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The Impact of Sustainability on Supplier Selection: A behavioural study

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Abstract

Supplier selection is a critical decision with sustainability impacts in global supply chain. This study explores how different dimensions of a supplier's sustainability can affect managers' evaluation and consequent selection of a supplier. An experimental research method is applied to examine a series of hypotheses that integrate the sustainable supply chain management literature and the behavioural decision-making literature. Data from a total of 857 valid sets of responses in three scenario-based experiments were used to explore the impacts of long-term and short-term relationships with the supplier, and the length of work experience of the supply chain manager as factors in managers' selection decisions. The findings show that managers favour sustainability dimensions in their evaluation and intention to select a supplier. Moreover, managers react more negatively to a low level of sustainability than they react positively to a high level of sustainability. The economic dimension of sustainability has the strongest impact of the three dimensions on managers' supplier evaluation and selection intent. Furthermore, where the manager and supplier have been in a long-term relationship, there is an interaction effect between managers support for each of the dimensions and the effect of sustainability on supplier evaluation and selection. However, this moderating effect is less significant in a short-term relationship and becomes insignificant after accounting for the impact of length of work experience of the decision-makers. The experimental research approach and results provide managerial implications for effective allocation of resources, as well as policy suggestions for the broader operations and supply chain systems.

Keywords: Sustainability, supplier selection, behaviour decision-making, supply chain management, experiment

1.0 Introduction

In recent years, companies have been required to do more than ever to address environmental and social issues (Choi and Ng, 2011; Huq et al., 2016; Villena and Gioia, 2018). This is exemplified by the Sustainable Development Goals (SDGs), which aim to achieve a more sustainable future for all (Lu et al., 2015). Notably, the significance of sustainability for value

generation has led to supplier selection becoming a key part of sustainable supply chain management (Bai et al., 2019). However, empirical evidence shows that sustainability can also be a major challenge for companies in selecting their suppliers (Holloos et al., 2012; Kannan, 2018; Mohammed et al., 2019). For example, companies such as Apple, Hewlett-Packard and Sony have been damaged by a series of Foxconn related scandals since 2010 (Lucas et al., 2013). As a result, companies increasingly recognise the need to avoid damage to their reputation that might result from a supplier's environmental or ethical misconduct (Schaltegger et al., 2014; Luthra et al., 2017; Govindan et al., 2018).

Typically, research on sustainable supplier selection – selection of supply chain partners that have a practical commitment to sustainability - has suggested that companies make decisions by applying certain mathematical models or economic utility frameworks in order to achieve the companies' long-term objectives (Lee et al., 2009; Friedl and Eagner, 2012; Tavana et al., 2017; Luthra et al., 2017). However, the managers who make the decisions are individuals (e.g., operations managers, supply chain specialists and procurement managers), and thus the decision-making approach is limited in its capability to process and obtain information (Mantel et al., 2006; Davis-Sramek et al., 2018). For instance, the Volkswagen emissions scandal happened in 2015 shows how sophisticated managers can make unethical decisions in business to achieve sustainability (Rhodes, 2016). According to Tversky and Kahneman (1973), individual decision-making tends to apply simplifying heuristics to solve complicated issues. The heuristics help managers to refine and absorb the information in effective decision-making. Particularly, they are commonly used when decision-making confronts conflicting information or other constraints (Anderson and Clemen, 2013; Davis-Sramek et al., 2018).

To study the effect of individual involvement on sustainable supplier selection, we integrate two literature streams: the sustainable supply chain management literature and the behavioural decision-making literature. Notably, in response to a rapidly increasing interest among operations managers, researchers and stakeholders in the influence of multiple sustainability dimensions (Linton et al., 2007; Seuring and Müller, 2008; Choi and Ng, 2011; Kannan, 2018; Raut et al., 2020), recent studies on sustainability have provided significant theoretical insights from operations and supply chain management perspectives. These insights are featured in various special issues and articles of leading journals, including the *Journal of Operations Management* (Boone and Ganeshan, 2007), the *International Journal of Operations and Production Management* (Gold et al., 2019), *Business Strategy and the Environment* (Gibassier et al., 2019) and the *International Journal of Production Research* (Kusi-Sarpong, 2020).

