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Published on: 18 Jun 2012 - International Journal of Production Research (Taylor & Francis)

Topics: Supplier relationship management, Sustainability, Sustainable procurement, Triple bottom line and Supply chain management

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Journal:	*International Journal of Production Research*
Manuscript ID:	TPRS-2010-IJPR-0698.R2
Manuscript Type:	Original Manuscript
Date Submitted by the Author:	10-Feb-2011
Complete List of Authors:	Hollos, Daniel; EBS Business School, Supply Chain Management Institute Blome, Constantin; EBS Business School, Supply Chain Management Institute Foerstl, Kai; Frauenhofer IIS, Center for Applied Research on Supply Chain Services SCS
Keywords:	SUSTAINABILITY, SUPPLY CHAIN MANAGEMENT, PROCUREMENT, EMPIRICAL STUDY
Keywords (user):	Sustainability; Supplier Cooperation; Sustainable Procurement; Triple Bottom Line; Structural Equation Model

Does Sustainable Supplier Cooperation Affect Performance? Examining Implications for the Triple Bottom Line

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(Received XX Month Year; final version received XX Month Year)

The increasing importance of sustainable behavior in business has enhanced its impact on supply chain management. Firms foster sustainability in their supplier base in reaction to growing sustainability requirements in various ways, including sustainable supplier cooperation. Knowledge about the effects of sustainable supplier cooperation on firm performance is limited; therefore, this study tests antecedents and implications of sustainable supplier cooperation according to the triple bottom line. A survey of Western European firms reveals that sustainable supplier cooperation has generally positive effects on firm performance across social, green, and economic dimensions. However, only green practices have positive significant effects on economic performance not social practices (e.g., child labor rules). In contrast to practitioner perceptions, investments in sustainability, for example through sustainable supplier cooperation does indeed result in sufficient returns.

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1. Introduction

The disintegration of vertically integrated value chains into globally dispersed supply chains has led to a greater appreciation of the purchasing and supply management (PSM) function as a source of competitive advantage (Carter and Narasimhan, 1996; Krause, Pagell, and

Curkovic, 2001). Scholars have found empirical support for the link between supply management proficiency and the company's economic performance (e.g., Cousins, Lawson, and Squire, 2006; González-Benito, 2007), in particular due to the significant economic benefits earned from effective management of buyer–supplier relationships (Narasimhan and Das, 2001).

The ongoing sustainability movement requires companies to extend their focus beyond traditional economic objectives to a *triple bottom line* (TBL) approach that simultaneously accounts for economic, ecological, and social performance. For this study, we use the term 'sustainability' in accordance with Elkington's definition (1994, 1998) of sustainability comprising people, planet, and profit (Carter and Rogers, 2008; Kleindorfer, Singhal and Van Wassenhove, 2005). There is empirical support that firms with higher levels of sustainability experience competitive advantages (Campbell, 2007; Russo and Fouts, 1997) which makes it imperative for supply chain management to deal with green and social issues (Carter and Rogers, 2008). In particular for firms selling branded products to the end consumer, customers and other stakeholders are inclined to punish these firms if their products and production processes fail to comply with accepted sustainability standards (Francés-Gómez, 2008). Thus, in order to ensure ecologically and socially viable production methods at supplier premises, the PSM function must encourage and enforce a high level of sustainability across the entire supply chain (Foerstl et al., 2010; Pagell and Wu, 2009).

Firms increasingly respond to the need for sustainability in their upstream supply chain. For example, E.ON U.K. recently implemented a 'Responsible Procurement' policy which focuses on (1) human rights, (2) minimization of environmental impacts, and (3) maintenance of high standards of ethics and business integrity. To implement its policy, E.ON U.K. cooperates with its suppliers developing joint social and environmental standards. Another prominent example is BASF. BASF's supply management function runs a selection,

evaluation, and development program to ensure supplier sustainability compliance. The sustainability performance measurement system enables continuous sustainability improvements in the global supply base. In case of non-compliance, suppliers may be blacklisted.

Sustainable suppliers appear to be a scarce resource. Therefore, there is a need to jointly improve sustainability with suppliers of the global supply base because suppliers in developing nations tend to create greater idiosyncratic sustainability risks (Reuter et al., 2010). Prior empirical studies indicate a positive impact of supplier cooperation on the (economic) bottom line without assessing the potential effects of such cooperative behavior on sustainability as a whole. Studies that integrate supplier management practices with TBL performance implications are relatively scarce, mostly due to measurement problems associated with TBL performance (e.g., Carter and Rogers, 2008; Pagell and Wu, 2009). To the best of our knowledge, thus far no study has focused on the relationship between (sustainable) supplier cooperation and the entire TBL.

In doing so, we use the term *sustainable supplier cooperation* to refer to a process, initiated by the buying firm, to conduct coordinated actions and work together over extended periods of time to achieve enhanced sustainability of the supply base, thereby generating benefits for the buying and supplying firm (Anderson and Narus, 1990; Carr and Pearson, 1999; Pagell and Wu, 2009). Sustainable supplier cooperation thus differs from "one-dimensional" economic supplier cooperation in general because it includes specific supplier attributes in terms of their social and green performance. However, elements from supplier management are used to implement the social and green contents (e.g., joint planning activities and decisions, reliable promises, ongoing feedback, support), which overlap with purely economic supplier cooperation literature (Carter and Jennings, 2002; Giunipero, 1990).

Even as examples of sustainable supplier cooperation increase, as stated earlier, there is no clear evidence whether these practices have a positive impact on a firm's TBL. Despite the effect it might have on green and social practices, practitioners express doubt that sustainability measures pay off from a purely economic perspective. To shed additional light on this question, we investigate whether firms with a strategic orientation towards PSM make stronger use of sustainable supplier cooperation practices. Thus, we address the following research questions:

(1) Does sustainable supplier cooperation result in a higher level of performance on each dimension of the TBL?

(2) Is a strategic orientation toward PSM an antecedent of sustainable supplier cooperation?

To answer these research questions, we adopt a research model that focuses on the relationship of strategic orientation towards PSM and sustainable supplier cooperation, as well as the effects of sustainable supplier cooperation on the three dimensions of sustainability. We ground our research in resource dependence theory and the resource-based view: to test the hypothesized relationships of the model, we collected empirical data from Western European firms since these are confronted with strict sustainability laws (Handfield et al., 2002).

