proactive strategic behavior and influence managerial decision outcomes (Singh, 1986). For example, financial slack allows the managers to invest in initiatives such as risk management strategies with positive performance implications that do not have an immediate pay-off and require a longer investment horizon (George, 2005, Bowen, 2002). Such discretionary investments might have lower potential returns, but at the same time they are highly visible to the stakeholders and the media (Chiu and Sharfman, 2011).

To implement the proactive risk management strategies discussed in this paper (i.e., both SSD initiatives and supplier phase-out), supply managers may have to implement some changes in the scope and/or volume of their supplier management processes and activities. Thereby, carrying them out without a sizeable level of excess resources available to be devoted to such activities can be highly challenging for them. For example, conducting audits or training programs at overseas supplier facilities can be costly and time consuming. Supplier phase-out, too, comes with substantial switching costs. Beside costs and financial factors, personnel related factors such as competences and skills (Bowen et al., 2001) and commitment (Walker et al., 2008) play a major role in the failure or success of such initiative. Therefore, the type of strategy supply managers select may well be limited by the resources at their disposal. Organizational slack essentially helps them afford their intended response strategy to their perceived risks (Latham and Braun, 2009). If the risk management strategy entails a significant cost and engagement of resources (e.g., risk mitigation through collaboration-based SSD initiatives), supply managers with more slack are more capable of absorbing those costs and undertaking the required actions.

This argument is reinforced by a number of studies showing that slack resources

are the pre-requisite for the choices made by managers in favor of sustainability-related issues (Adams and Hardwick, 1998, Chiu and Sharfman, 2011, Sharma, 2000, Hofer et al., 2012), as well as initiating supplier development projects, exploring new supply markets, and training of the supply and purchasing personnel (Ogden et al., 2007). Particularly, Cousins et al. (2004) propose that the resources available to the purchasing functions for managing the ecological issues are the crucial enabler of their environment-related supplier management initiatives. Based on their framework, a high level of resources is associated with performing basic supplier development initiatives and forming collaborative relationships with the suppliers to improve their performance. However, lack of adequate resources forces the purchasing functions to either take a "why bother" approach and suffice to comply with relevant laws and regulations or, at the most, to do simple supplier monitoring activities. Hence, we conclude that:

> *P3: Slack resources moderate the relationships between the predictors of supplier sustainability risk management strategies and the selected strategy. Particularly, the proposed relationships in P1~2 are contingent upon availability of slack resources to supply manager.*

More specifically, if supply managers are constrained by the resources available to them for implementing their intended strategy, their choice of strategy will be shifted toward other strategies which require less budget and fewer resources (see Figure III-3). As a result,

> *P3-a: In buyer dominance situations where supply managers perceive a low level of supplier sustainability risk, they are more likely to accept the risk (rather than to mitigate it through monitoring-based SSD initiatives) when slack resources are not available to them compared to when they are available.*

> *P3-b: In buyer dominance situations where supply managers perceive a high level of supplier sustainability risk, they are more likely to select any strategy other than collaboration-based SSD risk mitigation strategy when slack resources are not available to them compared to when they are available.*

However, since buyer-supplier dependence structure remains constant regardless of the level of organizational slack available to supply managers, they cannot choose more affordable strategies which require higher levels of supplier dependence for implementation (i.e., risk mitigation strategies). Thus,

> *P3-c: In independence situations where supply managers perceive a high level of*

supplier sustainability risk, they are more likely to accept the risk (rather than to phase out the supplier), when slack resources are not available to them compared to when they are available.

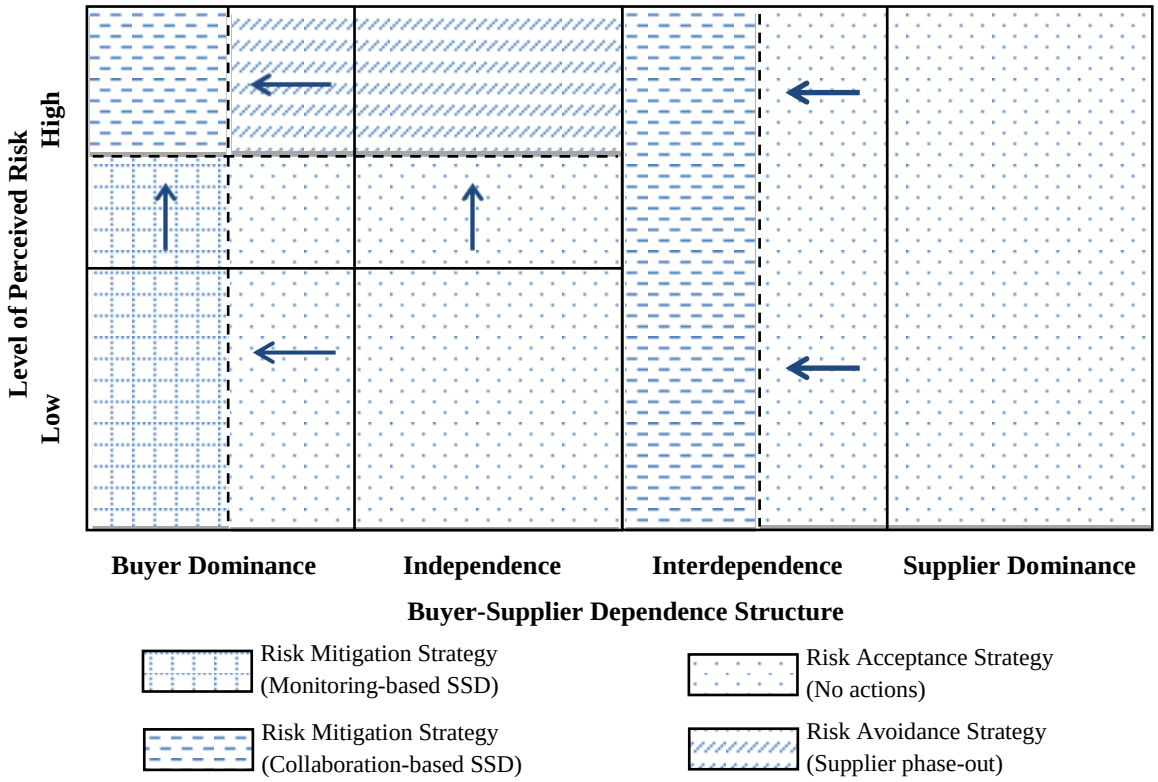
Nevertheless, unavailable slack resources in an interdependence situation may influence the supply managers' response to supplier sustainability risk in a different way because of the unique dynamics of the symmetric buyer-supplier dependence. In these relationships, both parties have already constrained their alternatives by making their exchange partner irreplaceable, or replaceable with very high switching costs (Oliver, 1990). In effect, they are both locked into the relationship, a situation which creates a joint tendency to show tolerance and flexibility in the relationship (Heide, 1994) and promotes strategies that ensure its continuance (Narasimhan et al., 2009, Williamson, 1983). Therefore, avoiding the supplier sustainability risk by switching to alternative suppliers will not be an option in such situations even if the supply managers do not have slack resources to mitigate the risk through collaborative initiatives.

On the other hand, joint dependence creates a culture of trust in the relationship where it is not rational for either party to behave opportunistically (Nyaga et al., 2010, Ketchen and Hult, 2007a). As such, implementing monitoring-based initiatives to mitigate the supplier sustainability risk becomes unnecessary (Zsidisin and Siferd, 2001), and even detrimental, to the trust culture and supplier's commitment to the relationship (Kwon and Suh, 2004). Therefore, when faced with shortage of slack resources to perform collaborative activities to mitigate the supplier sustainability risk, the supply managers will have no choice but to accept the risk and take no further actions.

P3-d: In interdependence situations, supply managers are more likely to accept the risk (rather than to mitigate it through collaboration-based SSD initiatives), when slack resources are not available to them compared to when they are available.

Figure III-3 presents a summary of the shifts in supply managers' choice among risk management strategies when slack resources for implementing the strategies suggested in Figure III-2 are not available.

Figure III-3. Supply manager's choice among risk management strategies (case of unavailable slack resources)



3.6. Risk management outcomes

As demonstrated in Figure III-1, managing supplier sustainability risk has positive performance implications beyond risk reduction: the strategies selected based on the situation contingencies augment the buyers' financial performance directly or indirectly through enhancing their reputation.

The buyers' reputation relates to its generalized favourability among different groups of stakeholders (e.g., investors, employees, regulators, NGOs, and consumers) regarding various aspects of its activities, including its ecological and social responsibilities (Lange et al., 2011, Eccles et al., 2007). Thus, their reputation is enhanced when they are able to obtain stakeholders' support such as customer loyalty, endorsements from activist groups, legitimacy from the community, and favourable coverage from the media; and it is destroyed when stakeholders withdraw their support and they face adverse reactions including threats of legal action from regulators, threats of boycott from activists, threats of illegitimacy from the community, and threats of

exposure from the media (McWilliams et al., 2006, Gardberg and Fombrun, 2006).

As the stakeholders increasingly favor the organizations that are known for making extra efforts to be ecologically friendly and socially responsible, buyers' reputation is enhanced if they go beyond the required standards to improve their suppliers' social and ecological performance via monitoring-based or collaboration-based SSD initiatives (Ehrgott et al., 2013, Ehrgott et al., 2011). In addition, avoiding the supplier sustainability risk through termination of the relationship with the irresponsible suppliers sends a positive signal to the stakeholders, implying that the buyers are responsive to stakeholders' social and ecological concerns and are willing to go the extra mile to reduce waste and damage to the environment and be considerate toward their social responsibilities (Fombrun and Shanley, 1990). Although these strategies do not necessarily lead to consistently high sustainability standards throughout the buyers' supply base, they still can have a positive impact on their reputation because of the visible and significant resource commitments the buyers make for implementing them (Bai and Sarkis, 2010).

The enhanced positive reputation, in turn, acts as a safety net for the buyers, buffering them from future negative events and enabling them to easily bounce back (Rhee and Valdez, 2009). For example, it may lead the stakeholders to give the buyers the benefit of the doubt (Pfarrer et al., 2010) and reduce the damage from negative publicity during a crisis (Vanhamme and Grobben, 2009). It also provides an opportunity platform for their future growth as it shows their stakeholders that they are good citizens of the planet and society (Bhattacharya et al., 2009). Lastly, it has a positive direct effect on their economic and financial outcomes: it becomes a source of competitive advantage (Ehrgott et al., 2013) with positive effects on their cost of capital (Gardberg and Fombrun, 2006), return on assets (Deephouse, 2000), market value (Porter and Kramer, 2006), and profitability (Roberts and Dowling, 2002). It also helps them to charge premium prices for their products (Benjamin and Podolny, 1999), to attract employees of higher quality (Turban and Cable, 2003), and to succeed in their acquisitions (Saxton and Dollinger, 2004).

> *P4: Implementation of risk mitigation and avoidance strategies to deal with supplier sustainability risk is positively associated with buyers' financial*

performance through enhancing their reputation.

Several studies in SSCM literature, such as Carter & Easton (2011), Gimenez et al. (2012), Golicic & Smith (2013), Green et al. (2012), Rao & Holt (2005), Vachon & Klassen (2008), Wang & Sarkis (2013), and Zhu & Sarkis (2004) have found that SSD initiatives have a positive impact on buyers' financial performance. Besides, the alignment of the risk management strategy with the level of perceived risk and the buyer-supplier dependence structure orchestrates the resources allocated to risk management strategies across diverse supplier groups. This, in turn, is expected to contribute to cost savings and, hence, improvements in financial performance. For example, the buyers can financially benefit if, when faced with low risk suppliers, they select the risk acceptance strategy and take no actions or, at the most, mitigate the risk through monitoring initiatives rather than investing in capital intensive collaboration-based programmes or phasing out the supplier. Therefore,

P5: Implementation of risk management strategies according to P1~2 is positively associated with buyers' financial performance.

4. Discussion and Conclusion

Given the growing evidence of supplier misconducts in terms of sustainability-related issues and their associated risks to the buyers, the dearth of studies in operations and supply chain management field looking into this phenomenon from a risk management perspective is surprising. Addressing this need, the current study focused on the choice supply managers face among different risk management strategies to deal with the supplier sustainability risks: whether to mitigate the risk by employing monitoring-based or collaboration-based SSD initiatives, to avoid the risk altogether by phasing out the supplier, or to accept the risk and decide to deal with the consequences should it materialize. Evidences from the business world discussed throughout the paper indicate that buyers take different paths to manage their supplier sustainability risk. But what are the factors that affect their choices? Is it a question of the level of risks threatening the buyers, or is it due to their available internal resources, or is it simply because of the way their organization is positioned within the supply chain? Are the managers' perceptions and characteristics influential in this setting?

Since purchasing and supply management function has a boundary-spanning role in buying organizations and is influential in extending their sustainability ambitions to the suppliers (Krause et al., 2009), we specifically focused on supply managers as the decision makers in this study and introduced three different factors which together could explain why they might select diverging risk management strategies. These factors include supply managers' perceived risk, buyer-supplier dependence structure, and the slack resources available to supply managers for implementing their intended strategy.

Drawing on the resource dependence theory, we further argued that supply managers can employ risk mitigation strategies only if their company has a reasonable amount of influence over the suppliers, which is the case of high supplier dependence. If not, they would have to decide to take no actions if the supplier was the dominant party in the exchange relationship or if their level of perceived risk was low, and to phase out the supplier if they perceived a high level of risk. In addition, we used the agency and management control theories to explain the relationship between supply managers' level of perceived risk and their choice between collaboration-based and monitoring-based risk mitigation strategies when the supplier was highly dependent on the buyer. We suggested that in such cases, low levels of supply managers' perceived risk would result in enforcing monitoring-based risk mitigation strategy, whereas a more collaborative approach would be employed should the supply managers perceive high levels of risk. In addition, we discussed the effect of slack resources availability on the supply managers' choice amongst four risk management strategies.

On the practical level, this study provides useful tools for purchasing and supply management functions to manage supplier sustainability risks strategically. Only when companies can understand and manage such risks properly can they ensure that they have reduced the ecological and social impacts of their activities not only within the boundaries of their own organization, but across the whole supply chain. As the first stage, supply managers should be encouraged to rethink the way they manage their supply base from a sustainability point of view and to assess the potential sustainability risks associated with each of their suppliers. The next step would be for them to decide on the suitable strategy for managing the evaluated risks considering the power-dependence structure of the relationships with the suppliers. Finally, focal firms are

required to support their purchasing and supply chain management functions by providing them with adequate resources to deploy their intended risk management strategies, particularly for cases which are perceived to be high risk.

In addition, we suggested that the supply managers' decisions were directly driven by their perceptions of the supplier sustainability risk. Buying organizations may foster improved decision-making by establishing sustainability-oriented purchasing policies and procedures that facilitate supply managers' translation of the information available to them into accurate risk assessments. Further, to create accurate views of the situation and to steer the risk management actions in the desired direction, buyers should also (i) employ appropriate training and information systems to promote the supply managers' knowledge regarding different aspects of supplier sustainability risk, such as the salient stakeholder pressures in their external environment, and (ii) establish performance evaluation and reward systems that provide incentives for supply managers to closely interact with suppliers to have a fairly accurate perception of their sustainability-related intentions and behaviors.

To advance this work, we recommend a number of avenues for future research. First, the proposed conceptual framework needs further validation through empirical research. An experimental study using scenarios seems appropriate as it would be difficult to find a fair number of companies functioning in each condition of the hypothesized matrices. Second, the propositions are limited to the operations strategy level and do not transcend to the corporate-level strategies toward reputational risk or brand management. For instance, some buyers have recently employed "stakeholder bridging" strategy and begun to actively approach and cooperate with critical NGO's and other salient stakeholders to reduce the stakeholder pressures, to enhance the legitimacy of their sustainability-related initiatives, to improve their sustainability risk management processes, and to be able to respond more effectively to their suppliers' misconducts (Foerstl et al., 2010, Matos and Hall, 2007). For example, DuPont partnered with Environmental Defense Fund in 2005 to ensure the responsible development of Nano-scale materials and to develop a tool to share information with stakeholders. The project also aimed at facilitating public understanding of the new technology and providing input for future government policy. These cooperative relationships provide independent third

party validation of buyers' claims of social and ecological performance and improve their image and credibility (GEMI-EDF, 2008).

Third, although supply managers' risk perception is considered as one of the major factors in their choice among management strategies, the determinants of this construct, such as supplier's size and ownership (Klassen and Vereecke, 2012), stakeholders' salience (Parmigiani et al., 2011), or supply managers' personal characteristics such as their risk propensity (Sitkin and Weingart, 1995) have not been included in the framework and can be explored in future studies. Finally, supply managers are human beings and their decisions are boundedly rational especially when making decisions in complex situations which involve risk and uncertainty within supply chains (Kahneman et al., 1982, Simon, 1979). The scope of this study, however, did not include the supply managers' biases and the simplifying heuristics they use to filter and assimilate the information when making decisions. Looking into these influential factors from a behavioral operations perspective is also a fruitful avenue for future research.

Finally, prior studies have considered trust as one of the crucial factors affecting different supply chain decisions and processes including information sharing (Özer et al., 2014), resource allocation (Pulles et al., 2014), collaboration (Nyaga et al., 2010), integration (Lockstroem et al., 2010), and commitment (Kwon and Suh, 2004), as well as supply chain performance (Johnston et al., 2004, Brinkhoff et al., 2015). Hence, looking into how the buyer's trust in supplier or vice versa can affect the decision making process proposed in our conceptual framework would be an interesting future research project.