Overall, the field has developed from studies of green practices such as eco-product design, green logistics and sourcing strategies to an interest in sustainable supply chain management, in which supply managers focus on ameliorating environmental and social issues rather than perpetuating them (Seuring and Müller, 2008; Sarkis and Dhavale, 2015; Sauer and Seuring, 2018; Banaeian et al., 2018; Bai et al., 2019). While these studies provide critical foundations regarding sustainable supply chain management, they do not explain how various sustainability dimensions are perceived by managers in their selection of a supplier (Hahn et al., 2010; Wu and Pagell, 2011; Raut et al., 2020). Although a few studies have investigated the role of sustainability in marketing strategy and consumer behaviour (Mohr et al., 2005; Choi and Ng, 2011; Joshi and Rahman, 2017), the primary focus has been on social concerns, which are more relevant to marketing and advertising.

Accordingly, the behavioural decision-making literature can be used to fill the gap and offer excellent insights for research on sustainable supplier selection. Specifically, although various perspectives have been taken in producing normative suggestions for what companies should do (Elkington, 1994; Cucchiella et al., 2012; Hegmon, 2017; Fahimnia et al., 2019), the sustainable supply chain management literature has said little about what is in managers' minds, how they respond and construct preferences in their decision-making - particularly when the decision approach enters a grey area where there is no distinct best option (Mantel et al., 2006; Davis-Sramek et al., 2018). Thus, this study aims to advance the knowledge of sustainable supply chain management, with specific regard to supplier selection. The main research question of this study is: How do the different sustainability dimensions (i.e., economic, social and environmental) of a supplier affect managers' evaluations and consequent selection of a supplier? To be consistent with the literature, this study defines the economic dimension as the supplier's financial performance (Figge and Hahn, 2012), the environmental dimension as the level of the supplier's engagement in ecologically responsible practices (Humphreys et al., 2006), and the social dimension as the supplier's investment in its employees and the community (Ehrgott et al., 2011). Instead of depending on economic utility models, this study uses a scenario-based empirical set-up to investigate what supply managers actually do in a supplier selection context.

The integration of these two streams of literature provides an opportunity to address a critical research gap to understand sustainable supplier selection. More specifically, the sustainable supply chain literature has not adequately considered the individual-related factors in supplier selection. In particular, it typically assumes that the company's decision-making is a rational

process, where a comprehensive, rules-based and optimal decision is generated from known information, such as specific sustainability measurements (Keskin et al., 2010; Kannan et al., 2013; Stević et al., 2020). However, in most cases, it is a manager who makes the decision rather than a company. Thus, there are influential individual factors in the process of company decision-making (Mantel et al., 2006; Morton and Fasolo, 2009; Pournader et al., 2017). In contrast, the behavioural decision-making literature has been developed and applied in a broad range of business situations to study, for instance, customer behaviour, negotiation mechanisms and business ethics (Mohr and Webb, 2005; Morton and Fasolo, 2009; Alexander et al., 20014; Rajavel and Thangarathanam, 2016). Although it has addressed various individual-related factors in decision-making (Tversky and Kahneman, 1973; Anderson and Clemen 2013), it has not been used to study the behaviour of supply managers involved in sustainable supplier selection.

Additionally, this study aims to contribute by presenting the results from a series of controlled experiments for the study of behavioural decision-making in the sustainable supplier selection context. Experimental research is an appropriate methodological approach as it can effectively control behavioural factors and examine various combinations of hypothesised causal relationships – which would be impracticable in many other sampling contexts. The remainder of the paper is structured as follows: Section 2 presents a review of the literature as well as the development of hypotheses. Section 3 describes the experimental method in detail, while Section 4 sets out the results of the statistical analysis. Section 5 discusses the results and their implications, determines the limitations of the research, and suggests directions for future study.

2.0 Literature Review

This section gives an overview of the literature on sustainable supplier selection and behavioural decision-making. Each of the components is discussed in the following parts, with hypotheses about how they are related.

2.1 Sustainable Supplier Selection

Apart from co-operating with existing suppliers to reach higher levels of sustainability (Vachon and Klassen, 2008; Hollos et al., 2012; Villena and Gioia, 2018), sustainable supplier selection has become vital for companies to improve the performance of their supply chain (Lee et al.,

2009; Kannan, 2018). Despite recent calls to extend supply chain management research into specific sustainability domains (Linton et al., 2007; Choi and Ng, 2011; Davis-Sramek et al., 2018), little is known about how different sustainability dimensions (i.e., economic, social and environmental) can work together to affect supplier selection.