The remainder of this article is structured in the following sections. First, we present our literature review and the theoretical foundation before developing our research model. Subsequently, we describe the methodology and our path analytical approach to data analysis in Section 3. Thereafter in Section 4, we present the results of the measurement model and the structural model, before we address the theoretical and practical implications of our findings. In section 5, we conclude with a summary of our key findings as well as limitations and suggestions for further research.

2. Literature Review and Theoretical Foundation

2.1. Sustainable Procurement and Supplier Cooperation

Until the turn of the millennium, green and social criteria received limited attention in research on PSM. The relevance of sustainability for value creation has made *sustainable procurement* an important part of modern PSM practices, especially because firms do not want to be exposed to reputational damage as a result of their suppliers' ethical or ecological misconduct (Carter and Jennings, 2004).

Although research in the field of sustainable procurement has increased, the TBL has received imbalanced attention in sustainable procurement literature thus far. The traditional focus on economic performance has been recently extended to investigate also 'green' practices and their effect on environmental and economic performance (e.g., Lee and Klassen, 2008; Min and Galle, 2001). Only a few studies address ethical and social topics in the supply chain (e.g., Basu and Palazzo, 2008; Carter and Jennings, 2004). Furthermore, research pursuing the tripartite of the TBL is even scarcer, notable exceptions are Carter and Rogers (2008), Foerstl et al. (2010), Maignan, Hillebrand, and McAlister (2002), Matos and Hall (2007), Pagell and Wu (2009) as well as Reuter et al. (2010). Despite these exceptions, our understanding of how to integrate all three dimensions of the TBL for sustainable procurement is still at an early stage (e.g., Gonzalez-Padron, Hult, and Calantone, 2008; Koplin, Seuring, and Mesterharm 2007).

To increase the sustainability of their supply base, firms have two main options: (1) to select and accept only sustainable suppliers and to drop those that do not meet certain standards or (2) to cooperate with existing or new suppliers to achieve higher levels of sustainability (Klassen and Vachon, 2003; Lee and Klassen, 2008; Paulraj, 2009; Vachon and Klassen, 2008). Cooperation with and development of suppliers is a key stream in buyer–supplier relationship literature. Coordination through cooperative partnerships increasingly

replaces coordination through markets and hierarchies (Powell, 1990; Williamson, 1991). In contrast with transactional supply relationships, cooperative relationships can increase performance for both the buyer and the supplier under certain external market conditions and certain buyer and supplier characteristics (Bensaou, 1999; Carr and Pearson, 1999; Dyer, 1997). Despite research calls on extending supplier collaborations into the sustainability domain (e.g., Vachon and Klassen, 2006), knowledge about cooperative partnerships with suppliers and their effects on the different dimensions of the TBL is limited. However, in recent years several scholars made an effort to help to close this research gap. We review the existing literature with a special focus on antecedents and outcome effects of sustainable supplier cooperation, even though literature comprising the social dimension is very scare (see Table 1).

The impact of sustainable supplier cooperation on performance and other dimensions is still unclear. Theyel (2001) did not find any significant effect; Vachon and Klassen (2006b; 2008) found positive performance effects on manufacturing delivery, quality, flexibility and environmental performance, but not on cost performance; Zhu, Sarkis, and Lai (2007a; 2007b) saw only positive effects on environmental performance in their study. So far, only Zhu and Sarkis (2004) found positive economic effects of green supplier cooperation in addition to a positive performance impact on the environment. Until now, the effect of sustainable supplier cooperation on the TBL is to a large extent unknown: we address this research gap with our study.

Another major focus in this particular research field is antecedents for sustainable supplier collaboration. Again, the literature on sustainable supplier collaboration is still at a very early stage. Therefore, we focus mainly on literature with an environmental dimension. Presently, literature addresses mainly two types of antecedents: (1) internal and (2) external antecedents. Bowen et al. (2001) argue that the certain internal capabilities, such as supply

management capabilities, are decisive for the buildup of special green supply cooperation capabilities. In contrast, Vachon and Klassen (2006a) anchor their research model more on an external view and demonstrate that technical and logistical integration with suppliers is relevant for establishing green collaboration. Lee and Klassen (2008) complete this picture by investigating buyers' green initiative to foster environmental capabilities on the supplier side. Contrarily, Simpson, Power, and Samson (2007) find that higher relationship investments by the buying firm result in less sustainability due to suppliers' perceptions that there is decreased likelihood of penalties for non-compliance. Overall, these results seem to suggest that internal and external antecedents have substantial influence on green supplier collaboration. These findings are enhanced by Zhu, Sarkis and Lai (2007b) and Paulraj (2009), who come to the conclusion that internal and external dimensions are a major source of influence as they focus on motivators (e.g., law, morale) to implement collaborative supplier relationships with a green focus. We would like to extend the less developed literature on internal antecedents with our study.

To summarize, the effects of sustainable supplier cooperation on social and green practices and performance have not been empirically tested to the same extent as the economic dimension (e.g., Carr and Pearson, 1999; Chen, Paulraj, and Lado, 2004). We shed light on this research gap by simultaneously assessing the effect on all three dimensions in our model. We address this specific research gap via data collection and the simultaneous estimation of the dimensions in our research model following the approach of Pullman, Maloni, and Carter (2009) in separating environmental and social dimensions.

Insert Table 1 about here

2.2 Supplier Cooperation: Resource Dependence Theory and Resource-Based View

The resource-based view (RBV) examines the link between firm performance differentials and firm-specific resources. Resources must be valuable, rare, imperfectly imitable, and imperfectly substitutable to provide a source of competitive advantage (Amit and Schoemaker, 1993; Barney, 1991); firms succeed only through the acquisition of scarce and valuable resources (Pfeffer and Salancik, 1978). Access to these strategic resources is limited, as is ex ante knowledge about their quality (Barney, 1986**;** Dierickx and Cool, 1989). If a firm can acquire better resources than its competitors, it gains a competitive advantage (Makadok, 2001; Peteraf, 1993), however, only if it exploits these opportunities (Barney, 1991). The RBV has been extended to sustainability, in line with Hart's (1995) conceptualization of a natural RBV, in the context of supply chain management (Carter and Rogers, 2008; Markley and Davis, 2007). Sustainability might become a valuable, scarce resource depending on consumer behavior.