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Chapter IV

Chapter IV. Managing Supplier Sustainability Risk: The Interacting Effect of Supplier Dependence, Perceived Risk, and Slack Resources

1. Introduction

A growing number of buying organizations[1] are suffering an increased exposure to different types of risk within their global supply chains which need to be proactively managed to protect them against financial loss and reputational damage (Sheffi, 2005). These risks may originate from a wide range of sources, such as disruptions in supplier operations, natural disasters, or supplier financial defaults (Kleindorfer and Saad, 2005, Bode et al., 2014). A particularly important topic is supplier sustainability risk, which originates from a negative sustainability-related[2] condition or potentially occurring event within the buyer's supply base (e.g., suppliers' unsafe or unhealthy work conditions or their environmentally unfriendly operations or products) that may provoke harmful stakeholder reactions (Foerstl et al., 2010, Hofmann et al., 2014). In such situations, buyers, such as Nike, Apple, and Nestle, may be held responsible by stakeholders (e.g., customers, NGOs, and regulators) for their suppliers' misconducts and, thereby, experience substantial market share loss, revenue reduction, adverse publicity, and reputational damage (Zhu and Sarkis, 2007, Parmigiani et al., 2011). A study by Lefevre et al. (2010) shows that these organizations face, on average, a 12% reduction in their market capitalization after a social or ecological problem is detected within their supply chains and publicized by concerned stakeholders.

Anecdotal evidence suggests that buyers manage this type of risk in four different ways: many of them, like BP in the 2010 oil spill case in the Gulf of Mexico (Herron, 2010), tend to accept the risk and practice damage control by addressing the

[1] Throughout this paper, we use the term "buyer" to refer to the buying organization contracting work to a "supplier" organization. The term "supply manager" refers to a middle manager within the buying organization, who is responsible for managing the relationship with one or multiple groups of supplier organizations.

[2] Throughout this paper, we use the term 'sustainability' to refer to ecological and social aspects of an organization's operations.

problem after its occurrence; others try to mitigate the risk either through monitoring their suppliers' activities (like Ford and GM) (Zhu et al., 2007) or through collaborative initiatives to enable them to improve their social or ecological performance (like IKEA) (IKEA, 2012); and a few of them, like Staples (Grant and Ando, 2008), take extreme measures and avoid the risk all together by phasing out the irresponsible suppliers. Such differences, however, have not been currently accounted for within supply chain risk management (SCRM) literature. Specifically, the questions as to "what underlying factors can shape these diverse responses and how" have remained unanswered.

In order to fill this gap and to respond to the ever-growing need for using established organizational theories to describe, explain, and predict supply chain phenomena (Ketchen and Hult, 2007a), we draw on agency and management control theories (Ouchi, 1979, Eisenhardt, 1989), as well as resource dependence theory (Pfeffer and Salancik, 2003), to develop a contingent conceptual model of supplier sustainability risk management. In this model, we particularly concentrate on three contextual factors, i.e., perceived risk, supplier dependence, and slack resources, and their noticeable effects on the risk management strategies. Supplier sustainability risk is an inter-organizational phenomenon. Therefore, we take the exchange relationship between a buyer and a specific supplier as the context and the buyer–supplier transaction as the unit of analysis in our study. Given the crucial role of supply managers as the decision makers in the supply chain context (Ellis et al., 2010, Mantel et al., 2006, Tazelaar and Snijders, 2013), we focus on the strategies they undertake at the operational level (Pagell and Gobeli, 2009). Hence, the focal decision is the supply manager's choice among the four risk management strategies: acceptance, avoidance, monitoring-based mitigation, and collaboration-based mitigation. A vignette-based experiment methodology is then employed to empirically test the hypothesized relationships.

In addition to its major contribution to the SCRM literature, this study also contributes to the sustainable supply chain management (SSCM) literature. Prior studies have established that different supply chain characteristics affect the buyers' approach toward SSCM. For instance, Vachon and Klassen (2006a) conclude that the buyer-supplier integration increases the buyers' use of monitoring and collaboration practices regarding environmental management issues. Based on their case study of five firms,

Klassen & Vereecke (2012) also propose that implementing monitoring or collaborative initiatives with regard to social issues within supply chains is prompted by increased accountability to stakeholders and compared actual social performance with regulatory, customer, and community expectations. However, the extant literature remains somewhat silent about the mechanisms underlying such relationships. Our study, however, suggests that sustainable supplier development (SSD) including monitoring- and collaboration-based initiatives is employed as a risk mitigation strategy to reduce supplier sustainability risk, and explains the conditions under which each of these initiatives are more likely to be used.

Lastly, although the role of supply managers as the decision makers in the supply chain context has been recently recognised in a number of studies such as Ellis et al. (2010) and Tazelaar & Snijders (2013), this view has not been extended to the SSCM literature. However, a number of studies suggest that one of the prevalent drivers of the buyers' decision to diffuse sustainability throughout their supply chains is their managers' perception of the risks involved (Zhu and Sarkis, 2007, Walker and Jones, 2012). We attempt to address this issue by focusing on supply managers' decisions and, specifically, their choice of risk management strategy.

In Section 2, we discuss the concept of supplier sustainability risk and the strategies for managing it. Section 3 provides the theoretical underpinnings of the proposed conceptual model and its related hypotheses. After presenting the research methodology and data analysis results in Sections 4 and 5, we conclude the paper by discussing its theoretical and managerial implications in Sections 6 and 7.

2. Supplier Sustainability Risk Management

A review of the supply chain risk management (SCRM) literature indicates that this literature is traditionally concerned with two types of risk: (i) coordination risks, originated from incoordination between supply and demand (Souza et al., 2004), and (ii) disruption risks, originated from unexpected internal or external process failures or disruptions (Kleindorfer and Saad, 2005). Although different in their source, both risk categories materialize through a disorder within the interconnected flows of material, information, and funds in supply chains (Sodhi et al., 2012). In this study, however, we

focus on a recently emerging type of risk, namely "supplier sustainability risk"[3] (Foerstl et al., 2010) which materializes through adverse stakeholder reactions (Hofmann et al., 2014). More specifically, it may occur when buyers are held responsible and accountable by their salient stakeholders (Mitchell et al., 1997) for their suppliers' misconducts related to the natural environment or social communities (Amaeshi et al., 2008, Klassen and Vereecke, 2012, Parmigiani et al., 2011).

Supplier sustainability risk was first identified by Cousins et al. (2004) as the driver of environmentally-oriented supplier management initiatives to avoid reputational losses. However, Foerstl et al. (2010) were the first to coin the term "supplier sustainability risk", defining it as "the risk of corporate reputational damage to the buying firm, caused by supplier [sustainability-related] misconduct[s]" (p. 118). Focusing on suppliers' labor-related behaviors in global supply chains and, specifically, their associated reputational risks, Jiang et al. (2009) identified the root causes of job dissatisfaction leading to turnover at supplier facilities. Klassen & Vereecke (2012), further, focused on the social sustainability risks within supply chains and highlighted their adverse effects on buyers' costs and revenues. Only recently, however, a concise conceptualization of supplier sustainability risk based on a theory-driven approach was provided by Hofmann et al. (2014), which lays the basis for our study (p. 168):

> *"[a sustainability-related] condition or a potentially occurring event",* located within a focal firm's supply base, that *"may provoke harmful stakeholder reactions."*

The supplier sustainability risk materialization process starts with a sustainability-related misconduct in buyer's supply base, followed by its detection by the concerned stakeholders. Once salient stakeholders regard the misconduct as illegitimate and hold the buyer responsible for supplier's misconduct, they might initiate some adverse reactions resulting in substantial financial and reputational losses for the buyer. As such, supplier sustainability risk is the cumulative likelihood of these events and their consequences (Roehrich et al., 2014). Hence, the level of supplier sustainability that buyers face depends not only on the probability and immediate consequences of

[3] Throughout this paper, we maintain the term "supplier sustainability risk" as it has already been used within the SCRM literature. Alternatively, these risks could also be coined as reputational risks (Jiang et al., 2009; Roehrich et al., 2014) because of their detrimental direct effects on the buyer's reputation.

suppliers' misconducts, but also on other factors such as their size and visibility in the marketplace (Bowen, 2002), location of their supply base (Reuter et al., 2010), salience of concerned stakeholders (Parmigiani et al., 2011), and their industry (Neef, 2004).

2.1. Risk management strategies

As with any other type of risk, buyers' ability in managing supplier sustainability risk is critical to their competitiveness and long-term success (Eccles et al., 2007). Although they may try to do it in a number of ways, their responses would fit into three generic categories of risk management strategies: avoidance, acceptance, and mitigation (Ritchie and Brindley, 2007, Blome and Schoenherr, 2011, Lemke and Petersen, 2013). The focus of this study is on operational-level strategies which supply managers undertake to manage the supplier sustainability risk within their supply base. Foerstl et al. (2010) suggest that such responses include supplier phase-out and sustainable supplier development (SSD). By implementing supplier phase-out, supply managers terminate the relationship with the incumbent risky supplier and switch to another alternative supplier with a clean sustainability record. Hence, supplier phase-out fits into the risk avoidance category (Jüttner et al., 2003), which entails the elimination of risk by withdrawing from the risky situations. For example, Wilmar International Ltd., the world's largest palm oil trader, decided in June 2013 to cut ties with all Indonesian suppliers who were found to clear land for cultivation with illegal fires (Yun et al., 2013).

Sustainable supplier development (SSD) initiatives, on the other hand, fit into risk mitigation category (Ritchie and Brindley, 2007). They are defined as the buyers' plans and strategies to integrate the ecological and social issues into supply management process to improve the ecological and social performance of the suppliers (Klassen and Vereecke, 2012, Krause et al., 2007). Therefore, they are the buyers' means for reducing the probability of supplier sustainability risk through enhancing suppliers' ecological and social performance. The initiatives that collectively define SSD are further classified in two categories: monitoring-based and collaboration-based initiatives (Vachon and Klassen, 2008, Zhao et al., 2007). Monitoring-based SSD initiatives focus on assessing the processes or actual performance of suppliers against specific characteristics or particular performance criteria to verify their compliance with the requirements. As part

of this approach, buyers usually gather and process suppliers' information, set proper criteria and assess the sustainability-related aspects of incoming goods and the suppliers that provide them through surveys and audits, and ask suppliers to report on different dimensions of their social and ecological performance (Seuring and Müller, 2008, Bowen et al., 2001). These are usually enforced through written social and ecological requirements within contracts (Ciliberti et al., 2008), requiring third-party certifications (Morali and Searcy, 2013), or imposing the buyers' codes of conducts on the suppliers (Andersen and Skjoett-Larsen, 2009). For instance, Bristol-Myers Squibb, IBM, and Xerox have encouraged their Chinese suppliers to develop environmental management systems consistent with ISO 14001 and Ford, GM, and Toyota have required their suppliers to obtain ISO 14000 certification (Zhu et al., 2007).

However, collaboration-based SSD initiatives aim at improving the suppliers' ecological and social performance through partnership, i.e., direct interaction with them and implementation of jointly-developed ecological and social solutions (Golicic and Smith, 2013). They encompass a broad range of activities such as providing training programs to suppliers, compensating them for the costs associated with their compliance (e.g., joint investments in environmental friendly equipment), and sponsoring ecological or social summits for suppliers to encourage the sharing of information and experience (Vereecke and Muylle, 2006). IKEA's strategy to provide its suppliers with technical as well as financial support regarding their sustainability endeavors is an example of this strategy (IKEA, 2012).

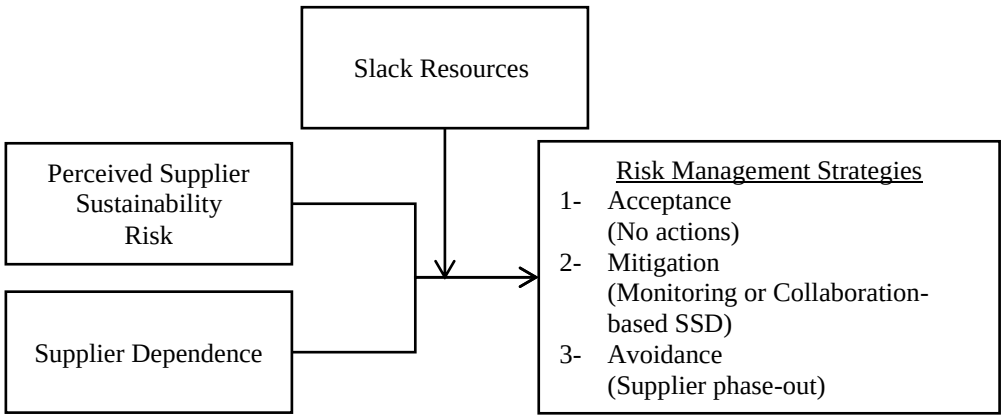
Finally, in addition to the proactive strategies suggested by Foerstl et al. (2010), we also include risk acceptance as a reactive strategy that buyers might use to manage supplier sustainability risk. Taking on this strategy, supply managers simply retain the risk by sufficing to comply with the regulations and taking no further actions and budgeting for dealing with the potential risk event should it happen at some point (Sodhi and Tang, 2012).

3. Hypotheses Development

In the previous section, four different strategies pertaining to the management of supplier sustainability risk were presented. In this section, the focus is on the contextual

factors that determine which strategy is more likely to be selected by the supply managers. Based on resource dependence (Pfeffer and Salancik, 2003) and agency/management control (Eisenhardt, 1989, Ouchi, 1979) theories, we focus on two major predictors of supply managers' strategy choice: supplier sustainability risk they perceive as well as supplier dependence on the buyer. We further suggest that selection of a risk management strategy that fits these contingencies depends on the availability of slack resources to implement the intended strategy.

Figure IV-1. Conceptual model



In order to develop a series of hypotheses linked to our conceptual model (Fig. IV-1), an approach composed of a series of systematic steps is needed. First, the concept of perceived risk and supplier dependence are defined and presented. These two concepts are then pulled together to form a matrix demonstrating four possible scenarios from their different combinations. This matrix is then populated with different risk management strategies hypothesized to be selected by the supply managers for each scenario (Fig. IV-2). Finally, the section concludes by introducing the impact of availability of slack resources on the positioning of the strategies in Figure IV-2.

3.1. Theoretical foundations

3.1.1. Agency and management control theories

Agency and management control theories (Eisenhardt, 1989, Ouchi, 1979) generally provide a useful framework for understanding the buyers' responses to supply chain risks (Zsidisin and Ellram, 2003, Zsidisin et al., 2005, Ketchen and Hult, 2007a). In this framework, the buyer serves as the principal delegating work to the agent, i.e., the

supplier. These theories put forth three mechanisms that can be used by principals to control agents' opportunistic behaviors: output, behavior, and input control mechanisms (Eisenhardt, 1989, Ouchi, 1979). Output control mechanisms focus on agents' performance, i.e., evaluating it against predetermined targets and giving agents' the authority to choose the means to achieve those goals (Ouchi, 1979). Behavior control mechanisms concentrate on the transformation process of agents' work, i.e., the processes, tasks, and activities that are expected to lead to their performance outcomes (Ouchi, 1977). Although output controls mainly motivate agents through the use of incentives and behavior controls ensure of their motivation through close supervision, both mechanisms are centred on evaluation and feedback processes (Gencturk and Aulakh, 1995). However, input control mechanisms emerge from a socialization process between principal and agent, which results in shared beliefs and values (Patzelt and Shepherd, 2008). It influences the agents' behaviour in a way that their commitment to the relationship is enhanced, and adjusts the antecedent conditions of their performance (i.e., their knowledge, skills, abilities, values, and motives) to ensure that they have the required ability to perform well (Snell, 1992, Ouchi, 1979).

In this study, suppliers' misconducts in terms of labor standards, ecological issues, or other sustainability-related concerns giving rise to supplier sustainability risk can be considered as their opportunistic behaviors which need to be controlled by the buyers (Moore, 2001, Jiang, 2009a). The more efficient these behaviors are controlled, the less supplier sustainability risk the buyers will face. Hence, control mechanisms perform as risk mitigation strategies. Output controls mitigate supplier sustainability risks by assessing suppliers' social and ecological performance against a set of pre-specified objectives, such as a code of conduct. Behavior controls, however, reduce the risk by close monitoring and evaluation of suppliers' actions over time and providing constructive feedbacks for correcting the deviations (Handley and Benton, 2013). Hence, in this study, the combination of output and behavior control mechanisms resembles the monitoring-based category of SSD initiatives (Vachon and Klassen, 2006a, Golicic and Smith, 2013). In contrast, when buyers use input controls, they decrease the probability of suppliers' misconducts by contributing to suppliers' awareness building, encouraging them to promote a socially and ecologically responsible culture, and helping them

develop related capabilities rather than a specific short-term outcome (Ciliberti et al., 2008). Therefore, in this study, the input control mechanisms are exemplified by the collaboration-based category of SSD initiatives (Golicic and Smith, 2013, Vachon and Klassen, 2008).

3.1.2. Resource dependence theory

The dependence concept in supply chains has been argued to be one of the key attributes influencing supply chain management issues, such as buyer-supplier relationship (Cox, 2004), supplier development (Carr et al., 2008), and supply chain performance (Gulati and Sytch, 2007). According to resource dependence theory, organizations are not self-sufficient and depend on each other for resources, and such interdependency introduces uncertainty into their decision-making environment (Pfeffer and Salancik, 2003). As a result, they adjust their structure and behaviors to acquire and maintain their required resources and try to reduce their environmental uncertainties and dependencies by means of control mechanisms (Hillman et al., 2009). Resource dependence theory predicts that the type of such control mechanisms depends on the level and nature of dependence they develop, and the relative power of all players (Pfeffer and Salancik, 2003). Consequently, in a supply chain context, we expect that the buyers' risk management strategies applied as control mechanisms to mitigate the supplier sustainability risks would depend on the level of buyer and supplier dependence on each other.