A comprehensive search of the literature shows that there have been only a few investigations of multiple sustainability dimensions in supplier selection (Vachon and Kassen, 2008; Friedl and Wagner, 2012; Kannan et al., 2013; Huq et al., 2016; Roehrich et al., 2017; Banaeian et al., 2018; Bai et al., 2019). Notably, most of the research on sustainable supplier selection has been theory based, for example producing mathematical models and analytical frameworks, rather than offering real business application (Keskin et al., 2010; Govindan et al., 2013; Duo et al., 2014; Tavana et al., 2017; Govindan et al., 2018; Mohammed et al., 2019; Stević et al., 2020). This problem is always acknowledged by the authors themselves as a critical limitation. Moreover, many prior studies have combined the roles of different sustainability dimensions in managing supply chains (Azadnia et al., 2015). For instance, although Duo et al. (2014) evaluated multiple elements relevant to supplier selection when they determined whether green supplier development programmes can enhance suppliers' performance effectively, the multiple sustainability dimensions were integrated within different programmes in the study, and this makes it difficult to identify the effect of each element.

Besides, while the literature suggests that all the sustainability dimensions are essential, studies have shown that there can be conflicts in implementing them (Kumar and Van Dissel, 1996; Hahn et al., 2010; Davis-Sramek et al., 2018). There are also conflicting arguments regarding how managers should consider each dimension versus how managers actually do consider them in practice (Wu and Pagell, 2011; Anderson and Clemen, 2013). Moreover, most studies of sustainable supply chain management apply the win-win perspective (Elkington, 1994; Beckmann et al., 2014; Azadnia et al., 2015). For instance, the study of Wang and Sarkis (2013) identified that companies' environmental and social performance are positively associated with companies' financial performance. In this way, one of the key assumptions is that practices which improve the social and environmental dimensions will also enhance the economic performance of the supply chain (Elkington, 1994). However, the trade-off perspective questions the win-win perspective by arguing that pressures always exist among different sustainability dimensions (Figge and Hahn, 2012; Van der and Slawinski, 2015). According to Wu and Pagell (2011), companies have stakeholders with diverse preferences due their own interests and values. For example, CEO and senior managers tend to pay more attention to

companies' profitability, while community members are likely concerned with the overall social and environmental impacts from productions. Hence, it is suggested that supplier selection decisions should be made without any predetermined preferences and based on the available alternative sustainability dimensions (Hegmon, 2017). In contrast, though, the ecological perspective suggests that managers, in their supplier selection, should explicitly order the dimensions of sustainability such that the environmental dimension comes first, the social second, and the economic third (Sherman, 1994; Cucchiella et al., 2012). In particular, ecological economists suggest a "safe minimum standards" process – an approach focused on protecting a minimum level of natural resources from irreversible damage unless the social or economic costs of doing so are intolerably high (Markman and Krause, 2016). The argument for this perspective is that society's very survival depends on the natural environment, rendering economic factors a secondary consideration (Ghisellini et al., 2016).

All three perspectives (i.e., win-win, trade-off and ecological) offer guidance on supplier selection. Nonetheless, understanding what managers actually do if they are requested to integrate the three dimensions of sustainability (i.e., economic, social and environmental) into their decision-making forms an important gap (Hahn et al., 2010; Van der and Slawinski, 2015; Hegmon, 2017; Villena et al., 2018). To further explore how managers make value judgements in sustainable supplier selection, this study turns to theoretical insights from the behavioural decision-making literature.

2.2 Behavioural Decision-making

The behavioural decision-making literature has been interested in learning how individuals make decisions when confronted with various options or under conditions of uncertainty (Schwenk, 1984; Luce et al., 2000; Morton and Fasolo, 2009; Choi and Ng, 2011; Rajavel and Thangarathanam, 2016). While behavioural decision-making has not been widely applied in empirical sustainable supply chain management, investigating how managers form preferences in their supplier selection strategies can provide valuable insights (Mantel et al., 2006; Alexander et al., 2014). The behavioural studies converge in their findings to suggest there are three main categories of factors affecting decision-making: task, context and the personal characteristics of the decision-maker.

First of all, task refers to any difference in the complexity as perceived by the decision-maker (Tversky and Kahneman, 1973; Morton and Fasolo, 2009). Complexity reflects the number of options identified, presentation, information formality and time pressure, or the form of reaction required. The behavioural decision-making literature argues that, under certain circumstances (e.g., decisions that are cognitively demanding), decision-makers tend to spend less time evaluating the trade-offs among the various alternatives when constructing their preferences (Anderson and Clemen, 2013). Thus, decision-makers seem to be applying the rule-of-thumb heuristics and avoiding any trade-offs in their decision-making (Van der Byl and Slawinski, 2015). For example, in social and management sciences, there are many well-known rule-of-thumb heuristics applied to generate a wide range of decisions such as ‘when in doubt, stick to the business you know best’, ‘the customer is always right’ and so on. These are some example rules that can be used to simplify complicated decision-making scenarios and generate decisions effectively (Anderson and Clemen, 2013). By using the rule-of-thumb heuristics, preferences are instead constructed by establishing a hierarchy of factors to be considered, in which one option or variable in the set is often allowed to dominate all the others (Mantel et al., 2006).