Resource dependence theory (RDT) also uses resources to explain firm performance. According to Hillman, Withers, and Collins (2009), firms are open systems that depend on the external environment but work to reduce their environmental uncertainty and dependence on suppliers. Therefore, they try to ensure their access to critical resources, especially in competitive environments and when resources are limited (Banaszak-Holl, Zinn, and Mor, 1996). Closer relationships with suppliers increase interdependence (Aiken and Hage, 1968; Pfeffer and Salancik, 1978).

RDT also suggests that firms have several options for securing access to environmental resources, depending on their ability to control these resources and potential substitutes. Pfeffer and Salancik (1978) propose coordination as a primary measure of resource dependence because it implies mutual control over the partner's activities. In this sense, the RDT might explain how to gain access to the valuable resources that are central to the RBV.

Thus, cooperative behavior becomes more important for increasing the level of sustainability in supply chains.

In examining inter-organizational relationships from an RDT perspective (Aldrich, 1976), Paulraj and Chen (2007) find that supply management depends on demand and supply uncertainty. They incorporate buyer–supplier relationships but do not analyze the direct effects of supplier cooperation in detail. Despite its potentially valuable insights, RDT has not, to the best of our knowledge, been applied to the field of sustainable supplier cooperation. Yet, because it has proven useful in explaining buyer–supplier relationships and because the RBV provides a theoretical basis for how valuable resources establish a competitive advantage, we use its principles as theoretical anchors, similar to scholars that have combined both theories previously (e.g., Grant and Baden-Fuller, 2004). In turn, we posit that firms depend on valuable resources for which they strive, but at the same time try to decrease their dependence on such resources because of the uncertainty associated with them. Thus, in the context of this paper, we consider supplier sustainability as a resource that is valuable, yet also uncertain to the buying firm unless actively managed in form of supplier cooperation.

3. Conceptual Development and Research Hypotheses

Our research framework is a path analytic model with six latent variables (Figure 1): strategic orientation, sustainable supplier cooperation, green practices, social practices, cost reduction, and operational performance. We first develop the link between strategic orientation of procurement and its effects on sustainable supplier cooperation, next we examine the extent to which sustainable supplier cooperation influences green and social practices. In turn, we assess the impact of green and social practices and sustainable supplier cooperation on the company's cost reduction and operational performance. We define the six constructs of our research model in Table 2, which we adapted from corresponding literature.

Insert Figure 1 about here

Insert Table 2 about here

3.1. Strategic Orientation and Sustainable Supplier Cooperation

Procurement can have a strategic impact on the company's competitive position, including effects on cost reduction, quality improvement, or innovativeness (Carter and Narasimhan, 1996). With our definition of a PSM strategic orientation (Chen et al., 2004; Narasimhan and Das, 2001), we acknowledge its impact on the proficiency of supplier management and the resulting performance outcomes (Schiele, 2007). In particular, the strategic orientation of PSM fosters relational interaction capabilities (Paulraj, Chen, and Flynn, 2006) in terms of joint planning activity and close alignment of strategic priorities and goals between buying and supplying firms (Handfield et al., 1997). If suppliers represent an extended arm of the buying firm, their performance is decisive for supply chain performance, and adequate supplier cooperation becomes decisive for overall firm success (Chan and Kumar, 2007).

Moreover, a PSM strategic orientation means that procurement adapts to the strategic plans of the firm, which reflect the needs of the firms' customers. As the number of customers and stakeholders who demand sustainability increases, this strategic orientation leads to stronger sustainability efforts in PSM as well.

Carr and Pearson (1999) argue that a strategic orientation in purchasing should recognize which measures of cooperation support the corporate strategy best, and that a strategic purchasing function should exploit supplier cooperation as a sophisticated method to

increase performance in PSM. These arguments should apply regardless of whether we focus on economic or sustainable supplier cooperation. Thus, we hypothesize:

H1. Strategic orientation in PSM has a positive effect on sustainable supplier cooperation.

3.2. Sustainable Supplier Cooperation and Sustainable Practices

A company can be only as sustainable as the organizations that supply it (Krause, Vachon, and Klassen, 2009). Therefore, environmentally friendly practices entail both internal operations and the activities of external supply chain members (Pullman, Maloni, and Carter, 2009; Zhu and Sarkis, 2007), including requests for suppliers for more environmentally friendly production and delivery processes (Klassen and Vachon, 2003). Therefore, we define green and social practices according to the buying firm's efforts, both internal and with regard to the supplying firm, as we detail in Table 2.

To ensure supplier cooperation and, hence, positive economic performance (Watts, Kee, and Hahn, 1992), buying firms can use quantitative rating systems, continuous communication and profound performance reviews (Giunipero, 1990). In addition to continuous evaluations of suppliers' sustainability and the provision of support, buying firms should enable sustainable production and business practices by suppliers (Pagell and Wu, 2009; Reuter et al., 2010). To reduce waste levels or CO_2 emissions in the chain, the buying firm can support its suppliers. Sustainable supplier cooperation reduces the risk of supplier mal-performance and thereby improves the supply chain's sustainability (Lee and Klassen, 2008). Beyond decreasing non-compliance risk, sustainable supplier cooperation should improve green and social practices through positive learning effects that emerge over time (Carter, 2005; March, 1991). Therefore, we hypothesize:

H2. Sustainable supplier cooperation has a positive effect on (a) green and (b) social practices.

3.3. Sustainable Practices, Sustainable Supplier Cooperation, and Cost Reduction

Cost reduction includes total, production, labor, material, and service costs (Carter, 2005). According to Min and Galle (2001), green and social costs accrue from environmentally friendly product handling and care for the environment and socially responsible behavior, respectively. There is an ongoing debate about whether the abatement costs related to eco-efficiency projects are greater or less than the cumulative cost savings available from decreased natural resource consumption or lower waste levels. Thus, we evaluate whether sustainable procurement is more costly because suppliers charge higher prices for ecologically and socially sound products to make up for their higher implementation costs for engaging in responsible business practices (Lankoski, 2009).

However, methods, such as life cycle assessment, demonstrate that sustainable procurement has positive effects on cost reduction (Pullman, Maloni, and Carter, 2009). Products produced under strict ecological and social standards also suffer from fewer process interruptions, which enhances throughput and reduces unit costs of production compared with less sustainable products (Brady, Hensen, and Fava, 1999; Burnett, Hansen, and Quintana, 2007). According to the concept of eco-efficiency, firms can produce the same amount with fewer or the same level of resources than traditional methods, which results in decreased costs per purchased item (Gee, 1994; Lye, Lee, and Khoo, 2001).