Given that supplier dependence is one of the most influential factors affecting buyer-supplier relationships (Tangpong et al., 2008) as well as supplier development processes (Carr et al., 2008), this study focuses on situations where buyer dependence on supplier is low. By doing so, we examine the isolated effect of supplier dependence on the risk management strategies selected to deal with the supplier sustainability risk. More specifically, we investigate the risk management strategies used in two scenarios: high vs. low supplier dependence.

3.1.3. Supply managers' perception of risk

As discussed earlier, supplier sustainability risk is the cumulative likelihood and consequence of a series of events: occurrence of a sustainability-related misconduct in

buyer's supply base, stakeholders' detection of the misconduct and their attribution of the misconduct responsibility to the buyer. There is no doubt that buyer's response to this cumulative risk depends on many different factors, including (i) the events' characteristics, such as nature of the misconduct, supplier's size, and ownership (Klassen and Vereecke, 2012) or stakeholders' salience (Parmigiani et al., 2011), (ii) the decision making context, e.g. buyer's orientation toward sustainability (Pagell and Wu, 2009) or the relevant laws and regulations in place (Jiang, 2009a), and (iii) the individual attributes of the decision makers, such as their experience as well as their sustainability-related values (Ellis et al., 2011).

However, behavioral research on decision-making has shown that the effect of such factors on the decision outcome is mediated through the decision maker's perception of risk (Sitkin and Weingart, 1995, Pablo et al., 1996, March and Shapira, 1987). More specifically, management responses to supplier sustainability risks are essentially not motivated by completely objective evaluations of the risks but by their subjective risk perceptions (Yates and Stone, 1992, Ellis et al., 2010, Kocabasoglu et al., 2007), defined as their general assessment of the risk inherent in a situation (Sitkin and Weingart, 1995). In addition, there are studies suggesting that one of the prevalent drivers of implementation of SSD initiatives by buyers is their managers' perception of the risks involved (Walker and Jones, 2012). Particularly, supply managers have been found to play a critical role in developing management systems (Angell and Klassen, 1999b) and to be the most significant driving force of extending sustainability initiatives throughout the supply chains (Ehrgott et al., 2011, Carter and Jennings, 2004).

Therefore, in this study, we focus on the level of supplier sustainability risk (cumulative risk) perceived by supply managers as one of the major predictors of their choice amongst the four risk management strategies. In addition, since this study focuses on how the perceived supplier sustainability risk - rather than its determinants - influences the decision outcome, we do not differentiate between the risks associated with social and ecological aspects of sustainability.

3.2. Supplier dependence and risk management strategy

Supplier dependence is shown to increase the buyer's relative power in the

buyer-supplier relationship, enabling it to significantly influence the actions and intentions of the supplier (Bastl et al., 2013, Lanier et al., 2010). Dependent suppliers are more likely to cooperate with buyers (Modi and Mabert, 2007) and to make changes to their processes and products to meet buyer requirements (Hallen et al., 1991). The presence of powerful buyers who reflect the market pressures onto their suppliers is suggested to be the main trigger for suppliers to pursue sustainability objectives (Hall, 2000). Particularly, supplier dependence enhances the buyers' ability to effectively implement monitoring-based or collaboration-based SSD initiatives because such initiatives usually include practices that take place at the supplier facilities which are out of buyers' direct control (Gulati and Sytch, 2007, Hoejmose et al., 2013).

In addition, buyers with a high level of bargaining power over their suppliers (i.e., high supplier dependence) are found to take two different paths to diffuse sustainability principles throughout their supply base (Vurro et al., 2009). They may either follow a "dictatorial" governance model through which they assume the role of a commander and impose their rules of the sustainability game (e.g., codes of conduct) on suppliers, or they pursue a "participative" governance model through which they remain open to interaction and involvement with their suppliers in the sustainability-related decision making and implementation process. These two mechanisms correspond to the monitoring-based and collaboration-based SSD initiatives. Hence, buyers will have the opportunity to influence suppliers' sustainability-related behaviors and mitigate supplier sustainability risk through collaboration-based or monitoring-based SSD initiatives only when suppliers are highly dependent on them (Parmigiani et al., 2011). Hence, supplier dependence is a precursor for employing either of the risk mitigation strategies.

> *H1: Supply managers are more likely to mitigate the supplier sustainability risk through either of the SSD initiatives when supplier dependence is high rather than low.*

In contrast, when the supplier is not highly dependent on the buyer, neither one of the two risk mitigation strategies is an option for the buyer (Parmigiani et al., 2011). In other words, buyers can only enforce sustainability-related requirements at their suppliers' facilities when they are in a good bargaining position and their threat to terminate the relationship will ensure that the suppliers act according to their

social/environmental expectations. When supplier dependence is at a low level, however, buyers perceiving any level of supplier sustainability risk can neither shape or alter the suppliers' behaviors nor can they use direct sanctions and threat of leaving to force the supplier to behave in a responsible manner (Pedersen and Andersen, 2006). This means that buyers will normally have to either continue the relationship with the suppliers without initiating any actions with regard to social or ecological issues at supplier facilities or to terminate the relationship with the supplier to avoid the supplier sustainability risk all together.

H2: Supply managers are more likely to avoid the supplier sustainability risk or accept it when supplier dependence is low rather than high.

3.3. Perceived risk and risk management strategy (high supplier dependence)

As we proposed in Hypothesis 1, supply managers in high supplier dependence situations are more likely to decide to mitigate supplier sustainability risk either through monitoring-based or collaboration-based SSD initiatives. In this section, we draw on agency/management theories to explain the effect of their perceived risk on the choice between these two mitigation strategies.

Based on the agency theory, monitoring-based SSD initiatives (i.e., behavior and output control mechanisms) are used when suppliers' performance ambiguity and environmental uncertainties are at a low level and when there is not a substantial incongruence between the buyer and supplier goals (Eisenhardt, 1989, Ouchi, 1980, Rowe et al., 2012). These conditions reflect a situation where the supply managers perceive a low level of risk. For instance, the global fashion brand Zara faces a relatively low level of supplier sustainability risk because almost 70% of its suppliers are based in Europe (Ghemawat and Nueno, 2006) and hence, suffices to merely enforce its Code of Conduct for Manufacturers and Suppliers throughout its supply chain (Inditex, 2013). In contrast, its US-based competitor, Gap Inc., with the majority of its suppliers operating in Asia, has to take further steps, like pursuing a stakeholder engagement strategy (Smith et al., 2011) or providing a $20 million of capital to support fire safety improvements at supplier facilities (Gap Inc., 2013). Therefore, we can conclude that:

H1-a: In high supplier dependence situations, supply managers are more likely to

mitigate the supplier sustainability risk through monitoring-based SSD initiatives when their perceived risk is low rather than high.

On the other hand, when a supply manager's knowledge of supplier's processes and activities is incomplete or the standards of desirable performance are ambiguous, the level of perceived risk increases and neither behavior control nor output control is likely to be a viable option (Ouchi, 1977). Pursuing such control mechanisms requires the supply managers to formally specify their expectations and be able to determine whether these agreed-to expectations are being achieved or observed (Ouchi, 1979, Handley and Benton, 2013). Hence, they incur substantial costs of surveillance, which may limit their span of control (e.g., the number of audits they conduct at supplier sites might decrease) and increase the probability of supplier's unsustainable behavior (Eisenhardt, 1985). In addition, even with the monitoring initiatives, supplier deception may emerge and the overall reliance on this strategy may create a system in which a supplier's main objective is to pass the audits, rather than address the substantive issues that are the focus of the audit (Jiang, 2009a, Roth et al., 2008). Hence, monitoring-based SSD initiatives are not likely to be used by supply managers who face a high level of supplier sustainability risk.

Input control mechanisms, however, are shown to be used in situations where high levels of complexity and uncertainty create a high risk situation for the principal (Ouchi, 1980). When the need for goal congruence between the principal and agent is high, in other words when the probability of agent's opportunistic behavior is significant, employing input control mechanism is more appropriate (Rowe et al., 2012, Wilkins and Ouchi, 1983). In the same vein, other studies have shown that when the supply risk increases, buyers become more eager to develop closer relationships with their suppliers because such relationships increase their social capital, promote effective communications, enhance their trust in the relationship, and improve their suppliers' performance (Cheng et al., 2012, Zsidisin and Ellram, 2003). In addition, it has been found that buyers with a prior experience of reputational damage due to their suppliers' misconducts develop more cooperative relationships with their suppliers to coordinate the exchange of their values in the supply chain (Spence and Bourlakis, 2009). We suggest this is due to the fact that these buyers perceive a higher level of risk due to their previous negative experiences. A notable example is Nike's new approach toward

supplier management: to improve suppliers' compliance with its code of conduct, Nike moved from a market relationship to a collaborative partnership where suppliers had a deeper and more secure association with Nike and internalized the sustainability-related values and practices (Lim and Phillips, 2008). For instance, it provided its suppliers with its own state-of-the-art screening tools, called bluesign technologies, that allows them to select more sustainable dyes, detergents, and chemicals for use in their textile manufacturing process (Fellow, 2013). Hence, we can conclude that:

H1-b: In high supplier dependence situations, supply managers are more likely to mitigate the supplier sustainability risk through collaboration-based SSD initiatives when their perceived risk is high rather than low.

3.4. Perceived risk and risk management strategy (low supplier dependence)

As discussed in Section 3.2, buyers can proactively mitigate the supplier sustainability risk either by implementing monitoring-based or collaboration-based SSD initiatives if they are the dominant partner in the relationship. However, they can exert very limited influence over their suppliers if suppliers hold the dominant power because of their low dependence (Carr et al., 2008). Because source of the risk is external to their control, supply managers will not be able to mitigate the supplier sustainability risk they perceive either by monitoring the suppliers' processes and performance or by developing their sustainability-related capabilities. In such cases, they have to pursue risk management strategies other than risk mitigation (Kraljic, 1983).

We suggest that for low levels of perceived risk, supply managers are more likely to take the "why bother" strategy (Cousins et al., 2004, Van Tulder et al., 2009) and suffice to comply with relevant sustainability-related laws and regulations and maintain the status quo. In other words, they prefer to retain the relationship with suppliers despite the risk associated with them and suffer the negative impacts if the risk materializes (risk acceptance).

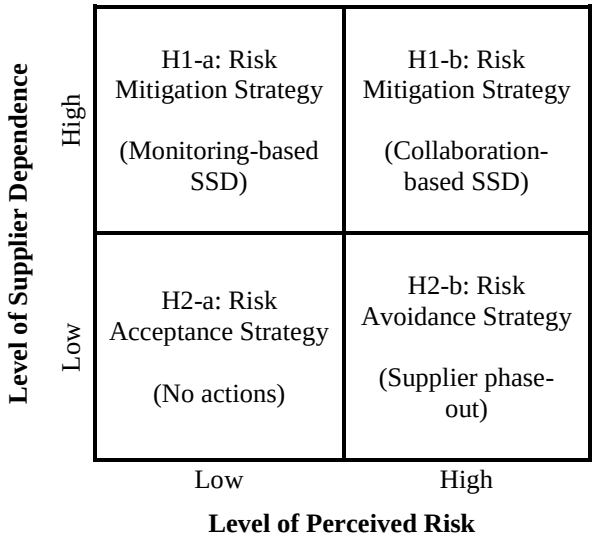
H2-a: In low supplier dependence situations, supply managers are more likely to accept the supplier sustainability risk when their perceived risk is low rather than high.

Conversely, the most ultimate risk management strategy, risk avoidance, is employed when supply managers perceive a high level of risk while their firm can exert

low or no influence over the suppliers to mitigate it. In this situation, they will decide to exclude the risk all together by blacklisting the suppliers in their order placement system, breaking off the relationship with them, and switching to alternative suppliers (Reuter et al., 2010). For example, in January 2008, Staples Inc., the largest U.S. office supplies retailer, terminated an 11-year relationship with Asia Pulp and Paper (APP) company, as APP failed to improve its environmental performance and remained as one of the preferred targets for environmental activists' campaigns (Grant and Ando, 2008). Therefore, we can conclude that:

> *H2-b: In low supplier dependence situations, supply managers are more likely to avoid the risk and phase out the supplier when their perceived risk is high rather than low.*

Figure IV-2. Supply manager's choice among risk management strategies



3.5. Moderating effect of slack resources

As noted above, a low level of supplier dependence restrains the supply managers' ability to mitigate the risk and shifts their choice toward risk acceptance or avoidance strategies. In addition, the perceived supplier sustainability risk is the primary factor to differentiate between two risk mitigation strategies in high supplier dependence situations and between risk acceptance and avoidance strategies in low supplier dependence situations. In practice, however, buyers competing in the same industry with similar external dynamics, such as stakeholder salience, supply base, and buyer-supplier dependence structure appear to pursue different risk management strategies. One

explanation for this is that, despite the similarities in their external environment, these organizations might differ in their resource endowments, especially the level of their organizational slack (Bowen et al., 2001, Voss et al., 2008).

Based on Bourgeois's (1981) seminal definition, organizational slack is the cushion of actual or potential resources which is not consumed by the necessity of the continued daily operations of the firm and allows it to successfully adapt to the internal or external pressures and to initiate changes in strategy with respect to the external environment. More specifically, it includes the resources available to the managers (in this case, supply managers) that enable them to pursue certain types of strategic actions (in this case, risk management strategies) to counter the external threats (in this case, the supplier sustainability risk) and to adjust to the required changes imposed by them (Sharma, 2000, Sharfman et al., 1988). Slack resources can take several forms including management time, excess skilled employees, discretionary budget, and unused capacity (Tan and Peng, 2003, Voss et al., 2008). They can ease the adoption of a proactive strategic behavior and influence managerial decision outcomes (Singh, 1986). Specifically, financial slack allows the managers to invest in initiatives with positive performance implications such as risk management strategies that do not have an immediate pay-off and require a longer investment horizon (George, 2005, Bowen, 2002).

To implement the proactive risk management strategies discussed in this paper (i.e., monitoring/collaboration-based SSD initiatives or supplier phase-out), supply managers may have to change the scope and/or volume of their supply management processes and activities. Thereby, carrying them out without a sizeable level of excess resources would be very challenging for them. In other words, the type of strategy they select may well be limited by the amount of resources at their disposal and the slack helps them afford their intended strategies in response to their perceived supplier sustainability risk (Latham and Braun, 2009). If the risk management strategy entails a significant cost and engagement of resources (e.g., risk mitigation through collaboration-based SSD initiatives), buyers with more slack are more capable of absorbing those costs and undertaking the required actions.

This argument is reinforced by a number of studies showing that existence of slack resources is a pre-requisite for the choices made by managers in favor of sustainability-related issues: initiating supplier development projects, exploring new supply markets, and training of the supply and purchasing personnel (Bowen, 2007, Chiu and Sharfman, 2011, Sharma, 2000, Hofer et al., 2012). Particularly, Cousins et al. (2004) propose that the stock of resources available to the purchasing functions for managing the environmental issues is a crucial enabler of their environment-related supplier management initiatives. Based on their framework, a high level of available resources is associated with performing basic supplier development initiatives and forming collaborative relationships with suppliers to improve their performance. However, lack of adequate resources makes the purchasing functions to either take a "why bother" strategy and suffice to comply with relevant laws and regulations or, at most, to do simple supplier monitoring activities.

Hence, we conclude that slack resources moderate the relationships between the predictors of supplier sustainability risk management strategies and the selected strategy. Specifically, the proposed relationships are all contingent upon availability of slack resources. Otherwise, the supply managers' choice of strategy will be shifted toward other available options requiring less budget and fewer resources if they are constrained by the resources available to them for implementing their intended strategy. It should be noted that since supplier dependence remains constant regardless of the level of organizational slack available to supply managers, they cannot choose more affordable strategies which require higher levels of supplier dependence for implementation.

H3: As the slack resources available to supply managers decrease, they are more likely to accept the supplier sustainability risk.

H4: As the slack resources available to supply managers decrease, they are less likely to mitigate the supplier sustainability risk or avoid it.

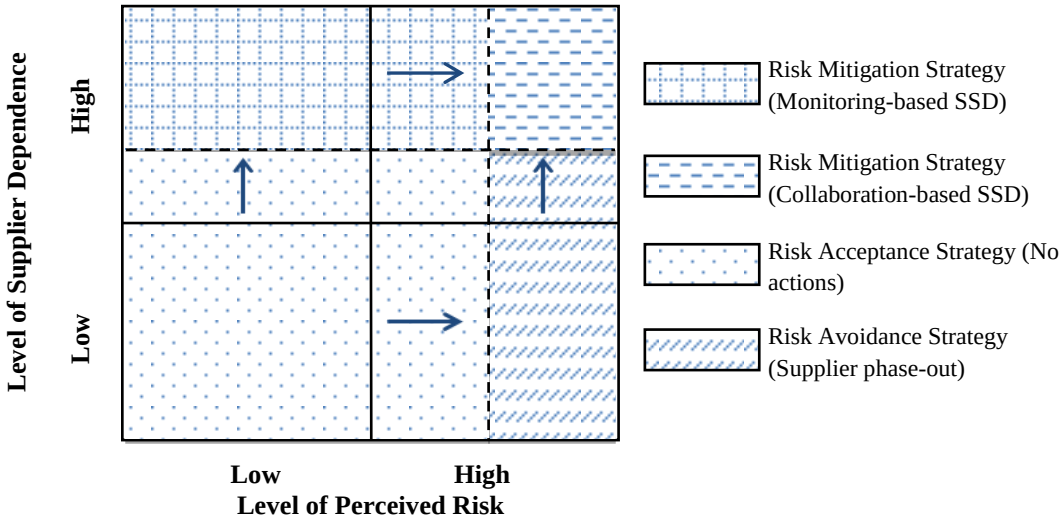
H4-a: As the slack resources available to supply managers decrease, they are more likely to accept the supplier sustainability risk rather than mitigate it through monitoring-based SSD initiatives in low risk-high dependence situations.