Moreover, total costs include product design, process design, manufacturing, costs of usage (e.g., energy, interruptions) and end-of-life costs (Klassen and McLaughlin, 1996; Lye, Lee, and Khoo, 2001). A total cost of ownership approach therefore calculates lower total costs for sustainable products despite their generally higher direct purchasing prices compared with traditionally produced products or services (Preston, 2001), due to reduced energy consumption to use the product, increased economies through possible refills or restoration, a longer lifespan or the elimination of pollution and associated legal problems or

penalties (King and Lenox, 2001). Disposal expenses also might decline, especially if laws restrict disposal methods to prevent dangers to the environment (Angell and Klassen, 1999). With this set of arguments, we hypothesize:

H3a. Green practices have a positive impact on cost reduction.

Social practices should offer similar cost reduction potential, especially in terms of the costs due to breakdowns, poor safety standards and higher employee absenteeism (or even compensation for work-related chronic diseases), which decline as social and safety standards improve (Chapman, 2007). Furthermore, material costs should be lower because better working conditions lead to a more motivated and more productive workforce, well-prepared workplaces and better instructed personal; sufficient leisure time between shifts lowers the rate of defective parts (Locke and Romis, 2007; Modarress, Ansari, and Lockwood, 2005) and thereby reduces material costs. The resultant decrease in demand for subsequent processing of defective material further decreases labor costs (Singh and Singh, 2009). As we have highlighted, supplier cooperation in general improves economic performance (Watts, Kee, and Hahn, 1992). This reasoning should apply to the case of sustainable supplier cooperation. That is, when suppliers achieve green and social practices, they also reduce costs. Therefore, we posit:

H3b. Social practices have a positive impact on cost reduction.

H3c. Sustainable supplier cooperation has a positive impact on cost reduction.

3.4. Sustainable Supplier Cooperation, Sustainable Practices and Operational Performance

The implementation of green and social practices often leads to increased process innovation as well (Porter and van der Linde, 1995), and innovative behavior of employees creates greater organizational support (Yuan and Woodman, 2010). Suppliers' product quality, lead time and supply security should improve as an outcome of such practices (Carter, 2005),

mainly due to a better educated workforce, superior wages and working conditions, which increase employee motivation (Pagell, Wu, and Wasserman, 2010). In addition, the financial resources obtained from waste prevention can be reinvested in the company to provide employees with advanced equipment (King and Lenox, 2002).

In contrast to an exploitative work environment, balanced working hours and sufficient breaks should improve workers' attention to their tasks and reduce manufacturing errors, which in turn may enhance the quality of supplier products and increase supply security (Freire and Alarcon, 2002). Educated, motivated supplier employees should exhibit greater innovativeness and work efficiently to lower lead times (Yuan and Woodman, 2010). Finally, an enhanced focus on green practices may increase quality through the more careful use of resources and aspiration for longer product life spans (Fiksel, 1997).

In line with these arguments, we argue that sustainable supplier cooperation should support operational performance. Superior methods by the supplier should result in positive performance effects for the buying firm because supplier cooperation leads in general to positive economic performance (Watts, Kee, and Hahn, 1992). Thus, we hypothesize:

H4a. Green practices have a positive impact on operational performance.

H4b. Social practices have a positive impact on operational performance.

In addition to the arguments discussed, it is important to consider that sustainable suppliers are a scarce and valuable resource, especially in global sourcing since not many suppliers achieve western sustainability standards (Foerstl et al., 2010). Since dependence on these suppliers is high, cooperation can at least help to mitigate uncertainty about supplier behavior by inducing greater behavioral interdependencies (Casciaro and Piskorsky, 2005; Pfeffer and Salancik, 1978) which might transform in better operational performance.

H4c. Sustainable supplier cooperation has a positive impact on operational performance.

4. Methodology

4.1. Sampling and Survey Response

The questionnaire development relied on the stepwise procedure for item generation (Churchill, 1979). We performed an extensive literature review to identify existing and appropriate scales and designed reflective measures (Bollen, 2002; Diamantopoulos, Riefler, and Roth, 2008; Diamantopoulos and Winkelhofer, 2001). All measures, except the control variables, used a seven-point Likert scale that provided the minimum and maximum values. The survey instrument was pre-tested to assess the face and content validity of the scales and the adequacy of the research design. We assessed the content and clarity of the items in a pre-test workshop with 15 senior purchasing practitioners resulting in minor changes of the wording of some items.

We contacted members of our sampling frame and sent the survey to senior purchasing managers and executives as key informants, who were able to provide valid judgments of specific practices and performance (e.g., Cousins, Lawson, and Squire, 2006; Krause, Handfield, and Tyler, 2007). The random sample came from the address database of one of the largest consultancies specializing in PSM and supply chain management. The questionnaire was sent to 311 companies. All mailings were personalized and included a cover letter highlighting the various means to return the questionnaire, namely online, direct mail, fax or e-mail. Four weeks after the initial mailing, personalized reminder e-mails were sent to all potential respondents. Those firms that did not respond within another six weeks were contacted by telephone in a last wave and sent an e-mail with the questionnaire.

We received 70 usable survey responses from different companies, for an effective response rate of 29.8%. The final sample contained companies from virtually every industry, of different sizes and with various ownership structures. Almost all companies are from Western Europe, mainly Germany and the United Kingdom, as illustrated in Table 3.

Insert Table 3 about here

Although the response rate is comparable to other research in PSM (e.g., Narasimhan and Das, 2001), non-response bias poses potential limitations. According to Armstrong and Overton's (1977) test for such a bias, we split the respondents into a group of early respondents (n_{er} = 48) and a group of late respondents (n_{lr} = 22) which is assumed to be similar to the group of non-respondents. This disjuncture was made based on the 22 respondents generated through our last wave of telephone calls and follow-up mails. We found no statistically significant differences in the responses of early and late respondents. The Mann-Whitney-U-Test for one indicator per construct and for firm size did not reveal significant differences for the two groups at a .05 significance level (values of.237 to .865). Furthermore, since we contacted non-respondents personally, we learned that most of the firms declined to participate due to the fact (1) they had not enough time to complete surveys or (2) they had to comply with the overall firm policy which doesn't allow participation in any survey.