H4-b: As the slack resources available to supply managers decrease, they are more likely to use any risk management strategy other than collaboration-based mitigation in high risk-high dependence situations.

H4-c: As the slack resources available to supply managers decrease, they are more likely to accept the supplier sustainability risk rather than avoid it by phasing out the supplier in high risk-low dependence situations.

Figure IV-3 presents a summary of the shifts in supply managers' choice of risk management strategies when slack resources available to supply managers decrease.

Figure IV-3. Supply manager's choice among risk management strategies (low level of slack resources)



4. Methodology

We used the vignette-based experiment methodology to examine the contingencies affecting the supply managers' strategic choice for managing supplier sustainability risk (Thomas et al., 2013, Tangpong et al., 2010). Experiment methodology has a long tradition in decision sciences (Bazerman and Moore, 2008) and proved to be useful for the study of major strategic decisions. This is particularly true because the causal relationships between decision's predictors and outcomes under controlled conditions are investigated (Croson et al., 2007, Tjemkes and Furrer, 2010). By controlling for the confounding effects, experiments rule out the variety of contextual factors which influence the managerial behavior (Bateman and Zeithaml, 1989) and eliminate the endogeneity concerns by isolating the causality (Echambadi et al., 2006).

Vignettes are short scenarios presenting a case/situation to participants who are then asked to describe their possible actions given a series of pre-set circumstances (Alexander and Becker, 1978). Although the vignette-based experiment looks like a

survey, it contains all the components of an experimental design (i.e., random assignment to the cells, manipulated independent variables, and measured dependent variables) and thus can be shown to eliminate the possibility of systematic differences in the participants or the environment that could affect the outcomes (Creswell, 2013). Therefore, the observed differences noted can be attributed to the experimental manipulations, thus allowing a step beyond correlation tests to actual tests of causality (Siemsen, 2011). It also reduces the biases from memory lapses, rationalization tendencies, and consistency factors (Grewal et al., 2008). In addition, there is evidence that when given information about a hypothetical situation (e.g., a scenario), people properly anticipate the situation that is similar to what actual participants would do (Angrist and Pischke, 2008).

In addition to these general advantages, this methodology helped us overcome two major challenges we faced for assessing our proposed framework with real world data. First, it would have been difficult, if not impossible, to account for the variety of factors colouring the supply managers' decisions, such as their firms' organizational structure and existing business processes. In other words, framing the scenario in vignettes minimized the need for respondents to impute their own contextual information, whereas direct-question-based techniques could stimulate unreliable and biased self-reports (Fredrickson, 1986). Second, it would have been difficult to find companies functioning in each condition of the hypothesized matrices. In other words, there might not have been adequate variance of proposed independent variables in the actual firms to capture their effects on the supply managers' decisions by other methodologies, such as survey or archival data. Experiment methodology allowed for consistent treatments to manipulate the independent variables among participants and made it possible to have more precise assessment of each study variable (Hyman and Steiner, 1996).

4.1. Vignette development and experimental design

Drawing from real supplier sustainability risk events, we developed two basic scenarios about two fictitious mid-sized multinational companies ─ the first one operating in the apparel retail sector (the second one in food industry) ─ whose CEO recently extended their safety (environmental) policy to include the suppliers' operations.

No brand names were provided in the scenarios to eliminate any biases against particular companies. In each scenario, the participants were asked to assume the role of Procurement and Supply Management Director and review the profile of one supplier and indicate what actions, if any, they would take with regard to the safety (environmental) issues at the supplier facilities. The scenarios were carefully designed to allow the manipulation of all three independent variables (i.e., treatment factors) at two levels: supplier sustainability risk (high vs. low), supplier dependence (high vs. low), and slack resources (high vs. low). This resulted in a 2 x 2 x 2 full factorial design where all other elements of the scenarios were held constant. As a result, eight vignettes for each scenario were generated (Table IV-1) to examine not only the effects of each treatment factor separately, but also the effect of the three of them in combination (Montgomery, 2012). The scenarios including the manipulation of three factors are presented in Appendix IV-A.

Each participant was given an introductory cover letter and the questionnaire including two assigned vignettes (one from each scenario). The ordering of vignettes was S1+E8, S2+E7, S3+E6, S4+E5. After reading the first vignette, the participant responded to a set of items that captured the likelihood of pursuing each of the four risk management strategies (i.e., the dependent variables): acceptance, avoidance, monitoring-based, and collaboration-based mitigation. To operationalize the constructs of monitoring-based and collaboration-based risk mitigation strategies, we adapted and modified two sets of measures (each including five items) from earlier work on supply chain governance (Jiang, 2009a), sustainable supply management (Vachon and Klassen, 2006a), and supplier development (Gimenez and Sierra, 2013, Ehrgott et al., 2013, Krause et al., 2007). The risk avoidance strategy was also operationalized by a five-item measure adapted from similar measures available in the supplier switching literature (Hung et al., 2009, Bharadwaj and Matsuno, 2006). Finally, we used a single item measure to operationalize risk acceptance strategy (i.e., taking no actions). A discrete choice question was also included in the questionnaire asking the participants to choose only one strategy among the four options as their major and ultimate approach to manage the supplier in the vignette.

The first section of the questionnaire was then concluded by asking a series of

manipulation check questions regarding the treatment factors. This process was repeated with a second vignette. Finally, participants reported their basic demographic information: industry and size of their employer, age, gender, experience, educational degree, position, professional certification, risk propensity (Sitkin & Weingart (1995)), and sustainability-related knowledge. Dependent variable measures, as well as manipulation check items, are presented in Appendix IV-B.

Table IV-1. Vignettes and their combination of treatment factors' manipulations

Vignette ID	Perceived risk	Supplier dependence	Slack resources	Manipulation combination
S1 [a] /E1 [b]	High	High	High	HHH
S2/E2	High	High	Low	HHL
S3/E3	High	Low	High	HLH
S4/E4	High	Low	Low	HLL
S5/E5	Low	High	High	LHH
S6/E6	Low	High	Low	LHL
S7/E7	Low	Low	High	LLH
S8/E8	Low	Low	Low	LLL

[a] S1 to S8 are the vignettes drawn from Scenario 1 (supplier with safety problem in apparel industry).
[b] E1 to E8 are the vignettes drawn from Scenario 2 (supplier with environmental problem in food industry).

To build the internal validity and to control for any sequence effects, the vignettes were rotated so that each vignette version was equally likely to be in the first or second sequential position. One major concern in the experimental design is the issue of demand artifacts which refers to "all aspects of the experiment which cause a subject to perceive, interpret and act upon what he believes is expected or desired of him by the experimenter" (Sawyer, 1975). We reduced this bias and its potential confounding effects by (i) utilizing a between-subject design that is less prone to demand characteristics, (ii) instructing the participants that there were no "right" or "wrong" answers, and (iii) not explicitly mentioning the labels of the treatment factors (i.e., risk, dependence, and slack resources) within the vignettes (Sawyer, 1975).

4.1.1. Perceived risk manipulation

As mentioned in Section 2, supplier sustainability risk is the cumulative likelihood and consequence of a series of events: occurrence of a sustainability-related misconduct in buyer's supply base, stakeholders' detection of the misconduct, and

stakeholders' attribution of the misconduct responsibility to the buyer. The probability of occurrence of a supplier's misconducts increases if there is evidence of such events in supplier's past performance (Foerstl et al., 2010). Since such information is used as an indicator of the likelihood of unsatisfactory future performance, it can influence the perceived riskiness of the supplier (Pablo et al., 1996). Further, supplier's size is used as proxy for the visibility of the supplier's misconducts and hence, the perceived risk of being caught ignoring their behavior (Roberts, 1992). For example, small suppliers are not perceived to be visible enough to attract NGO's and other concerned stakeholders' attention (Klassen and Vereecke, 2012).

As a result, to manipulate the supply manager's perceived risk, two different vignettes were developed for each scenario. In the low risk vignette, the respondents dealt with a small supplier which had received one safety violation citation from the local government authorities because of the unsafe and unhealthy work conditions at their facilities (or had been found guilty by a local court and ordered to pay a fine for violating the environmental laws and clearing an area of protected peat forest). Conversely, in the high risk vignette, they were faced with a large supplier which was targeted by a reputable international human rights (or environmental) activist group and highlighted on their website because of the unsafe and unhealthy work conditions at their facilities (or for violating the environmental laws and clearing an area of protected peat forest).

4.1.2. Supplier dependence manipulation

It is well-established in the supply chain literature that when a significant proportion of a supplier's sales are to a buyer, its dependence increases (Carr et al., 2008). Hence, inspired by Lanier et al.'s (2010) operationalization of this construct, supplier dependence was manipulated by describing a supplier which 90% of its total sales were to the buyer in the scenario (high dependence) versus a supplier which provided products to a number of other companies and only 10% of its total sales were allocated to the buyer in the scenario (low dependence).

4.1.3. Slack resources manipulation

A series of changes in the supplier management strategies, including taking part in monitoring-based or collaborative-based SSD initiatives or switching to new suppliers

requires human, technical, and financial resources to deploy (Sharma, 2000, Lee and Klassen, 2008). Financial slack represents the excess uncommitted financial resources which are unabsorbed and highly flexible and can be easily redeployed to a wide range of activities (e.g., investment in new technologies, recruitment of specialized staff). Thereby, it is well established as the most discretionary or unabsorbed and readily-available slack resources (Sharfman et al., 1988, George, 2005).

Hence, this study specifically focuses on this category of slack resources available to the supply mangers to allocate them to alternate uses other than their current operations and activities. To manipulate the financial slack resources, the participants assigned to the "high slack resources" vignette were informed that the CEO had allocated a special annual budget to their department for making the necessary changes to supplier management activities, whereas those assigned to the "low slack resources" vignette were informed that the CEO had asked them to make the necessary changes to supplier management activities within their department's current budget limits and stated that no budget adjustments would be approved.

4.2. Pre-test

A qualitative analysis of the vignettes' content validity was conducted among five purchasing and supply management academicians and professionals. After making appropriate adjustments to the scenarios and questionnaires, a pre-test using 141 MBA students at two major business schools in Canada was conducted to verify the scenarios' plausibility and the manipulations' validity (Rungtusanatham et al., 2011). Students were randomly assigned two of the sixteen vignettes (one from each scenario) and we received 54 complete responses (total of 108 vignettes). The plausibility of scenarios was assessed during the pre-test along three dimensions (Eckerd et al., 2013): realism (one item scale: "the presented case scenario is realistic"), believability (one item scale: "the presented case scenario is believable"), and role involvement (one item scale: "I took my assumed role seriously while filling out the questionnaire"), on scales from 1 (strongly disagree) to 7 (strongly agree). Results showed that all vignettes had a mean of at least 5.40 on all three scales.

As noted earlier, sixteen seven-point items (where 1=very unlikely to 7=very

likely) were used to measure the likelihood of pursuing each of the four risk management strategies by asking the respondents how likely they were to take those actions with regard to the supplier mentioned in the vignette. Based on the pre-test data, four items were dropped due to their low loadings or high cross-loadings to establish reliability and uni-dimensionality of all four constructs. These results were further re-confirmed using the main experiment data (Table IV-2).

Table IV-2. Dependent variable items' loadings and cross loadings and scale reliabilities

Item	Risk acceptance	Risk avoidance	Risk mitigation: monitoring-based	Risk mitigation: collaboration-based
Q-1	**0.972**	-0.061	-0.146	-0.104
Q-3	-0.080	**0.884**	-0.034	-0.154
Q-6	0.019	**0.907**	-0.091	-0.079
Q-7	-0.164	-0.136	**0.836**	0.025
Q-8	-0.027	-0.042	**0.829**	0.158
Q-9	-0.040	0.067	**0.721**	0.318
Q-10	-0.094	-0.159	**0.850**	0.139
Q-11	0.027	0.040	**0.761**	-0.011
Q-13	-0.067	-0.065	0.190	**0.862**
Q-14	-0.125	-0.082	0.167	**0.884**
Q-15	-0.038	-0.082	0.053	**0.859**
Q-16	0.050	-0.103	0.080	**0.861**
Reliability (α)	---	0.79	0.87	0.90

Rotation Method: Varimax with Kaiser Normalization

The pre-test also assessed the validity of the manipulations to ensure that the perceived risk, supplier dependence, and slack resources varied significantly among vignettes as intended (Perdue and Summers, 1986). The mean responses for all three treatment factors were significantly different between their two levels for both scenarios, except for the perceived risk factor in Scenario 1. To address this shortcoming, modifications were made to the scenario and a second round of pre-test was conducted using 60 MBA students at another major Canadian business school (including only one vignette per participant). The results from 39 complete responses confirmed the validity of the perceived risk manipulation in Scenario 1.

4.3. Sample and data collection

Perception and experience play a major role in evaluating the risks associated with the complex supply chain relationships, and the "real" business people are the ideal sample for supply chain risk management research (Mantel et al., 2006, Hora and Klassen, 2013). Hence, for the purpose of increasing the internal validity as well as the generalizability of the research findings, a sample of experienced supply/purchasing managers was used in this study.

Table IV-3. Experimental cells and assignment of participants

Panel A: Experimental cells and number of observations

	High slack resources		Low slack resources		Total
	Low supplier dependence	High supplier dependence	Low supplier dependence	High supplier dependence	
Low risk	50 vignettes	49 vignettes	50 vignettes	49 vignettes	198 vignettes
High risk	49 vignettes	50 vignettes	49 vignettes	50 vignettes	198 vignettes
Total	99 vignettes	99 vignettes	99 vignettes	99 vignettes	396 vignettes

Panel B: Assignment of participants

Questionnaire #	Version of scenario 1 (safety)	Version of scenario 2 (environmental)	Number of respondents
Q1	HHH	LLL	13
Q2	HHL	LLH	12
Q3	HLH	LHL	12
Q4	HLL	LHH	12
Q5	LHH	HLL	12
Q6	LHL	HLH	12
Q7	LLH	HHL	13
Q8	LLL	HHH	12
Q9	LLL	HHH	13
Q10	LLH	HHL	12
Q11	LHL	HLH	13
Q12	LHH	HLL	12
Q13	HLL	LHH	13
Q14	HLH	LHL	12
Q15	HHL	LLH	13
Q16	HHH	LLL	12
Total			198

We chose to administer the experiment electronically, since previous research has suggested that electronic data collection is comparable to (Boyer et al., 2002), and more efficient than (Klassen and Jacobs, 2001), paper data collection. In addition, it is more cost effective and convenient, enhances the researcher ability to reach subjects, and results in fewer missing responses (Klassen and Jacobs, 2001). Our sample was drawn from an internet panel administered by Qualtrics. The data was generated using Qualtrics software, Version 56686 of the Qualtrics Research Suite, Copyright © 2014 Qualtrics.

Table IV-4. Demographic data of experiment participants

Size (no. of employees)	**Percent of sample**	**Industry**	**Percent of sample**
100-1,000	33.5%	Manufacturing	70.5%
1,001-5,000	35.0%	Retail	29.5%
5,001-10,000	15.0%		
More than 10,000	16.5%		
Education	**Percent of sample**	**Age**	**Percent of sample**
High School	6.0%	21-30	5.0%
College	23.5%	31-40	33.0%
Undergraduate degree	36.0%	41-50	30.5%
Master degree	30.5%	51-60	24.5%
Doctorate degree	4.0%	61 and over	7.0%
Total work experience	**Percent of sample**	**Purchasing experience**	**Percent of sample**
0-5 years	2.0%	0-5 years	7.5%
6-10 years	11.0%	6-10 years	30.5%
11-15 years	21.0%	11-15 years	23.5%
16-20 years	14.0%	16-20 years	14.5%
21-25 years	16.0%	21-25 years	12.0%
26 years or more	36.0%	26 years or more	12.0%
Gender	**Percent of sample**	**Purchasing certification**	**Percent of sample**
Male	62.5%	Yes	41.5%
Female	37.5%	No	58.5%
Title	**Percent of sample**	**Other control variables**	**Mean (SD)**
Purchasing/Supply Manager	54.5%	Sustainability knowledge	5.38 (1.11)
Purchasing/Supply Director	19.0%	Risk propensity	3.89 (1.34)
Purchasing/Supply VP	13.0%		
Other	13.5%		

For reasons noted earlier, full-time supply managers currently working for U.S-based medium or large size companies (with more than 100 employees) were targeted as our key respondents. Besides, drawing on the arguments by Amaeshi et al. (2008) and Seuring & Müller (2008), we limited the respondent pool to two socially- and environmentally-sensitive industries: manufacturing (including food; CIS code 31-33)

and retail trade sectors (CIS code: 443,445,446,448,451). Based on the estimated response rate of 30-40% (according to Qualtrics records), an estimated time of 20 minutes to complete the survey, and the challenge of specifically targeting purchasing/supply managers and providing enough incentive to get them to participate in the survey, it was agreed that participants would receive a $25 incentive.

Sixteen different versions of the questionnaire were loaded on Qualtrics platform and potential participants were asked a set of qualifying questions to make sure that they fit the target sample specifications. To increase the quality of the data, two attention questions were designed after each scenario to screen out the respondents who attempted to complete the survey without reading the scenarios. The data collection was stopped after two weeks, once our predetermined sample size of 200 complete quality responses (minimum 12 responses per each vignette) was achieved from the initial pool of 1,064 potential participants (19% response rate). Two of the responses were excluded because of their undesirable response pattern (straight-lining), reducing the sample size to 198 responses (total of 396 vignettes). The assignment of vignettes and respondents for each experimental treatment is reported in Table IV-3. A summary of the respondents' demographic information is provided in Table IV-4.