4.2. Data Analysis

To verify our hypotheses and estimate the parameters of our structural equation model, we chose partial least square (PLS) (Chin, 1998; Lohmoeller, 1988), with the software package SmartPLS 2.0 (Ringle, Wende, and Will, 2005). The relatively small sample size makes this procedure preferable because the estimates of the individual path coefficients are more conservative than in covariance-based techniques (Bagozzi and Yi, 1994; Chin, 1998; Hulland, 1999). Moreover, the PLS approach is component-based and not restricted to multivariate normal data (Chin, 1998; Chin and Newsted, 1999). For good model fit, we need sufficiently high R^2 values, construct reliability and significant path coefficients (Chin, 1998;

Gefen, Straub, and Boudreau, 2000; Hulland, 1999). We assessed the indicators' reliability using bootstrapping. Henseler (2010) recommend a minimum of 500 samples or data sets to decrease the effects of possible random sampling errors; we used 2,000 data sets, at which point adding further data sets made a marginal difference to the solution.

4.3. Common Method Variance

Given that the data for predictor and outcome variables were collected from the same respondent, we conducted methodological tests to ensure that common method bias is not an issue (Podsakoff et al., 2003). More specifically, we employed exploratory factor analysis to test for common method bias (Harman, 1967). Moreover, we used the anti-image correlation matrix and the Kaiser-Meyer-Olkin (KMO) criterion to assess the sampling adequacy for a factor analysis. All values in the diagonal of the matrix were above the minimum of .5 and the KMO coefficient was at .783, and hence also high enough. Next, we applied both the Kaiser-Guttman criterion and the Scree test to evaluate the reasonable number of factors. Eventually, the assessment revealed six factors with eigenvalues greater than 1.0 that accounted for 78.5% of the variance, and the first factor accounted for only 16.6% of the variance. This result was further validated using the PLS measurement analysis recommended by Podsakoff et al. (2003). According to this procedure, a methods factor was included along with six theoretical constructs. First, the methods factor did not affect the path loadings or statistical significance of the path between the indicators and their respective construct. Second, in comparison to the average variance of .78 explained by the substantive factors, the average variance explained by the methods factor was found to be only .36. These results collectively suggest that common method bias was not an issue in our sample and did not affect the path analysis among the six constructs.

5. Results

5.1. Construct Validation

As confirmatory factory analysis was not reasonable due to the small sample size (Gagne and Hancock, 2010), we empirically assessed the content validity of our constructs using exploratory factor analysis (Chin, 1998) with Varimax rotation in SPSS 16.0. All factor loadings were greater than the cut-off point of .50 and showed the highest loading on the anticipated factor (Hair et al., 2005). The results of this exploratory factor analysis can be found in table 4 and 5 (for reading convenience we excluded values below .3).

Insert Table 4 about here

Insert Table 5 about here

We confirmed convergent validity and uni-dimensionality (Fornell and Larcker, 1981) for all items by showing statistically significant standardized loadings with their underlying constructs in a simultaneous estimation of the measurement and structural models in PLS (Anderson and Gerbing, 1988). We also confirmed that all scale items loaded on their assigned construct significantly above the minimum threshold; otherwise, the indicators might not share most of their variance with the construct but instead with the error variance (Chin, 1998). In addition, the cross-loadings did not exceed the critical values. That is, the items explained the respective construct and did not share overly high variance with other constructs.

Moreover, in support of convergent validity, the average variance extracted (AVE) was greater than .5 (Chin, 1998; Fornell and Larcker, 1981), ranging from .671 to .824. All tests

of discriminant validity were similarly supportive. The square root of the AVE of a latent construct should be greater than its correlation with all other latent variables (Chin, 1998; Fornell and Larcker, 1981), and as presented in Table 6, in which the square roots are on the diagonal, this condition holds true in support of discriminant validity (Chin, 1998).

Insert Table 6 about here

Composite reliability (CR) can be established by an inspection of the CR scale (Bagozzi and Yi, 1988; Fornell and Larcker, 1981) and the internal consistency estimated by Cronbach's α (Cronbach, 1951; Litwin, 1995; Nunnaly, 1978). Cronbach's α values ranged from .76 to .93, above the required minimum of .7. The CR values exceeded the suggested minimum of .7, ranging from .86 to .95. We present the results of the measurement model tests in Table 7.

Insert Table 7 about here

5.2. Hypotheses Testing

Figure 2 and Table 8 depict the results of our hypothesis testing. Solid lines represent significant relationships ($p < .05$); dotted lines indicate hypothesized but insignificant relationships. We find a positive relationship between strategic orientation and sustainable supplier cooperation, in support of Hypothesis 1, as well as positive relationships of sustainable supplier cooperation with green (Hypothesis 2a) and social (Hypothesis 2b) practices. That is, both are supported and highly significant.

The relationships between the green and social practices and the economic performance are more complex. Green practices have significant positive relationships with both cost

reduction and operational performance, in support of Hypotheses 3a and 4a, respectively. In contrast, social practices yield no significant impacts on cost reduction and operational performance, so we must reject both Hypothesis 3b and Hypothesis 4b. Moreover, sustainable supplier cooperation has no significant influence on either cost reduction (Hypothesis 3c) or operational performance (Hypothesis 4c).

Insert Figure 2 about here

Insert Table 8 about here

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6. Discussion

We have analyzed sustainable supplier cooperation from a TBL perspective and found evidence that sustainable supplier cooperation improves in response to a strategic orientation of procurement and has a positive impact on green and social practices. While social practices and sustainable supplier cooperation do not have a significant direct effect on performance, green practices positively influence cost reduction and operational performance.

With these findings, our study paper makes four key contributions to extant research. First, our results support the importance of procurement's strategic orientation, not only for supplier cooperation in general (Paulraj, Chen, and Flynn, 2006), but also for sustainable supplier cooperation. This contrasts earlier findings in this field (Bowen et al., 2001) which could not find any direct effect of procurement's strategic integration. This might be due to the fact that the demand for purchasing to build up sustainable collaboration was limited or less attractive. A PSM strategic orientation integrates corporate plans, which are closer to end

customer demands than is common for PSM. End customers drive sustainability in firms. Therefore, this strategic orientation might lead to more sustainable supplier cooperation by leveraging higher levels of firm sustainability.