5. Data Analysis

As with the pre-test, after each participant read and responded to a vignette, it was important to verify that he/she perceived differences in the treatment factors, as intended.

The manipulation check results reported in Table IV-5 indicate that the risk perceived by the respondents was significantly different between the low risk and high risk vignettes for both scenarios (t_1=5.34 and t_2=4.64, $p<0.001$). Similarly, the respondents' perceptions of supplier dependence and slack resources were significantly different at the two levels of each factor for both scenarios (SD: t_1=5.98 and t_2=6.56, $p<0.001$; SR: t_1=2.95, $p<0.01$ and t_2=4.89, $p<0.001$). To test our conceptual model and its associated hypotheses, we conducted two different set of data analysis: MANCOVA/ANCOVA, using the scale-type dependent variables, and logistic regression, using the discrete choice question for the dependent variable.

Table IV-5. Independent variables' manipulation checks for both scenarios

Scenario	Treatment factor	Descriptive statistics	Manipulation test results
Safety, Apparel retail industry	Risk perception	High: N=100; Mean=5.40; SD=1.04 Low: N=100; Mean=4.44; SD=1.46	t(df)=5.34(179)***
	Supplier dependence	High: N=100; Mean=5.62; SD=1.40 Low: N=100; Mean=4.55; SD=1.13	t(df)=5.98(189)***
	Slack resources	High: N=104; Mean=5.26; SD=1.13 Low: N=96; Mean=4.68; SD=1.60	t(df)=2.95(169)**
Environmental, Food industry	Risk perception	High: N=100; Mean=5.55; SD=1.00 Low: N=100; Mean=4.88; SD=1.01	t(df)=4.64 (198)***
	Supplier dependence	High: N=100; Mean=5.47; SD=1.05 Low: N=100; Mean=4.37; SD=1.35	t(df)=6.56 (186)***
	Slack resources	High: N=104; Mean=5.47; SD=0.98 Low: N=96; Mean=4.50; SD=1.74	t(df)=4.89 (165)***

** p<0.01; *** p<0.001

5.1. MANCOVA/ANCOVA

Due to the categorical nature of the treatment factors, the hypothesized simple main effects and interaction effects were analyzed through MANCOVA/ANCOVA (Hair et al., 2010). While controlling for the respondents' demographics as well as the vignette versions and sequencing, a 2 x 2 x 2 MANCOVA was performed on the four dependent variables (risk management strategies): acceptance, avoidance, monitoring-based mitigation, and collaboration-based mitigation strategies. The results (Table IV-6) showed that all three treatment factors, including perceived risk, supplier dependence, and slack resources, as well as their interactions, significantly influenced the risk management strategies as a set. The partial eta squared values, interpreted as the amount of variance in dependent variables that is explained by the factors, show that 22.4% of difference in risk management strategies can be explained by supply managers' perceived risk, 10.8% by supplier dependence on the buyer, 6.5% by slack resources, 3.4% by the interaction of perceived risk and supplier dependence, and another 4.1% because of the interaction of all three factors.

After finding significant main and interaction effects in MANCOVA, a series of univariate ANCOVA's was conducted to investigate the effect of three treatment factors and their interactions on each risk management strategy separately to test the hypotheses. The ANCOVA results indicated that compared to low supplier dependence, high supplier dependence was associated with greater probability of using collaboration-based risk

mitigation strategy ($F=3.096$, $p<0.1$). However, results found no difference in the probability of using monitoring-based risk mitigation strategy in high versus low supplier dependence situations. Thus, H1 is partially supported. We also found support for H2. Managers reported a greater probability of employing risk acceptance and risk avoidance strategies in low supplier dependence situations than in high supplier dependence situations ($F=35.789$, $p<0.001$; $F=7.185$, $p<0.01$, respectively).

H1-a/b and H2-a/b state that perceived risk moderates the effect of supplier dependence on monitoring-based/collaboration-based risk mitigation and risk acceptance/risk avoidance strategies, respectively. The results showed that the perceived risk had a significant direct effect on all four risk management strategies: high level of perceived risk was associated with greater use of collaboration-based risk mitigation ($F=16.113$, $p<0.001$) and risk avoidance strategies ($F=21.256$, $p<0.001$), whereas low level of perceived risk was associated with greater use of monitoring-based risk mitigation ($F=4.157$, $p<0.05$) and risk acceptance strategies ($F=49.947$, $p<0.001$). The interaction of the two predictors, however, only significantly affected the risk acceptance ($F=3.277$, $p<0.1$) and monitoring-based risk mitigation ($F=7.831$, $p<0.01$) strategies, and not the other two. A planned contrast analysis revealed that marginal mean of risk acceptance strategy when the supply manager perceived a low level of risk (rather than high) was significantly higher when supplier dependence was at a low level ($MD_{HL-LL}=-1.649$, $p<0.001$). Similarly, the marginal mean of monitoring-based risk mitigation strategy when the supply manager perceived a low level of risk (rather than high) was significantly higher when supplier was highly dependent on the buyer ($MD_{HH-LH}=-0.544$, $p<0.001$). Taken together, these findings provide strong support for H1-a and H2-a with partial support for H1-b and H2-b. The results also indicated that compared to the situations where the amount of slack resources was high, low amount of slack resources led to greater use of risk acceptance strategy ($F=14.018$, $p<0.001$) and less use of collaboration-based mitigation strategy ($F=14.873$, $p<0.001$). However, we found no difference in the extent to which risk avoidance or monitoring-based risk mitigation strategies were used in situations with low versus high amount of slack resources. These results provide support for H3, while H4 is only partially supported.

Table IV-6. MANCOVA/ANCOVA results

	MANCOVA[a]		ANCOVA							
			Risk acceptance		Risk avoidance		Risk mitigation-M		Risk mitigation-C	
	F-value	η^2	*F-value*	η^2	*F-value*	η^2	*F-value*	η^2	*F-value*	η^2
PR[d]	26.673***	0.224	49.947*** MD^b_{H-L}=-1.287***(0.188)	0.112	21.256*** MD_{H-L}=0.561***(0.122)	0.054	4.157* MD_{H-L}= -0.220* (0.104)	0.011	16.113*** MD_{H-L}=0.481*** (0.119)	0.041
SD[d]	11.228***	0.108	35.789*** MD_{H-L}=-1.123***(0.188)	0.088	7.185** MD_{H-L}=-0.326**(0.122)	0.019			3.096I MD_{H-L}=0.211I (0.119)	0.008
SR[d]	6.394***	0.065	14.018** MD_{H-L}=-0.703***(0.188)	0.037					14.873*** MD_{H-L}=0.463*** (0.120)	0.039
PR x SD	3.268*	0.034	3.277I MD_{LH-LL}=-1.485*** MD_{HH-HL}=-0.761** MD_{HL-LL}=-1.649*** MD_{HH-LH}=-0.925** (0.270)	0.009			7.831** MD_{HH-LH}=-0.544***(0.155)	0.021		
PR x SD x SR	3.966***	0.041	3.118* $MD_{LHH-LHL}$=-0.934* $MD_{HLH-HLL}$=-1.523*** (0.392)	0.024			12.065*** $MD_{HHH-HHL}$=-0.886*** (0.216)	0.088		
Company size[e]	2.684**	0.028	4.965**	0.038	3.412*	0.027				
Age[f]	2.891***	0.030	3.395*	0.035	4.368**	0.045				
Work experience[g]	2.014**	0.026	2.690*	0.035	3.267**	0.042				
Sustainability knowledge	2.731*	0.029	3.895* B= -0.174* (0.088)	0.010	5.132* B=0.129* (0.057)	0.014				
Risk propensity	5.153***	0.053	6.780* B=-0.208* (0.080)	0.018					5.785* B=0.123* (0.051)	0.015

a. MANCOVA F and partial eta-squared values are based on Wilks' lambda approach.
b. MDs are marginal mean differences for the factors levels; standard deviations are shown in parentheses. For the interactions, MD_{ABC} represents the marginal mean difference for level A of perceived risk, level B of supplier dependence, and level C of slack resources.
c. *** p-value<0.001; ** p-value<0.01; * p-value<0.05; I p-value<0.1
d. PR: Perceived risk (Low=0, High=1), SD: Supplier dependence (Low=0, High=1), SR: Slack resources (Low=0, High=1)
e. Base category: 100-1000 employees
f. Base category: 21-30 years old
g. Base category: 0-5 years

Finally, H4-a~c simply state that slack resources positively moderate the hypothesized relationships in H1-a,b and H2-b. According to Table IV-6, the interaction of the slack resources with the other two predictors significantly affected the risk acceptance ($F=3.118$, $p<0.05$) and monitoring-based risk mitigation ($F=12.065$, $p<0.001$) strategies. The results of a planned contrast analysis showed that when the amount of slack resources was low (rather than high), the marginal mean of risk acceptance strategy was significantly higher in low risk-high dependence ($MD_{LHH-LHL}=-0.934$, $p<0.05$), as well as high risk-low dependence ($MD_{HLH-HLL}=-1.523$, $p<0.001$) situations, providing support for H4-a and H4-c. Similarly, the marginal mean of monitoring-based risk mitigation strategy was significantly higher in high risk-high dependence situations ($MD_{HHH-HHL}=-0.886$, $p<0.001$), providing support for H4-b.

The ANCOVA results for the covariates (i.e., the control variables) showed that the size of respondents' employer firm significantly affected their use of risk acceptance and avoidance strategies: those working for larger firms were more likely to accept, and less likely to avoid, the supplier sustainability risk. The findings also showed that managers with more experience and sustainability-related knowledge were more inclined to avoid the risk and less motivated to accept it. In addition, the respondents' risk propensity had a significant negative effect on use of risk acceptance strategy and a significant positive effect on the use of collaboration-based risk mitigation strategy. The results identified no relationship between respondents' industry, gender, purchasing work experience, education, and certification, and their use of any of the risk management strategies and, as such, we removed them for the ease of exhibition.

To examine the robustness of these results, we ran a set of other tests. Firstly, a Roy-Bargmann stepdown analysis was performed to avoid the potential biases in ANCOVA results due to the significant correlation between two of the dependent variables, i.e., monitoring-based and collaboration-based mitigation strategies (Pearson correlation = 0.299, $p<0.01$). The results confirmed our conclusions drawn from the univariate ANCOVA. Secondly, a Kruskal-Wallis test was conducted to relax the normality assumption, which further confirmed the same statistically significant main effects as the ANCOVA results. Finally, because every participant responded to two

vignettes, it was possible that the experience of responding to the first vignette may have influenced their responses to the second vignette. While we controlled for this order effect by balancing and reversing the order of treatments, we also reran a MANCOVA with only the first vignette. The results remained qualitatively similar to that reported earlier.

5.2. Logistic regression

Because of the categorical nature of the discrete choice question (strategy selection among four options), moderated logistic regression technique was used to supplement our MANCOVA analysis results and assess the effect of perceived risk, supplier dependence, and slack resources on supply managers' choice among four different risk management strategies. In this technique, the log odds of the outcome categories are modeled as a linear combination of the predictor variables. To reduce the complications associated with interpreting the multinomial logistic regression results involving an outcome variable with four categories, we split the outcome variable into four binary variables: selection of risk acceptance (yes or no), risk avoidance (yes or no), monitoring-based risk mitigation (yes or no), or collaboration-based risk mitigation strategy (yes or no). The three predictor variables were modeled as dummy variables, with the reference group being an independent supplier posing a low level of sustainability risk on a buyer which had a high amount of slack resources to deal with the situation. The interaction analysis in logistic regression uses a hierarchically well-formulated (HWF) model in which all lower-order components of a higher-order interaction term are included in the model. Hence, the typical strategy used to evaluate interactions is hierarchical analysis, i.e., if the higher-order interaction term was not significant, it was eliminated (Jaccard, 2001). The logistic regression model describing the relationship between $logit(\pi_1)$ (i.e., the log odds that the strategy 1 is selected) and our set of predictors is:

$$logit(\pi_1) = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_1X_2 + B_5X_1X_3 + B_6X_2X_3 + B_7X_1X_2X_3 \qquad \text{(Eq.1)}$$

If the model includes only the main effects and not the interaction terms, the exponent of the logistic coefficient (i.e., $Exp(B_i)$) will be equal to the odds ratio in which the predicted odds for the group scored 1 on X_i is divided by the predicted odds for the

reference group, holding constant all other predictor variables in the equation. For an interactive logistic model including the product terms (i.e., X_iX_j), however, the logistic coefficient for X_i is conditioned to the reference group for X_j. In other words, the exponent of the logistic coefficient for X_i is the odds ratio that divides the predicted odds for the group scored 1 on X_i by the predicted odds for the reference group on X_i, for the case where the dummy variable on X_j equals zero. In addition, the exponent of the logistic coefficient for the product term is the ratio of predicted odds ratios: it focuses on the predicted odds for the group scored 1 on X_i divided by the predicted odds for the reference group on X_i for the case where X_j equals 1 and divides it by the corresponding odds ratio for the reference group on X_j (Jaccard, 2001). The results are presented in Table IV-7.

The main effect models (A to D) were used to test the hypotheses H1, H2, H3, and H4. The significant main effects of supplier dependence in models A and B indicated that it negatively influenced the likelihood of risk avoidance and risk acceptance strategies being selected regardless of the level of risk perceived or the slack resources available. Risk acceptance (avoidance) strategy was 4.76 (4.85) times more likely to be selected to manage supplier sustainability risk associated with an independent supplier (B=-1.561; B=-1.580, p<0.001).

Similarly, the significant main effects of supplier dependence in models C and D showed that supply managers were 4.40 (2.73) times more likely to choose monitoring-based (collaboration-based) risk mitigation strategy (B=1.481; B=1.007, p<0.001) to manage the supplier sustainability risks associated with highly dependent suppliers. These results provide strong support for H1 and H2. The results in these models also indicated that risk acceptance strategy was 3.40 times more likely to be selected when slack resources were not available to supply managers (B=1.225, p<0.001), whereas risk avoidance and collaboration-based risk mitigation strategies were significantly less likely to be used in this condition (B=-0.547, p<0.01; B=-1.157, p<0.001). Monitoring-based risk mitigation strategy, however, was found to be used equally likely in situations with high vs. low slack resources. Hence, H3 is strongly supported by the findings, whereas H4 is only partially supported.

Table IV-7. Binary logistic regression models for four outcome variables [a]

Predictors	Risk acceptance			Risk avoidance			Risk mitigation-M			Risk mitigation-C		
	B	Wald	Exp(B)	B	Wald	Exp(B)	B	Wald	Exp(B)	B	Wald	Exp(B)
Main effect models	**Model A**			**Model B**			**Model C**			**Model D**		
PR[b]	-2.005	41.211***	0.135	1.035	14.568***	2.815	-0.564	5.967**	0.569	1.552	29.654***	4.723
SD[b]	-1.561	28.018***	0.210	-1.580	30.059***	0.206	1.481	38.521***	4.398	1.007	13.824***	2.739
SR[b]	1.225	18.188***	3.405	-0.547	4.277**	0.579	0.445	3.734	1.560	-1.157	17.855***	0.315
Constant	-0.498	4.112	0.608	-0.988	15.731	0.372	-1.523	38.218	0.218	-2.219	54.072	0.109
Complete models	**Model A'**			**Model B'**			**Model C'**			**Model D'**		
PR[b]	-3.791	13.055***	0.023	1.553	12.071**	4.727	-0.481	0.895	0.618	1.909	10.346**	6.744
SD[b]	-2.650	16.136***	0.071	-0.704	1.616	0.495	1.524	11.968**	4.592	1.799	9.140**	6.042
SR[b]	0.240	0.360	1.272	-0.121	0.060	0.886	-0.364	0.539	0.695	0.676	1.196	1.965
PR x SD	2.629	2.792	13.865	-1.576	4.290*	0.207	-1.705	5.707*	0.182	0.155	0.062	1.167
PR x SR	2.813	6.192*	16.652	-0.800	1.541	0.450	0.028	0.001	1.029	-0.919	2.230	0.399
SD x SR	2.033	6.868**	7.636	-1.781	2.184	0.168	0.033	0.003	1.033	-2.087	13.538***	0.124
PR x SD x SR	-5.086	6.880**	0.006	2.878	4.182*	17.787	2.781	7.689**	16.135	---[a]	--- [a]	--- [a]
Constant	-0.080	0.080	0.923	-1.266	13.744	0.282	-1.153	12.117	0.316	-2.973	28.334	0.051
Nagelkerke R^2		0.370			0.210			0.252			0.279	

a. The interaction analysis in logistic regression uses a hierarchically well-formulated (HWF) model in which all lower-order components of a higher-order interaction term are included in the model. Hence, the typical strategy used to evaluate interactions is hierarchical analysis, i.e., if the higher-order interaction term is not significant, it can be eliminated (Jaccard, 2001).

b. PR: Perceived risk (base category=low), SD: Supplier dependence (base category=low), SR: Slack resources (base category=high)

c. *** p-value<0.001; ** p-value<0.01; * p-value<0.05

To better appreciate the results of the interactive logistic models A'~D', we used Equation 1 and the coefficients reported in Table IV-7 to calculate the predicted $logit(\pi_1)$ for each cell of the 2 X 2 X 2 factorial design for all four outcome variables. We then converted these log odds to odds by calculating the exponent of each. According to the results, if the amount of slack resources was high, supply managers were 8.89 times (i.e., 1.449/0.163) more likely to select monitoring-based strategy to mitigate the supplier sustainability risk associated with a dependent supplier if they perceived a low level of risk rather than a high level of risk ($p<0.001$). They were, however, 7.88 (i.e., 2.435/0.309) times more likely to select collaboration-based risk mitigation strategy if they perceived a high level of risk than a low level of risk ($p<0.001$). In contrast, supply managers were 4.72 (i.e., 1.330/0.282) times more likely to decide to avoid the risk associated with an independent supplier if they perceived a high level of risk versus a low level of risk ($p<0.01$) and about 44 times more likely to choose to take no actions and accept the risk if the risk they perceived was low ($p<0.001$). Taken together, these findings provide strong support for H1-a, H1-b, H2-a, and H2-b.