Second, we find a strong link between sustainable supplier cooperation and both green and social behaviors, which reinforces the argument that a company is only as sustainable as its suppliers (Krause, Vachon, and Klassen, 2009). In addition, sustainable supplier cooperation has no direct significant effect on economic performance, only green practices seem to exert positive effects. Apparently, sustainable supplier cooperation improves sustainability of the buying firm; however, other aspects are responsible to also augment the economic performance output. Therefore, sustainable supplier cooperation leads to superior performance if the buying firm not only cooperates with the supplier on environmentally friendly practices, but combines the supplier's efforts with its own efforts. Using RBV terminology, we can explain our finding in the following way: sustainable supplier cooperation offers access to a scarce (sustainable) resource, but this sustainable resource can be exploited only by implementing also ecologically responsible practices within the buying firm. Yet we find no significant support for the claim that sustainable supplier cooperation directly affects cost reduction and operational performance, as is the case for pure 'economic' supplier cooperation. These findings are in line with previous literature since several scholars did not find direct effects of green supplier cooperation on economic performance as well. It seems that only the right set of additional internal capabilities enable positive economic performance effects. This finding can also be explained with the help of RDT: firms acquire the scarce resource sustainable supplier by cooperating with this supplier and making this resource even scarcer by increasing the sustainability of the supplier. Nevertheless, in case the focal firm does not exploit this competitive advantage by means of internal environmental practices, we do not see any significant performance effect, underlining the strength of RDT

also in the field of sustainable supplier collaboration. Unfortunately, social practices do not reveal any performance impact, neither positive nor negative.

Third, green practices along the supply chain apparently improve both operational performance and cost reduction. Thus, performance effects materialize only when sustainable supplier cooperation and green practices are in place at the same time. Sustainable supplier cooperation becomes effective only when the sustainability measures materialize in PSM. We might posit that green practices in general encompass a greater performance potential than social measures, but we find no significant effect for social measures. Therefore, it seems that the performance effects do not exhibit a trend. A detailed post-hoc analysis did not reveal any further insights. Perhaps our social measure construct is too broad, in that it encompasses very different measures. Introducing social standards regarding child labor or labor safety could be very costly in terms of implementation but also reduce costs associated with worker injuries, firm reputation and defective parts. Performance effects thus appear diverse, and we might not have found a positive relationship because this construct introduces complexity into the measurement of social practices. Alternatively, the performance effects of green measures may be more observable because they tend to be product related, whereas social measures often pertain only to the production process. To explain our mixed findings, further research, such as case studies, would be helpful. Our results distinguish green and social sustainability components and their impact on performance might help to explicate some varied and even contradictory prior findings (Carter, 2005).

7. Conclusion and Further Research

By adopting a TBL approach, this study adds to the understanding of how sustainable supplier cooperation contributes to firm performance. Furthermore, it outlines the circumstances needed to transform the benefits of sustainable supplier cooperation into firm performance. The evidence we provide suggests that the green element of sustainable

procurement reduces organizations' costs and improves their operational performance, while mixed effects may be inherent to the social component.

From a practical point of view, these analyses reveal the strategic importance of strategic purchasing and good supplier cooperation for superior TBL performance. Although sustainable supplier coordination does not directly improve the economic performance of buying firms, it supports social and green behavior along the supply chain. The ecologically conscious behavior in turn fosters economic performance. Under these circumstances, sustainable supplier cooperation guarantees access to scarce resources and thereby may provide competitive advantage. Social practices have no discernible positive impact on cost reduction; however, they do not lead to cost increases either. Perhaps there are other positive impacts of social practices which need to be considered (e.g., additional sales or employee satisfaction) to better understand why firms are using social practices also by choice (Brammer and Pavelin, 2006).

Managers in both service and manufacturing sectors thus should cooperate with their suppliers on a long-term basis, adapt their plans to changing business needs and attend to certain social and green standards that all members of the supply chain must meet. A company can only be as sustainable as its supply chain partners (Krause, Vachon, and Klassen, 2009). Feedback and regular communication with suppliers provide a formal means to track compliance and confirm that the entire supply chain is truly aligned with and committed to the TBL.

Purchasers should insist on green production methods that eliminate dangerous chemicals, toxic materials, or high CO_2 emissions and thus help improve operational performance. Similarly, avoiding waste and reducing packaging material are not only environmentally friendly but also help cut down on costs. Purchasers that consider not just

procurement or engineering but also operating costs can procure environmentally and at the same time achieve savings for their organization.

The limitations of our research also open the field to further research. We have focused on cost reduction and operative performance; further research could elucidate the effects of sustainable procurement on other performance measures, such as financial or commercial performance. Moreover, our sample is relatively small, and a larger sample would be desirable to increase statistical power. A more diverse sample could extend it to other geographic regions. On the other hand, a focus on and comparison of a few industries could discuss differences in the effects of sustainable supplier cooperation on performance depending on the industry.

We assessed sustainable supplier cooperation from the viewpoint of the buying firm, but dyadic research might help us to see why social practices did not lead to any performance changes. Detailed case study research might be the right approach to shed light on our non-significant findings. Furthermore, our model concentrates on the performance implications of sustainable supplier cooperation in a TBL context. Even though it might be difficult to compare social and green performance due to the very different nature of sustainability demand and degree of sustainability performance transparency, the extension on social and green performance is still a major research gap in sustainable supplier cooperation. Finally, although we designed the TBL using a multi-level approach, we concentrated purely on supplier cooperation and did not derive a competing model for sustainable supplier selection which might reveal if a collaborative or transactional relationship is more likely to improve the TBL performance.