As the next step, we compared the odds values of high vs. low slack resources situations. The monitoring-based risk mitigation strategy was almost equally likely to be selected for low risk-high dependence cells in both situations (odds ratio=1.00/0.718, $p>0.05$). Although risk acceptance strategy was found to be 9.7 (i.e., 0.633/0.065) times more likely to be selected in this cell for the low slack resources situation, this effect was not found to be statistically significant because of its large standard error.

As a result, our findings do not support H4-a. Comparing the odds values for high risk-high dependence cells for high vs. low slack resources conditions, we found that supply managers were 0.097 ($p<0.001$) times less likely to decide to mitigate the supplier sustainability risk through collaboration-based initiatives and 11.917 ($p<0.001$) times more likely to choose to mitigate it through monitoring-based initiatives if the amount of slack resources was low. However, the likelihood of using risk acceptance or avoidance strategies were not significantly different in these two conditions. Taken together, these results provide partial support for H4-b. Finally, we found strong support for H4-c as the results showed that the supply managers were 21 (i.e., 0.441/0.021) times more likely to accept the risk and 0.398 (i.e., 0.530/1.33) times less likely to avoid the

risk if the amount of discretionary slack resources was low in high risk-low dependence situations ($p<0.01$ and $p<0.05$, respectively).

Table IV-8 presents a summary of MANCOVA/ANCOVA and logistic regression results for each hypothesis.

Table IV-8. Summary of M/ANCOVA and logistic regression results

Hypothesis	Description	M/ANCOVA	Logistic Regression
H1	High-SD → Mitigation	Partially Supported	Supported
H1-a	High-SD x Low-PR → Mitigation-M	Supported	Supported
H1-b	High-SD x High-PR → Mitigation-C	Partially Supported	Supported
H2	Low-SD → Acceptance/Avoidance	Supported	Supported
H2-a	Low-SD x Low-PR → Acceptance	Supported	Supported
H2-b	Low SD x High-PR → Avoidance	Partially Supported	Supported
H3	Low-SR → Acceptance	Supported	Supported
H4	High-SR → Avoidance/Mitigation	Partially Supported	Partially Supported
H4-a	Low-SR & (High-SD x Low-PR) → Acceptance (+), Mitigation-M (-)	Partially Supported	Not Supported
H4-b	Low-SR & (High-SD x High-PR) → Acceptance (+), Mitigation-M (+), Avoidance (+), Mitigation-C (-)	Partially Supported	Partially Supported
H4-c	Low-SR & (Low-SD x High-PR) → Acceptance (+), Avoidance (-)	Partially Supported	Supported

Note: SD= Supplier Dependence; PR=Perceived Risk; SR: Slack Resources

6. Discussion

The purpose of this research was to test theoretically-derived hypotheses related to the different strategies pursued by supply managers for managing supplier sustainability risks. Since purchasing and supply management function has a boundary-spanning role in the buying organizations and is influential in extending their sustainability ambitions to the suppliers (Krause et al., 2009), we specifically focused on supply managers as the decision makers in this study. The effects of high and low levels of perceived supplier sustainability risk were assessed at two levels of supplier dependence (high vs. low) within two organizational contexts (where the amount of slack

resources was either high or low). Overall, the results indicate that these multi-level contextual factors significantly impact supply managers' intended risk management strategy: whether to mitigate the risk by monitoring-based or collaboration-based SSD initiatives, to avoid the risk altogether by phasing out the supplier, or to accept the risk and decide to deal with the consequences should it materialize.

The empirical results of this paper extend the literature to date in four essential ways. First, prior studies built on resource dependence theory suggest that buyer dominant relationships enable the buyers to successfully implement their monitoring-based or collaboration-based SSD initiatives (Spence and Bourlakis, 2009, Pedersen, 2009, Hoejmose et al., 2013). Besides, supplier dependence on the buyer is considered as a major requirement for suppliers' compliance to buyers' specific social and environmental standards and requirements (Locke et al., 2009, Pedersen, 2009). The results of this study provide additional support for this premise from a risk management perspective. Collaboration-based and monitoring-based risk mitigation strategies were found more likely to be used in buyer dominant situations where the participants believed they had the power to enforce such initiatives to improve suppliers' safety or environmental performance. The likelihood of using risk avoidance and risk acceptance strategies, however, increased when supplier dependence on the buyer was low. These findings are in line with Kraljic's (1983) strategic recommendation to buying organizations to exploit their full bargaining power so as to minimize the supply risks if they are the dominant player in the supply chain, or to get defensive and start looking for substitute material and suppliers if the supplier has the upper hand in the game.

Second, this study provides empirical support for merging the agency and management control theories to explain the relationship between the risk inherent in an agent-principal relationship and the control mechanism used by the principal for managing the agent's opportunistic behavior. In line with these theories' predictions, in high supplier dependence situations, the likelihood of using collaboration-based risk mitigation strategy (parallel to input control mechanism) increased when the participants perceived a high level of risk threatening their organization. However, the likelihood of pursuing a monitoring-based risk mitigation strategy (parallel to behavior and output control mechanisms) was significantly higher when the participants perceived a low level

of risk from the supplier's sustainability-related misconducts.

Third, our findings call for more scholarly attention to the crucial effect of slack resources on the strategic decisions made by middle managers, in this case, supply managers. The empirical results confirmed that the slack resources moderated the defined predictor-outcome relationships in risk management decision making: as the amount of available slack resources decreased, the participants became more inclined to (1) choose monitoring-based risk mitigation strategy over collaboration-based one to deal with high risk suppliers in high supplier dependence situations, (2) take no actions and accept the risk rather than to avoid it by terminating the relationship even when they perceived a high level of risk in low supplier dependence situations. This is in line with Meszaros's (1999) study conclusions showing that managers utilize a form of threshold-based heuristic, namely "affordability heuristic", in their decision making, picking options that are not perceived to deteriorate their organizations' profitability. Therefore, the decision outcome of "which risk management strategy to use" varies depending on the desired strategy to be affordable or not.

Fourth, our findings add depth to the literature on SSCM by extending it to a risk-based framework and empirically examining the concept of supplier sustainability risk management and its predictors. Particularly, while this literature is mainly concentrated on the effect of different supply management initiatives which could fit into monitoring or collaborative activities (Pagell and Wu, 2009, Awaysheh and Klassen, 2010, Vachon and Klassen, 2006a, Klassen and Vereecke, 2012), we provide new insights on why and under what conditions either of these initiatives are used by buying organizations. In addition, we examine why some buyers might take two other alternative strategies, i.e., supplier phase-out or accepting the risk, instead of using such initiatives.

Finally, from an empirical standpoint, the vignette-based experiment methodology allowed for more controlled examination of the causal relationships with a sample of real supply managers. While the work here investigated supply managers' decision making regarding supplier sustainability risk, the developed vignettes and their associated manipulations and scales can be used by other researchers in a variety of operational contexts involving risk, dependence, or slack resources constructs.

7. Managerial Implications and Limitations

This study makes additional managerial contributions for buying organizations dealing with supplier sustainability risk. Besides, we found that supply managers' risk propensity (or their prior sustainability-related knowledge) can color their decision making process and make them favor collaboration-based risk mitigation (or risk avoidance) strategy over others regardless of the situation in hand. Hence, in supply chain staffing decisions, senior managers in buying organizations should consider the personal characteristics (e.g., risk propensity, sustainability-related training and knowledge) of key personnel who are in charge of buyer-supplier exchanges to ensure that they are aligned with their social and environmental policies. They also need to foster improved decision-making by supply managers via establishing sustainability-oriented purchasing policies and procedures that facilitate the supply managers' translation of the information available to them into accurate risk assessments. Further, to create accurate views of the situation and to steer the risk management actions in the desired direction, they should also (i) employ appropriate training and information systems to promote the supply managers' knowledge regarding the sustainability-related issues, such as the salient stakeholder pressures in their external environment, and (ii) establish performance evaluation and reward systems that provide incentives for supply managers to closely interact with suppliers to have a fairly accurate perception of their sustainability-related intentions and behaviors. Finally, they should support their purchasing and supply chain management functions by providing them with adequate resources to deploy appropriate risk management strategy, particularly for cases which are perceived to be high risk.

This paper put forth and investigated a conceptual framework that can be deepened and broadened in a number of ways. First, we found that the supply managers' decisions were directly driven by their perceptions of the risks associated with suppliers. However, this perception can be biased (i.e., under-estimating or over-estimating the actual risk), and result in improper management of the risk or over-investments in unsuitable more-costly risk management strategies. Therefore, a possible future research topic is to investigate the approaches that buying organizations can take to improve the supply managers' estimation of risk such that their perceived risk aligns better with the

actual risk. Second, low buyer independence was one of the major premises of this study. More specifically, we focused on the buyer-supplier situations where the supplier dependence was either low or high, given that the buyer dependence on the supplier was always low. To extend this model, an avenue for future research would be to investigate how the supply managers' choice among the four risk management strategies would shift if this factor is included in the model. Third, although supply managers' risk perception is considered as one of the major factors in their choice among management strategies, the determinants of this construct, such as supplier's size and ownership (Klassen and Vereecke, 2012), the level of focal firm's accountability for social and environmental issues in their supply base (Parmigiani et al., 2011), or the supply managers' personal characteristics such as their risk propensity (Sitkin and Weingart, 1995) were not included in the model and can be explored in future studies. Fourth, this study considered a one-shot decision regarding one supplier. Future research may consider a step-wise decision making process where the information on the predictor factors are gradually provided to the participants or use conjoint analysis technique comparing multiple suppliers. Finally, the scope of inquiry in this study is limited to the supply managers in the United States. However, given the essential effect of organizational culture on supply chain management practices, including sustainable supply management decisions (Crum et al., 2011, Wu and Pagell, 2011), future studies are required to look beyond the North American context.

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Appendix IV-A: Description of the scenarios and the manipulation of treatment factors

Scenario 1

Kojak Inc. is a mid-sized apparel retailer based in United States, offering stylish and affordable clothing and accessories for men and women. The Kojak brand is available online and in more than 400 stores across North America. With only 20% of its clothing made locally, the company has a large international supply base located in Asia (about 50%) and South America (about 30%). In 2013, Kojak spent about $500 million on purchasing finished goods from suppliers. Sales in North America have been growing slowly with modest profitability in recent years. In the past few years, a number of companies operating in the apparel industry have experienced negative publicity and reputational damage due to the unsafe and unhealthy work conditions at their suppliers' facilities. To avoid similar problems, Kojak's CEO has recently extended Kojak's health and safety policy to include the suppliers' premises.

Currently, Kojak has no formal processes to monitor, manage, or improve health- and safety-related measures in place at its suppliers' facilities. The CEO has **[*allocated a special annual budget of $5 million to your department for making the necessary changes to the supplier management activities*** vs. ***asked you to make the necessary changes to the supplier management activities within your department's current budget limits and stated that no budget adjustments will be approved*]**. To comply with Kojak's new policy, you plan to look into all supplier profiles from a workplace health and safety perspective and decide what action, if any, to take with each of them. One supplier has been brought to your attention by a junior staff person.

B.A.P. Ltd. is located in a developing country in Southeast Asia. During the past year, this company **[*received one safety violation citation from the local government authorities*** vs. ***was targeted by a reputable international human rights activist group and highlighted on their website*]** because of the unsafe and unhealthy work conditions at their facilities. Because of their **[*small size (120 employees)*** vs. ***large size (1100 employees)*]**, it **[*is not* vs. *is*]** likely that they will draw **[*any* vs. *more*]** attention from the activist groups, non-government organizations (NGOs), or media in the future. Approximately **[*90%* vs. *10%*]** of B.A.P. total sales are to Kojak, which accounts for nearly one tenth of Kojak's purchased goods.

Scenario 2

ChocoYum Inc., headquartered in Chicago, is a mid-sized confectionery producer with over 700 employees. Established in 1995, the company now manufactures chocolates, snacks, and refreshment products at five plants spread across United States. These products are distributed and sold in North America. Palm oil is one of the major ingredients of ChocoYum chocolate products. Oil palms grow in equatorial conditions in Asia, Latin America, and Africa. ChocoYum's oil suppliers are mainly based in Asia. In 2013, ChocoYum spent about $200 million for the imported palm oil. During the past few years, a number of companies operating in this industry have experienced negative publicity and reputational damage because one or more of their suppliers have sourced palm oil from regions of the world experiencing rainforest deforestation. Such deforestation has been linked to climate change and destruction of rainforest ecosystems. To avoid similar problems, ChocoYum's CEO has recently extended ChocoYum's environmental policy to include the suppliers' processes and activities.

Currently, ChocoYum has no formal processes to monitor, manage, or improve the environmental measures in place at its suppliers' facilities. The CEO has **[*allocated a special annual budget of $2 million to your department for making the necessary changes to the supplier management activities*** vs. ***asked you to make the necessary changes to the supplier management activities within your department's current budget limits and stated that no budget adjustments will be approved*]**. To comply with ChocoYum's new policy, you plan to look into how suppliers source palm oil from an environmental sustainability perspective and decide what action, if any, to take with each of them. One supplier has been brought to your attention by a junior staff person.

P.O.P. Ltd., one of the palm oil suppliers, is an Indonesian firm. Last year, this company was **[found guilty and ordered to pay a fine by an Indonesian court** vs. **targeted by a reputable environmental activist group and highlighted on their website]** for violating the environmental laws and clearing an area of protected peat forest. Because of their **[*small size (120 employees)* vs. *large size (1100 employees)*]**, it **[*is not* vs. *is*]** likely that they will draw **[*any* vs. *more*]** attention from the activist groups, non-government organizations (NGOs), or media in the future. Approximately **[*90%* vs. *10%*]** of P.O.P. total sales are to ChocoYum, which accounts for nearly one tenth of ChocoYum's palm oil supply.

Appendix IV-B: Dependent variable and manipulation check scales (Scenario 1)

Scale-Type Dependent Variables

Given the information provided in the scenario, to what extent are you likely to take the following actions with regard to B.A.P. Ltd.? (1=very unlikely, 7=very likely)

Risk Acceptance

Q-1: Take no new actions regarding health & safety issues at their facilities.

Risk Avoidance

Q-2: Continue the business with them for a long time. (Dropped)

Q-3: Look for another supplier to replace them.

Q-4: Imply in your negotiations with them that they are in danger of losing the business unless their health and safety issues are properly managed. (Dropped)

Q-5: Renew the relationship once the current contract expires. (Dropped)

Q-6: Terminate the relationship.

Risk Mitigation- Monitoring Based

Q-7: Include health and safety measures such as incident/ accident rates in evaluating their performance.

Q-8: Send out a questionnaire asking them to report on their health and safety measures such as incident/ accident rates or the use of overtime.

Q-9: Regularly send your staff to perform workplace health and safety audits at their facilities.

Q-10: Provide them with feedback about the results of audits and performance evaluations.

Q-11: Require them an international health and safety standard certification (e.g., OHSAS 18001).

Risk Mitigation- Collaboration Based

Q-12: Allow an open two-way dialogue to jointly establish proper goals/targets regarding health and safety issues. (Dropped)

Q-13: Work closely with them to improve their health and safety performance (e.g., joint investment).

Q-14: Provide training/education to their personnel to improve their health and safety performance.

Q-15: Put incentives in place to improve their health and safety performance (e.g., financial rewards).

Q-16: Invest resources in developing their capabilities and improving their health and safety performance (e.g., financial aids).

Discrete Choice Dependent Variable

Given the information provided in the scenario, which one of the following four strategies would you choose as your MAJOR and ULTIMATE approach in managing your supplier, B.A.P. Ltd.?

a) You will terminate the relationship with them and switch to another supplier.
b) You will start collaborating with them to improve their health & safety performance, e.g. through training and education of their personnel, providing financial aids, etc.
c) You will start monitoring their health & safety performance, e.g. through self-evaluations, audits, third party certifications, etc.
d) You will continue working with them without taking any new actions regarding health & safety issues at their facilities.

Manipulation Check Scales

Given the information provided in the scenario, to what extent do you agree or disagree with the following statements? (1=strongly disagree, 7= strongly agree)

Perceived Risk (Adapted from Wagner & Bode (2006), Ellis et al. (2010), and Tazelaar & Snijders (2013))

1. B.A.P.'s behavior will have negative impacts on Kojak's reputation.
2. The relationship with B.A.P. will be problematic for Kojak in the future.
3. The relationship with B.A.P. is risky for Kojak.

Supplier Dependence (Adapted from Carr et al. (2008), Bode et al. (2011), He et al. (2012))

1. B.A.P. cannot afford to lose Kojak's business.
2. The relationship with Kojak is crucial to B.A.P.'s future performance.
3. B.A.P. is dependent on Kojak.

Slack Resources (Adapted from Danneels (2008))

1. You have sufficient discretionary financial resources to implement your desired supply management strategy.

Chapter V

Chapter V. Conclusion

This dissertation aimed to study various approaches which organizations might undertake to manage the environmental and social risks originating from their internal operations or their supply chains, including environmental management, safety management, supplier development, and supplier phase-out initiatives. Specifically, the overarching research objective was to investigate the determinants of these initiatives and their subsequent effects on organizations' performance. In doing so, this dissertation presented three complementary essays, each one making a unique contribution to a deeper understanding of sustainable operations management (OM). This final chapter concludes the dissertation by outlining the broader contributions of the dissertation, describing its limitations, and discussing possibilities for future research.

1. Key Implications

This dissertation made four major contributions to the sustainable operations management literature which, when taken together, sheds some light on different ways to manage sustainability-related risks within organizations or across their supply chains. First, this dissertation took a broad approach and adapted the Kleindorfer et al.'s internal-external perspective (2005) on sustainable operations. Specifically, it took the leap from investigating the intra-organizational environmental and social practices in the first essay to the examination of the strategies aimed at managing sustainability issues within the supply chain in the second and third essays. In addition, the three essays collectively contribute to the sustainable operations management literature by exploring it through two relatively new perspectives, i.e., "safety management" and "risk management".

Second, sustainable operations management literature has traditionally focused on the environmental issues and overlooked the social component of sustainability (Kleindorfer et al., 2005, Linton et al., 2007). Moreover, only a few recent studies have simultaneously looked at social, environmental, and economic aspects of sustainability (Thornton et al., 2013, Pagell et al., 2010, Pullman et al., 2009, Gimenez et al., 2012), whereas almost all other studies investigate these aspects in a standalone fashion (Seuring and Müller, 2008). The three essays in this dissertation, however, collectively

considered all three elements of sustainability, i.e., people, planet, and profit (Elkington, 1998). For example, the first and third essays concentrated on the workplace safety as one of the most important social aspects of organization's operations, which has been predominantly ignored in the sustainable operations management literature (Pagell et al., 2014). Essay 1, further, empirically investigated the simultaneous effect of safety culture on organizations' financial, environmental, and safety performance through the mediating effect of environmental and safety management practices. Similarly, the vignette-based experiment presented in essay 3 explored how buying organizations manage safety- or environmentally-related risks within their supply chains. Finally, the second paper conceptually theorized about the relationship between managing supplier sustainability risks (environmental and social risks, as a whole) and organizations' financial performance.

Third, this dissertation responded to the ever-growing need for theoretically-grounded studies to describe, explain, and predict operations and supply chain phenomena (Ketchen and Hult, 2007b, Sarkis et al., 2011). For example, the first essay built on the organizational support theory (Eisenberger et al., 1997) to explain how the organization's safety culture and the management commitment in improving workplace safety would motivate the employees to help their organization enhance its financial performance and effectively adopt environmental practices and improve its environmental performance. In the same vein, the second and third essays drew on the resource dependence (Pfeffer and Salancik, 2003) and the agency/management control (Eisenhardt, 1989, Ouchi, 1979) theories and identified two major factors as the determinants of different approaches toward managing supplier sustainability risks: level of perceived risk and the buyer-supplier dependence structure. Accordingly, collaboration-based sustainable supplier development (SSD) was suggested to be used in interdependent buyer-supplier relationships and high-risk buyer dominant situations. Monitoring-based SSD, however, was hypothesized to be employed to mitigate low levels of risk in buyer dominant situations. In addition, it was proposed that the intended strategy in high-risk independent buyer-supplier relationships would be to phase-out the supplier. Finally, organizations were suggested to accept the risk and take no actions in low-risk independent situations as well as in relationships with dominant suppliers.

Finally, top management intentions can be quite different from the decisions made by the operational managers when it comes to being more sustainable (Wheeler et al., 2002). Therefore, it is imperative to understand the sustainability-related strategies, initiatives, and decisions carried out at the operational level (Pagell and Gobeli, 2009). This dissertation addressed this issue in three different ways: (i) the first essay examined individual plants, and not companies, as the unit of analysis to be closer to day-to-day decisions at the operational level, (ii) the scope of the second essay was limited to the operational-level, and not corporate-level, strategies for managing the supplier sustainability risks such as monitoring-based or collaboration-based sustainable supplier development (SSD) initiatives, and (iii) the third essay targeted actual supply managers, and not top management, as the sample population assuming that they are the major decision makers in the supply chain context.

2. Limitations and Future Research

The contributions made in this dissertation must be viewed in light of the limitations associated with the three essays. First and foremost, the scope of all three studies was limited to strategies and initiatives carried out at the operational level and not the corporate level. For example, the risk management strategies in essays 2 and 3 are limited to the operations strategy level and do not transcend to the corporate-level strategies toward reputational risk or brand management. For instance, some buying organizations have recently employed "stakeholder bridging" strategy to deal with supplier sustainability risks: they have begun to actively approach and cooperate with critical NGO's and other salient stakeholders to reduce their pressure and enhance the legitimacy of their own sustainability-related initiatives (Foerstl et al., 2010, Matos and Hall, 2007). However, the scope of this dissertation does not cover such corporate-level strategies.

Three major limitations of this dissertation arise predominantly from the employed methodologies and the nature of the data in both empirical studies (i.e., essays 1 and 3). First, the data was collected from a limited range of industries in North America with moderate levels of safety and environmental risks in the first essay and high levels of supplier sustainability risks in the third essay. Therefore, the findings may not be

generalizable to organizations operating in other counties or other industries. Given the essential effect of industry and culture on operations and supply chain management practices (Wu and Pagell, 2011, Bates et al., 1995, Bortolotti et al., 2015, Baird et al., 2012), future studies are required to look beyond the context of these two studies.

Second, the collected data was from a cross-sectional snapshot; therefore, in the first essay, it was not possible to test and account for the lags between the development of the safety culture and the existence of practices and performance changes; similarly, the third essay investigated a one-shot decision regarding one supplier. To address this limitation in essay 1, a set of longitudinal studies can be conducted to measure the extent of safety-oriented culture and the implementation level of safety and environmental practices and their impact on organizational performance across a three to five year period, examining the relationships and their development through time. As for essay 3, future research may consider a step-wise decision making process where the information on the predictor factors are gradually provided to the participants or use conjoint analysis technique comparing multiple suppliers.

Third, both empirical studies used a single methodology (survey or experiment) and data source for empirical investigation. Specifically, the first essay relied on single-respondent perceptual data which could create grounds for bias. This shortcoming was partially addressed by validating the survey data on environmental performance with NPRI objective measure to show that there was no major bias in the single respondent self-reported data in this study (it was the only plant-level secondary data available). Changing the unit of analysis to the firm level, future studies can collect secondary panel data for companies whose performance information are available on databases such as Compustat and Environmental, Social and Governance factors (ESG) and triangulate it with a primary survey data collected from the same companies.

In addition, essay 2 put forth a conceptual framework that was only partially validated by the empirical data in essay 3. Specifically, essay 3 neither examined the effect of buyer dependence on the risk management strategies nor did it investigate the strategy-outcome relationships (i.e., the effect of risk management strategies on reputation and financial performance). An avenue for future research would be to design

and develop empirical studies to examine these missing elements.

From a conceptual standpoint, this dissertation provides several trajectories for future research. In essay 1, a positive relationship between safety culture and environmental practices was established. It was argued that this relationship was because the employees were motivated by the positive safety culture and changed their behaviors to contribute to organizations' plans and objectives, including green programmes. However, such mediating effects were not empirically examined. Hence, an interesting stream of future research could supplement this study by concentrating on the underlying mechanisms between organizations' safety and environmental endeavors. Similarly, in essays 2 and 3, supply managers' risk perception was considered as one of the major factors in their choice among management strategies. However, the determinants of this construct, such as suppliers' size and ownership (Klassen and Vereecke, 2012), the level of focal firm's accountability for social and environmental issues in their supply base (Parmigiani et al., 2011), or the supply managers' personal characteristics, such as their risk propensity (Sitkin and Weingart, 1995), were not included in the model and can be explored in future studies.

Finally, a very interesting stream for future scholarly attempts stems from bringing the two research streams of this dissertation together. Specifically, exploring the connections between the internal sustainability-related approaches of a buying organization and its external sustainability-related management strategies toward the suppliers would be a worthy pursuit.

As a final remark, it is noteworthy to mention that the sustainability discussions are based on the basic assumption that a true sustainable organization can continue to do business forever by performing well not only on the traditional short-term measures of profit and loss, but also on the broader triple-bottom-line concept, including the long-term ecological and social outcomes. Indeed, such an organization does not exist today (Pagell and Gobeli, 2009). However, to be more sustainable than the competitors and remain in business longer than them, an organization should avoid a pure profit-maximization approach. Instead, it is best to take a non-trade-off perspective and try to balance and align its non-economic sustainability objectives with its financial goals. By

doing so, the sustainability issues are integrated into all aspects of organization's business processes, driving its growth and financial gains.

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Appendices

Appendix A. Letter of Information and Questionnaire (Essay 3)

Sustainability Challenges across Supply Chains

Dear Madam/Sir,

You are invited to participate in a research project by a team of Operations Management researchers at Ivey Business School, Western University. This study addresses the sustainability issues within the supply chains, from a risk management perspective. If you are a panel member of Qualtrics who is currently working in the United States as a purchasing/supply manager (or director) for a medium or large size company in the manufacturing or retail trade industries, you are qualified to participate.

The purpose of this letter is to provide the information required for you to make an informed decision regarding participation in this research. Through the collection of perspectives from informed respondents, this study aims to explore how the organizations (specifically, focal firms within supply chains) can strategically manage the reputational risks associated with the sustainability-related malpractices at their suppliers' facilities. The online survey will ask you to read two scenarios and then, describe your possible actions in those circumstances by answering a set of questions. There is no time limit for completing the survey, although the estimated time for its completion is about 25 minutes. Your participation will be compensated in accordance with your agreement with Qualtrics.

There are no known or anticipated risks or discomforts from participating in this study. Your identity will remain anonymous and will not be provided to the researchers along with your responses. Any information that could identify you will be removed from your questionnaire, and you will not be asked to include your name or other identifying information on your survey. Participation in this study is voluntary. You may refuse to participate or withdraw from the study at any time. The collected information will remain strictly confidential and will be used only to advance knowledge and for the dissemination of the overall results at academic or professional forums. In accordance with the American Psychological Association guidelines, the data will be kept on file for five years and then destroyed.

Please note that completion of the online survey is indication of your consent to participate in this research study. Should you have any questions or concerns regarding this study, please contact the researchers, Stephan Vachon or Sara Hajmohammad. If you have any questions about the conduct of this study or your rights as a research participant, you may contact the Office of Research Ethics at Western University.

Thank you for completing the survey. Your participation in this research project is greatly appreciated!

Sincerely,

Stephan Vachon and Sara Hajmohammad

Q1.1 In what state do you currently reside?

- ❍ I do not reside in the United States
- ❍ _____

Q1.2 In which industry are you currently employed?

- ❍ Manufacturing (NAICS 31-33)
- ❍ Retail Trade- Electronics and Appliance (NAICS 443)
- ❍ Retail Trade- Food and Beverage (NAICS 445)
- ❍ Retail Trade- Health and Personal Care (NAICS 446)
- ❍ Retail Trade- Clothing and Clothing Accessories (NAICS 448)
- ❍ Retail Trade- Sporting Goods, Hobby, Book and Music (NAICS 451)
- ❍ Other (7) _____

Q1.3 Approximately, how many employees work for your company?

- ❍ < 100
- ❍ 100 - 1,000
- ❍ 1,001 - 5,000
- ❍ 5,001 - 10,000
- ❍ 10,001 and more

Q1.4 Do you consider yourself to be part of purchasing/supply chain team in your organization?

- ❍ Yes
- ❍ No

Q1.5 Are you knowledgeable about purchasing/supply chain issues within your organization?

- ❍ Yes
- ❍ No

Q1.6 Please rate your level of agreement with the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
A significant percentage of my time & effort is devoted to negotiating prices with suppliers.	❍	❍	❍	❍	❍	❍	❍
A significant percentage of my time & effort is devoted to handling delivery of raw material and/or supplied items.	❍	❍	❍	❍	❍	❍	❍
A significant percentage of my time & effort is devoted to taking care of supplier problems.	❍	❍	❍	❍	❍	❍	❍

Scenario 1

Rather than focusing on your current employer, please imagine yourself in the position of Director of Procurement and Supply Chain Management at Kojak Inc., described below.

Kojak Inc. is a mid-sized apparel retailer based in the United States, offering stylish and affordable clothing and accessories for men and women. The Kojak brand is available online and in more than 400 stores across North America. With only 20% of its clothing made locally, the company has a large international supply base located in Asia (about 50%) and South America (about 30%). In 2013, Kojak spent about $500 million on purchasing finished goods from suppliers. Sales in North America have been growing slowly with modest profitability in recent years.

In the past few years, a number of companies operating in the apparel industry have experienced negative publicity and reputational damage due to the unsafe and unhealthy work conditions at their suppliers' facilities. To avoid similar problems, Kojak's CEO has recently extended Kojak's health and safety policy to include the suppliers' premises.

Currently, Kojak has no formal processes to monitor, manage, or improve health- and safety-related measures in place at its suppliers' facilities. The CEO has allocated a special annual budget of $5 million to your department for making the necessary changes to the supplier management activities.

To comply with Kojak's new policy, you plan to look into all supplier profiles from a workplace health and safety perspective and decide what action, if any, to take with each of them. One supplier has been brought to your attention by a junior staff person.

> B.A.P. Ltd. is located in a developing country in Southeast Asia. During the past five years, this company has been targeted by a reputable international human rights activist group and highlighted on their website because of the unsafe and unhealthy work conditions at their facilities. Because of their large size (1100 employees), it is very likely that they will draw more attention from the activist groups, non-government organizations (NGOs), or media in the future. Approximately 90% of B.A.P. total sales are to Kojak, which accounts for nearly 5% of Kojak's purchased goods.

Before answering the questions, please consider how you might react in your position of Director of Procurement and Supply Management at Kojak Inc.

Q2.1 Given the information provided in the scenario, to what extent are you likely to take the following actions with regard to B.A.P. Ltd.?

	Very Unlikely (1)	Unlikely (2)	Somewhat Unlikely (3)	50/50 Chance (4)	Somewhat Likely (5)	Likely (6)	Very Likely (7)
Take no new actions regarding health & safety issues at their facilities.	❍	❍	❍	❍	❍	❍	❍
Continue the business with them for a long time.	❍	❍	❍	❍	❍	❍	❍
Look for another supplier to replace them.	❍	❍	❍	❍	❍	❍	❍
Renew the relationship once the current contract expires.	❍	❍	❍	❍	❍	❍	❍
Terminate the relationship.	❍	❍	❍	❍	❍	❍	❍
Include health & safety measures such as incident/accident rates in evaluating their performance.	❍	❍	❍	❍	❍	❍	❍
Send out a questionnaire asking them to report on their health & safety measures such as incident/accident rates or the use of overtime.	❍	❍	❍	❍	❍	❍	❍
Regularly send your staff to perform workplace health & safety audits at their facilities.	❍	❍	❍	❍	❍	❍	❍
Provide them with feedback about the results of audits and performance evaluations.	❍	❍	❍	❍	❍	❍	❍
Require them an international health & safety standard certification (e.g., OHSAS 18001).	❍	❍	❍	❍	❍	❍	❍
Work closely with them to improve their health & safety performance (e.g., joint investment).	❍	❍	❍	❍	❍	❍	❍
Provide training/education to their personnel to improve their health & safety performance.	❍	❍	❍	❍	❍	❍	❍
Put incentives in place to improve their health & safety performance (e.g., financial rewards).	❍	❍	❍	❍	❍	❍	❍
Invest resources in developing their capabilities and improving their health & safety performance (e.g., financial aids)	❍	❍	❍	❍	❍	❍	❍

Q2.2 Given the information provided in the scenario, which one of the following four strategies would you choose as your MAJOR and ULTIMATE approach in managing your supplier, B.A.P. Ltd.?

- ❍ You will terminate the relationship with them and switch to another supplier.
- ❍ You will start collaborating with them to improve their health & safety performance, e.g. through training and education of their personnel, providing financial aids, etc.
- ❍ You will start monitoring their health & safety performance, e.g. through self-evaluations, audits, third party certifications, etc.
- ❍ You will continue working with them without taking any new actions regarding health & safety issues at their facilities.

Q2.3 Given the information provided in the scenario, to what extent do you agree or disagree with the following statements?

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
B.A.P.'s behavior will have negative impacts on Kojak's reputation.	❍	❍	❍	❍	❍	❍	❍
The relationship with B.A.P. will be problematic for Kojak in the future.	❍	❍	❍	❍	❍	❍	❍
The relationship with B.A.P. is risky for Kojak.	❍	❍	❍	❍	❍	❍	❍
B.A.P. cannot afford to lose Kojak's business.	❍	❍	❍	❍	❍	❍	❍
The relationship with Kojak is crucial to B.A.P.'s future performance.	❍	❍	❍	❍	❍	❍	❍
B.A.P. is dependent on Kojak.	❍	❍	❍	❍	❍	❍	❍
You have sufficient discretionary financial resources to implement your desired supply management strategy.	❍	❍	❍	❍	❍	❍	❍

Scenario 2

As before, rather than focusing on your current employer, please imagine that you are the Director of Procurement and Supply Chain Management at another firm, ChocoYum Inc., described below.

ChocoYum Inc., headquartered in Chicago, is a mid-sized confectionery producer with over 700 employees. Established in 1995, the company now manufactures chocolates, snacks, and refreshment products at five plants spread across United States. These products are distributed and sold in North America. Palm oil is one of the major ingredients of ChocoYum chocolate products. Oil palms grow in equatorial conditions in Asia, Latin America, and Africa. ChocoYum's oil suppliers are mainly based in Asia. In 2013, ChocoYum spent about $200 million for the imported palm oil.

During the past few years, a number of companies operating in this industry have experienced negative publicity and reputational damage because one or more of their suppliers have sourced palm oil from regions of the world experiencing rain-forest deforestation. Such deforestation has been linked to climate change and destruction of rain-forest ecosystems. To avoid similar problems, ChocoYum's CEO has recently extended ChocoYum's environmental policy to include the suppliers' processes and activities.