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Study	Primary methodology	Dimensions	Focus	Study aim	Supplier Cooperation Construct	Comments on Cooperation
Bowen et al. (2001)	Survey	Green focus only	Antecedents	Examining corporate environmental proactivity and strategic purchasing and supply as antecedents of supply management capabilities that enable green supply management	Product-based green supply practices	Product-based green supply practices comprise only cooperative practices (e.g. collaboration on recycling). Supply management capabilities enable green supplier cooperations.
Carter and Jennings (2002)	Survey	Green and social focus	Performance and Impact	Examining the effect of purchasing social responsibility on supply chain relationships.	Cooperation between buyer and supplier	Purchasing social responsibility has indirect effect on supplier performance mediated by supplier cooperation, but the supplier cooperation construct doesn't cover sustainability explicitly.
Ciliberti, Pontrandolfo, and Scozzi (2008)	Case studies	Green and social focus	Supplier collaboration as antecedent	Examining different strategies and diverse management systems and tools to address corporate social responsibility issues along supply chains	Transfer socially responsible behaviors to suppliers	Green supplier cooperation as measure to increase supplier CSR compliance.
Klassen and Vachon (2003)	Survey	Green focus only	Supply chain collaboration as antecedent for environmental management	Examining the effects of supply chain collaboration and evaluation on environmental management	Supply chain collaboration	The supply chain collaboration has no direct link to sustainability.
Lee and Klassen (2008)	Case studies	Green focus only	Antecedents	Exploring factors that initiated and improved environmental capabilities in small- and medium-sized enterprises over time.	Support-based green supply chain management	Green supplier cooperation enabled the improvement of suppliers' environmental capabilities.
Paulraj (2009)	Survey	Green focus only	Antecedents	Empirical taxonomy of environmental Motivations	External environmental practices	Green supplier cooperation is especially pursued by firms with a comprehensive green strategy
Theyel (2001)	Survey	Green focus only	Adoption and performance	Examining how relations between customers and suppliers affect environmental performance.	Environmental supply chain relations	No significant performance effect of green supplier collaboration.
Vachon and Klassen (2006b)	Survey	Green focus only	Performance	Examining the performance impact of green project partnerships	Green project partnership	Green supplier cooperation leads to better delivery manufacturing performance.
Vachon and Klassen (2006a)	Survey	Green focus only	Antecedents	Examining how plant-level and supply chain characteristics influence green supply chain practices	Environmental collaboration	Higher level of technological and logistical integration as well as reduction of the supply base lead to higher levels of environmental collaboration
Vachon and Klassen (2008)	Survey	Green focus only	Performance	Examining the impact of environmental collaborative activities on manufacturing performance	Environmental collaborative activities	Green supplier cooperation has positive quality/delivery/flexibility performance and environmental performance impact.
Zhu and	Survey	Green focus	Performance	Examining the relationships between green	External green supply	Green supplier cooperation leads to better

Sarkis (2004)		only		supply chain management practices and environmental and economic performance	chain management practices	environmental and economic performance.
Zhu, Sarkis, and Lai (2007a)	Survey	Green focus only	Adoption and performance	Examining green supply chain management initiatives implementation of various manufacturing industrial sectors and its performance outcomes	Green purchasing	Collaboration only one item out of several on green procurement, no direct conclusion possible.
Zhu, Sarkis, and Lai (2007b)	Survey	Green focus only	Antecedents and performance	Exploring green supply chain management motivators, initiatives and performance outcomes	Green purchasing	Collaboration only one item out of several on green procurement, no direct conclusion possible.

Name[a]	Construct Definition	Source
Strategic Orientation	The function's integration in strategic planning, its knowledge of and contribution to corporate strategic goals and the visibility of its contribution to these goals.	Carr and Pearson, 1999; Chen et al., 2004; González-Benito, 2007; Narasimhan and Das, 2001
Sustainable Supplier Cooperation	The buying firm–induced process of coordinated action over an extended period to achieve enhanced levels of sustainability in the supply chain to the benefit of both parties.	Anderson and Narus, 1990; Carr and Pearson, 1999; Pagell and Wu, 2009; Ring and Van de Ven, 1992
Green Practices	The buying firm's efforts for waste reduction and preservation of natural resources in its own operations and the operations of the members of its supplier base.	Carter and Rogers, 2008; Krause, Vachon, and Klassen, 2009; Pullman, Maloni, and Carter, 2009
Social Practices	The buying firm's efforts to induce socially responsible behaviour, such as good working conditions, avoidance of child labour, appropriate and fair wages and high safety standards in its own operations and the operations of its suppliers.	Krause, Vachon, and Klassen, 2009; Pullman, Maloni, and Carter, 2009
Operational Performance	The outcome of a company's purchasing efficacy, including product and service quality, lead time, innovativeness and security of supply.	González-Benito, 2007; Krause, Vachon, and Klassen, 2009
Cost Performance	The company's cost performance, which includes total, production, labour, material and service costs.	Carter, 2005

[a] The constructs are listed in the order in which we introduce them.

Sector	n	Percentage	Region	n	Percentage	Annual Revenues [Euro]	n	Percentage
Manufacturing	47	67.1%	Western Europe	68	97.1%	< 50 million	5	7.1%
Services	23	32.9%	Others	2	2.9%	billion	14	20.0%
						1–10 billion	21	30.0%
						>10 billion	30	42.9%

Table 4: Exploratory factor analysis for the independent variables

Rotated Component Matrix				
	Component			
	Sustainable Supplier Collaboration	Social Practices	Green Practices	Strategic Orientation
Formal_system_to_track_ecological_standards	.889			
Feedback	.836			
Formal_system_to_track_social_standards	.836			
Joint_planning_activities	.778			
Supplier_and_certifiable_labour_standard		.899		
Supplier_and_certifiable_safety_standard		.833		
Work_conditions		.757		
Design_disassembly			.845	
Supplier_and_recyclable_packing			.813	
Waste_reduction			.791	
Adapt_plans_to_change_business_needs				.884
Long_range_plan				.794
Profound_knowlege			.320	.704

Table 5: Exploratory factor analysis for the dependent variables

Rotated Component Matrix		
	Component	
	Cost Reduction	Operational Performance
Labour_costs	.834	
Material_and_service_costs	.901	
Production_costs	.810	.376
Total_costs	.876	.317
Innovativeness		.783
Lead_time	.443	.728
Quality_and_service		.871
Security	.315	.831

Constructs	(CP) Cost Performance	(GP) Green Practices	(OP) Operational Performance	(SP) Social Practices	(SO) Strategic Orientation	(SSC) Sustainable Supplier Cooperation
(CP) Cost Performance	*.907*					
(GP) Green Practices	.330	*.875*				
(OP) Operational Performance	.634	.400	*.857*			
(SP) Social Practices	.193	.462	.206	*.889*		
(SO) Strategic Orientation	.005	.378	.173	.230	*.819*	
(SSC) Sustainable Supplier Cooperation	.250	.459	.369	.522	.309	*.886*

Constructs [a]	Items	M	SD	CFA	Loading [b]	CA	CR	AVE
Strategic Orientation	Adapt plans to change business needs	5.667	1.358	.796	.861	.757	.859	.671
	Purchasing has a long range plan	5.000	1.542	.690	.868			
	Profound knowlege of overall company strategy	5.929	1,208	.679	.720			
Sustainable Supplier Cooperation	Feedback	3.757	2.088	.799	.896	.909	.936	.785
	Formal system to track ecological standards	4.217	2.028	.865	.907			
	Formal system to track social standards	4.171	2.187	.782	.883			
	Joint planning activities	3.957	1.914	.731	.857			
Green Practices	Design for disassembly	3.750	1.911	.791	.883	.845	.908	.767
	Supplier and recyclable packing	4.565	1.736	.794	.877			
	Waste reduction	4.300	1.929	.764	.867			
Social Practices	Work conditions	5.429	1.733	.740	.838	.868	.919	.792
	Supplier and certifiable labour standard	5.652	1.551	.901	.934			
	Supplier and certifiable safety standard	5.884	1.278	.809	.894			
Cost Performance	Material and service costs	3.431	1.479	.901	.948	.928	.949	.824
	Total costs	3.538	1.511	.869	.934			
	Labour costs	3.077	1.122	.755	.848			
	Production costs	3.538	1.542	.807	.898			
Operational Performance	Quality and service	4.215	1.566	.794	.901	.881	.918	.738
	Security of supply	3.968	1.576	.820	870			
	Lead time	3.359	1.326	.760	.854			
	Innovativeness	4.369	1.557	.634	.808			

[a] M=Mean; SD=Standard deviation; CFA=Confirmatory Factor Analysis; Loading=Standardized loading; CA=Cronbach's Alpha; CR=Composite reliability; AVE=Average variance extracted. All scales are perceptual. Respondents were asked to rate their practices and their performance on a 7-point Likert-scale.

[b] All standardized loadings are significant at $p < .01$.

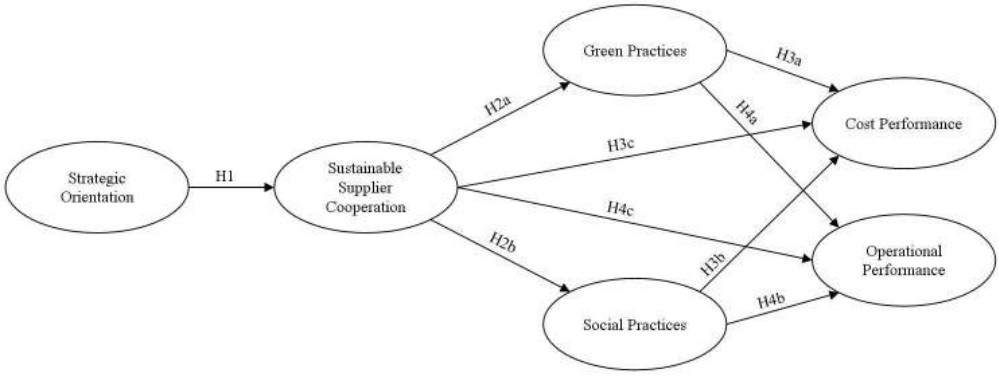
* $p < .05$.

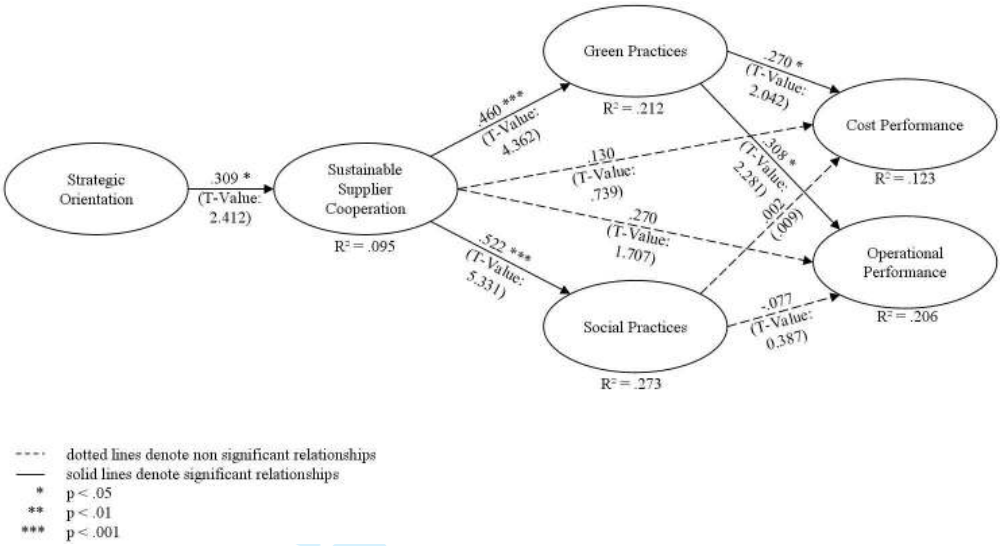
** $p < .01$.

*** $p < .001$.

Substantive Relations	Path Coefficients	T Statistic	Standard Error	Total Effects	T Statistic	Standard Error
Strategic Orientation -> Sustainable Supplier Cooperation (H1)	.309*	2.412	.128	.309*	2.412	.128
Sustainable Supplier Cooperation -> Green Practices (H2a)	.460***	4.362	.105	.460***	4.362	.105
Sustainable Supplier Cooperation -> Social Practices (H2b)	.522***	5.331	.098	.522***	5.331	.098
Green Practices -> Cost Performance (H3a)	.270*	2.042	.132	.270*	2.042	.132
Social Practices -> Cost Performance (H3b)	.002[ns]	.009	.193	.002[ns]	.009	.193
Sustainable Supplier Cooperation -> Cost Performance (H3c)	.130[ns]	.739	.176	.255[ns]	1.857	.138
Green Practices -> Operational Performance (H4a)	.308*	2.281	.135	.308*	2.281	.135
Social Practices -> Operational Performance (H4b)	-.077[ns]	.387	.200	-.077[ns]	.387	.200
Sustainable Supplier Cooperation -> Operational Performance	.270[ns]	1.707	.158	.371**	3.100	.120
Strategic Orientation -> Green Practices				.142[ns]	1.875	.076
Strategic Orientation -> Social Practices				.161*	2.109	.077
Strategic Orientation -> Cost Performance				.079[ns]	1.294	.061
Strategic Orientation -> Operational Performance				.115[ns]	1.727	.066

[ns] Not significant.
* $p < .05$.
** $p < .01$.
*** $p < .001$.





dotted lines denote non significant relationships
solid lines denote significant relationships
* p < .05
** p < .01
*** p < .001