Currently, ChocoYum has no formal processes to monitor, manage, or improve the environmental measures in place at its suppliers' facilities. The CEO has asked you to make the necessary changes to the supplier management activities within your department's current budget limits and stated that no budget adjustments will be approved.

To comply with ChocoYum's new policy, you plan to look into how suppliers source palm oil from an environmental sustainability perspective and decide what action, if any, to take with each of them. One supplier has been brought to your attention by a junior staff person.

> P.O.P. Ltd., one of the palm oil suppliers, is an Indonesian firm. Last year, this company was found guilty and ordered to pay a fine by an Indonesian court for violating the environmental laws and clearing an area of protected peat forest. Because of their small size (120 employees), it is not likely that they will draw any attention from the activist groups, non-government organizations (NGOs), or media in the future. Approximately 10% of P.O.P. total sales are to ChocoYum, which accounts for nearly 5% of ChocoYum's palm oil supply.

Before answering the questions, please consider how you might react in your position of Director of Procurement and Supply Management at ChocoYum Inc.

Q3.1 Given the information provided in the scenario, to what extent are you likely to take the following actions with regard to P.O.P. Ltd.?

	Very Unlikely (1)	Unlikely (2)	Somewhat Unlikely (3)	50/50 Chance (4)	Somewhat Likely (5)	Likely (6)	Very Likely (7)
Take no new actions regarding environmental issues at their facilities.	❍	❍	❍	❍	❍	❍	❍
Continue the business with them for a long time.	❍	❍	❍	❍	❍	❍	❍
Look for another supplier to replace them.	❍	❍	❍	❍	❍	❍	❍
Renew the relationship once the current contract expires.	❍	❍	❍	❍	❍	❍	❍
Terminate the relationship.	❍	❍	❍	❍	❍	❍	❍
Include environmental measures in evaluating their performance.	❍	❍	❍	❍	❍	❍	❍
Send out a questionnaire asking them to report on the environmental aspects of their operations such as sources of their palm oil.	❍	❍	❍	❍	❍	❍	❍
Regularly send your staff to perform environmental audits at their facilities.	❍	❍	❍	❍	❍	❍	❍
Provide them with feedback about the results of audits and performance evaluations.	❍	❍	❍	❍	❍	❍	❍
Require them an international environmental standard certification (e.g., ISO 14001).	❍	❍	❍	❍	❍	❍	❍
Work closely with them to improve their environmental performance (e.g., joint investment).	❍	❍	❍	❍	❍	❍	❍
Provide them with training / education to improve their environmental performance.	❍	❍	❍	❍	❍	❍	❍
Put incentives in place to improve their environmental performance (e.g., financial rewards).	❍	❍	❍	❍	❍	❍	❍
Invest resources in developing their capabilities and improving their environmental performance (e.g., financial aids)	❍	❍	❍	❍	❍	❍	❍

Q3.2 Given the information provided in the scenario, which one of the following four strategies would you choose as your MAJOR and ULTIMATE approach in managing your supplier, P.O.P. Ltd.?

- ❍ You will terminate the relationship with them and switch to another supplier.
- ❍ You will start collaborating with them to improve their environmental performance, e.g. through providing training and education, financial aids, etc.
- ❍ You will start monitoring their environmental performance, e.g. through self-evaluations, audits, third party certifications, etc.
- ❍ You will continue working with them without taking any new actions regarding environmental issues at their facilities.

Q3.3 Given the information provided in the scenario, to what extent do you agree or disagree with the following statements?

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
P.O.P.'s behavior will have negative impacts on ChocoYum's reputation.	❍	❍	❍	❍	❍	❍	❍
The relationship with P.O.P. will be problematic for ChocoYum in the future.	❍	❍	❍	❍	❍	❍	❍
The relationship with P.O.P. is risky for ChocoYum.	❍	❍	❍	❍	❍	❍	❍
P.O.P. cannot afford to lose ChocoYum's business.	❍	❍	❍	❍	❍	❍	❍
The relationship with ChocoYum is crucial to P.O.P.'s future performance.	❍	❍	❍	❍	❍	❍	❍
P.O.P. is dependent on ChocoYum.	❍	❍	❍	❍	❍	❍	❍
You have sufficient discretionary financial resources to implement your desired supply management strategy.	❍	❍	❍	❍	❍	❍	❍

Demographic Questions

Please answer the following questions as they describe you:

Q4.1 Your gender:

- ❍ Male
- ❍ Female

Q4.2 Your age:

- ❍ 21 - 30
- ❍ 31 - 40
- ❍ 41 - 50
- ❍ 51 - 60
- ❍ 61 and over

Q4.3 Your highest level of education completed:

- ❍ High School
- ❍ College
- ❍ Undergraduate Degree
- ❍ Master Degree
- ❍ Doctoral Degree

Q4.4 Your work experience (total years):

- ❍ 0 - 5
- ❍ 6 - 10
- ❍ 11 - 15
- ❍ 16 - 20
- ❍ 21 - 25
- ❍ 26 or more

Q4.5 Your current position (Job title):

- ❍ Manager- Purchasing/Supply Chain/Procurement
- ❍ Director- Purchasing/Supply Chain/Procurement
- ❍ VP- Purchasing/Supply Chain/Procurement
- ❍ Other _____

Q4.6 Your work experience in purchasing (years):

- ❍ 0 - 5
- ❍ 6 - 10
- ❍ 11 - 15
- ❍ 16 - 20
- ❍ 21 – 25
- ❍ 26 or more

Q4.7 Do you have any purchasing professional certification such as CPM, APP, or SCMP?

- ❍ Yes
- ❍ No

Q4.8 On a scale of 1 to 7, how do you evaluate your knowledge on the following issues?

	Not Familiar At All (1)	(2)	(3)	(4)	(5)	(6)	Well-Versed (7)
Environmental Management	❍	❍	❍	❍	❍	❍	❍
Safety Management	❍	❍	❍	❍	❍	❍	❍
Corporate Social Responsibility	❍	❍	❍	❍	❍	❍	❍
Waste Management	❍	❍	❍	❍	❍	❍	❍
Product Life Cycle Assessment	❍	❍	❍	❍	❍	❍	❍

Q4.9 Assume that in the context of your responsibilities within your current organization, you face a decision that may affect your organization's reputation. Given this circumstance, please rate your level of agreement with the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat Disagree (3)	Neither Agree nor Disagree (4)	Somewhat Agree (5)	Agree (6)	Strongly Agree (7)
I choose more risky alternatives based on the assessment of others on whom I must rely.	❍	❍	❍	❍	❍	❍	❍
I choose more risky alternatives which rely upon complex technical analyses.	❍	❍	❍	❍	❍	❍	❍
I choose more risky alternatives which can have a major impact on the strategic direction of my organization.	❍	❍	❍	❍	❍	❍	❍
I initiate a strategic action which has the potential to backfire.	❍	❍	❍	❍	❍	❍	❍
I support a decision when I am aware that relevant analyses were done while missing several pieces of information.	❍	❍	❍	❍	❍	❍	❍

Appendix B. Ethics Approvals (Essay 3)

Western Research

Research Ethics

Use of Human Participants - Initial Ethics Approval Notice

Principal Investigator: Dr. Stephan Vachon
File Number:105176
Review Level: Delegated
Protocol Title: Managing Supplier Sustainability Risk: Strategies and Predictors
Department & Institution: Richard Ivey School of Business,Western University
Sponsor: Social Sciences and Humanities Research Council

Ethics Approval Date: April 21, 2014 **Expiry Date:** December 31, 2014

Documents Reviewed & Approved & Documents Received for Information:

Document Name	Comments	Version Date
Instruments	Pre Test- Instrument	2014/03/24
Instruments	Phases 1 and 2- Instrument	2014/03/24
Revised Letter of Information & Consent	Revised Pretest LOI- Clean Copy- 09 04 2014	2014/04/09
Revised Letter of Information & Consent	Revised Phase 2 LOI- Clean Copy- 09 04 2014	2014/04/09
Revised Letter of Information & Consent	Revised Phase 1 LOI- Clean Copy- 09 04 2014	2014/04/09
Revised Western University Protocol	Revised Western Protocol- Clean Copy - 09 04 2014	2014/04/09
Response to Board Recommendations	Response Letter to NMREB Board Recommendations (#105176)- 09 04 2014	2014/04/09

This is to notify you that The University of Western Ontario Research Ethics Board for Non-Medical Research Involving Human Subjects (NMREB) which is organized and operates according to the Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans and the applicable laws and regulations of Ontario has granted approval to the above named research study on the approval date noted above.

This approval shall remain valid until the expiry date noted above assuming timely and acceptable responses to the NMREB's periodic requests for surveillance and monitoring information.

Members of the NMREB who are named as investigators in research studies, or declare a conflict of interest, do not participate in discussions related to, nor vote on, such studies when they are presented to the NMREB.

The Chair of the NMREB is Dr. Riley Hinson. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Ethics Officer to Contact for Further Information

✓ Grace Kelly	Vikki Tran	Mina Mekhail	Erika Basile

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Western Research

Research Ethics

Western University Health Science Research Ethics Board
NMREB Delegated Initial Approval Notice

Principal Investigator: Dr. Stephan Vachon
Department & Institution: Richard Ivey School of Business,Western University

NMREB File Number: 105547
Study Title: Managing Supplier Sustainability Risk: Strategies and Predictors
Sponsor:

NMREB Initial Approval Date: August 22, 2014
NMREB Expiry Date: March 31, 2015

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Instruments	Instrument (Vignettes + Questionnaire)	2014/07/14
Revised Letter of Information & Consent	Letter of Information (PDF file)revised as per board recommendations	2014/08/08
Revised Western University Protocol	Application Form (PDF file) revised as per board recommendations	2014/08/08

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the above named study, as of the HSREB Initial Approval Date noted above.

NMREB approval for this study remains valid until the NMREB Expiry Date noted above, conditional to timely submission and acceptance of HSREB Continuing Ethics Review.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario.

Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Ethics Officer to Contact for Further Information

Erika Basile	Grace Kelly	Mina Mekhail	Vikki Tran

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Appendix D. Curriculum Vitae

SARA HAJMOHAMMAD, PMP

EDUCATION

Sep. 2011 – June 2015	Ph.D., Business Administration- Operations Management Ivey Business School, Western University, London, ON, Canada GPA: 87 over 100
Sep. 2009 - Aug. 2011	Ph.D., Business Administration- Operations Management HEC Montreal, Montreal, QC, Canada (*Transferred to Western University*) GPA: 4.00 over 4.3
Sep. 2000 – Apr. 2003	M.A., Industrial Management Shahid Beheshti University, Tehran, Iran GPA: 17.87 over 20
Sep. 1995 – Feb. 2000	B.Sc., Chemical Engineering Sharif University of Technology, Tehran, Iran GPA: 15.16 over 20

PRIMARY RESEARCH INTERESTS

- Sustainable Operations Management
- Supply Chain Management
- Risk Management
- Behavioral Operations
- Project Management

REFEREED PUBLICATIONS

[1] Hajmohammad, S. and Vachon, S. (2014). Safety culture: A catalyst for sustainable development. *Journal of Business Ethics*. 123 (2), 263-281.

[2] Vachon, S., Hajmohammad, S., and Patry, K. (2013). Returns management in a business-to-business context: Its impact on customer satisfaction. *International Journal of Integrated Supply Management*. 8(4), 173-192.

[3] Hajmohammad, S., Vachon, S., Klassen, R. D., and Gavronski, I. (2013). Lean management and supply management: Their role in green practices and performance. *Journal of Cleaner Production*. 39(1), 312-320.

MANUSCRIPTS UNDER REVIEW/WORKING PAPERS

[1] Hajmohammad, S. and Vachon, S. Managing supplier sustainability risk: Strategies and

predictors.

[2] Hajmohammad, S. and Vachon, S. Managing Supplier Sustainability Risk: The Interacting Effect of Supplier Dependence, Perceived Risk, and Slack Resources.

CONFERENCE PRESENTATIONS AND PROCEEDINGS

[1] Hajmohammad, S. and Vachon, S. (November 2014). Managing supplier sustainability risk: The interacting effect of supplier dependence, perceived risk, and availability of slack resources. *2014 Decision Sciences Institute (DSI) Annual Meeting*, Tampa, USA.

[2] Hajmohammad, S. and Vachon S. (August 2014). Managing supplier sustainability risk: Strategies and predictors. *2014 Academy of Management (AOM) Annual Meeting*, Philadelphia, USA.

[3] Hajmohammad, S. (May 2014). Switching barriers in nonstrategic buyer-supplier relationships. *2014 Administrative Sciences Association of Canada (ASAC) Conference*, Muskoka, Canada.

[4] Hajmohammad, S. and Vachon S. (May 2014). Managing supplier sustainability risk. *2014 Administrative Sciences Association of Canada (ASAC) Conference*, Muskoka, Canada.

[5] Vachon, S. and Hajmohammad, S. (November 2013). Production stability and sustainable development. *2013 Decision Sciences Institute (DSI) Annual Meeting*, Baltimore, USA.

[6] Hajmohammad, S. and Vachon, S. (November 2012). Does it pay to care for safety? The impact of safety culture on organizational performance. *2012 Decision Sciences Institute (DSI) Annual Meeting*, San Francisco, USA.

[7] Hajmohammad, S., Vachon, S., Klassen, R. D., and Gavronski, I. (April 2011). Lean management and supply management: Their role in green practices and performance. *2011 Northeast Decision Sciences Institute (NEDSI) Annual Meeting*, Montreal, Canada.

HONORS/SCHOLARSHIPS/AWARDS

[1] OM Division's PhD Student Travel Grant- AOM Conference Grant Competition, Academy of Management (2014).

[2] Al Mikalachki PhD Research Fund- Conference Grant Competition, Ivey Business School, Western University (2014).

[3] C.B. (Bud) Johnston Ontario Graduate Scholarship, Ivey Business School, Western University (2013-14 and 2014-15).

[4] Ontario Graduate Scholarship, Province of Ontario, Canada (2013-14 and 2014-15).

[5] PhD Research Stipend, Building Sustainable Value Research Centre (BSV), Western University (Sep. 2012).

[6] Plan for Excellence Doctoral Fellowship, Ivey Business School, Western University (2011-14).

[7] Phase II Completion Scholarship, HEC Montreal (Fall 2010).

[8] "Bourse VIP" for Academic Excellence, HEC Montreal (Winter 2010).

[9] Tuition Exemption Scholarship, HEC Montreal (2009–11).

[10] Admission Scholarship, HEC Montreal (Fall 2009).

[11] Graduate with honors (1st rank), Management and Accounting (Administrative Science) Department, Shahid Beheshti University.

TEACHING EXPERIENCE

Winter 2014 **Sessional Lecturer**
HEC Montreal
MBA Elective Course: Project Management Principles and Tools

Winter 2013 **Teaching Assistant**
Ivey Business School, Western University
HBA Elective Course: Operations (2 Sections)

PRIMARY TEACHING INTERESTS

- Operations Management
- Sustainable Development
- Supply Chain Management
- Project Management
- Quality Management

SCHOLARLY AND PROFESSIONAL SERVICES

AD-HOC REVIEWS

- Administrative Sciences Association of Canada Conference (2014)
- Academy of Management Annual Meeting (2013; 2014)
- International Journal of Production Economics (2012; 2013)
- Journal of Cleaner Production (2012)
- Decision Sciences Institute Annual Meeting (2012)
- Journal of Operations and Supply Chain Management (2011)

GRADUATE RESEARCH ASSISTANT

- Ivey Business School (Stephan Vachon; Robert Mitchell; Robert Klassen)
- HEC Montreal (Stephan Vachon)

GRADUATE TEACHING ASSISTANT

- Ivey Business School (Robert D. Klassen; David Sparling; Stephan Vachon)
- HEC Montreal (Rajesh Kumar Tyagi)

ASSOCIATION MEMBERSHIP

- Project Management Institute (2008-Present)
- Production and Operations Management Society (2010-Present)
- Academy of Management (2010-Present)
- Decision Sciences Institute (2012-Present)
- Administrative Sciences Association of Canada (2014-Present)

CERTIFICATIONS

- Certified Project Management Professional (PMP) by PMI (May 2009)
- Certified European Excellence Assessor by EFQM (May 2006)
- Certified Lead Auditor of ISO 9001, OHSAS 18001, ISO 14001 by DNV
- Certified Auditor of ISO/TS 29001 by DNV

RELEVANT EMPLOYMENT

Nov. 2002 – Dec. 2008 **Quality Manager / Specialist**
Sazeh Consultants, Tehran, Iran

The company was a leading Iranian EPC (Engineering, Procurement and Construction) Contractor in Oil, Gas and Petrochemical Industries (www.sazeh.com).

Reporting to the Managing Director and Management Representative, I directed a team of 10 qualified quality management specialists.

Main achievements / responsibilities:

- Establishment, documentation, implementation, maintaining, updating and auditing Company Quality and HSE Management System, based on ISO 9001, ISO/TS 29001, ISO 14001 and OHSAS 18001
- Managing quality issues within company projects and proposals/tenders
- Preparation of Company Project Management Manual based on PMBOK (Project Management Body of Knowledge)
- Conducting Self-Assessment (1- Questionnaire Method 2- Workshop Method 3- Award Simulation Method) based on EFQM (European Foundation for Quality Management) Excellence Model: 2003
- Participation in Value Management activities and establishing Human Resource Management Systems, such as Employee Recognition, Training Management, Suggestion System, Employee Satisfaction Evaluation, etc.

Aug. 2000 – Oct. 2002 **Process Engineer**
Sazeh Consultants, Tehran, Iran