Secondly, context refers to the way in which the decision-making associates with the environment or itself (Luce et al., 2000; Davis-Sramek et al., 2018). Context can affect decision-making in different ways according to the demonstration of the task information. For instance, when alternative options differ markedly, the decision-making approach tends to be different from that used when the options are similar. It has been suggested that preference construction does not apply only to decision-making (Tversky and Kahneman, 1973; Morton and Fasolo, 2009), but that individuals apply information from their memory to construct preferences as a reaction to any situation in which they have to make a selection (Anderson and Clemen, 2013). Decision-makers have to manage the complexity of evaluating trade-offs among various options, and this has been a critical issue for studies on preference construction (Van der Byl and Slawinski, 2015).

Thirdly, decision-makers’ characteristics, including their experience, attitude and motivation, can affect the decision-making procedure in different ways (Petty et al., 1983; Mantel et al., 2006). For example, when decision-makers perceive that the action is critical, they are more inclined to get involved in the decision-making (Mantel et al., 2006). Despite the fact that decision-makers tend to spend more time reaching a critical decision, studies indicate that this

does not help to ensure that correct decisions are made (Payne et al., 1999; Morton and Fasolo, 2009).

2.3 Hypotheses Development

To fill the research gaps, the first hypothesis considers a manager's reactions to suppliers' sustainability. If all managers reacted to sustainability positively and proactively, the majority of companies would have already adopted the concept. Instead, the literature shows that managers react differently to suppliers' sustainability (Elkington, 1994; Linton et al., 2007; Hahn et al., 2010; Hollos et al., 2012; Kannan, 2018). For instance, Favis-Sramek et al. (2018) identified a group of managers who based their supplier selection almost wholly on benefits or profits rather than on environmental and social factors. Nonetheless, the literature on supplier selection has identified a positive effect of environmental practices (Vachon and Klassen, 2008; Choi and Ng, 2011; Ghisellini et al., 2016). Also, the sustainable supply chain management literature has reported a positive impact of socially responsible practices on supplier selection (Ehrgott et al., 2011; Huq et al., 2016; Bai et al., 2019). Overall, the literature suggests that social and environmentally responsible practices can improve suppliers' reputation and thereby enhance their chances of being selected. This is consistent with behavioural decision-making theory and the concepts of self-enhancement and self-expression (Payne et al., 1999; Mohr and Webb, 2005). According to Luce et al. (2000), decision-makers are inclined to identify with a supplier that has similar ethical values. Managers integrate such shared values into their self-enhancement and self-expression. When a supplier is perceived to perform social and environmentally responsible practices, some managers will value a supplier's social and environmentally responsible practices because this will enhance their own sense of self (Alexander et al., 2014). As a result, the decision-makers are more likely to assess the supplier positively. Hence, we hypothesise:

H1: A high degree of sustainability (economic, social and environmental) will have a positive impact on supplier evaluation and selection intent.

The second hypothesis considers the negativity bias regarding sustainability. The literature has investigated whether negative information on a firm's corporate social responsibility has a more significant impact than positive information, for example on customers (Mohr and Webb,

2005; Choi and Ng, 2011; Govindan et al., 2018). For example, Mohr and Webb (2005) investigate if low levels of corporate social responsibility have a larger effect on consumer responses than high levels. The results show that low ratings for a company's social and environmental sustainability greatly decreased consumers' positive responses, while high sustainability ratings did not significantly improve consumer responses. These findings suggest a negativity bias. This bias can also be explained by the behavioural decision-making literature, as decision-makers give more weight to negative information than to positive information (Tversky and Kahneman, 1973; Morton and Fasolo, 2009). This has been well illustrated in the behaviour decision-making literature on impression formation, where research has shown that impressions that integrate both negative and positive features are more negative than would be expected based on the separate scale values of those features (Payne et al., 1999). The same results have been found when decision-making needs a combination of information regarding particular behaviours instead of features. Studies have also found that negative first impressions are far more difficult to change than positive first impressions, and, compared with positive information, negative information tends to have longer-lasting consequences (Schwenk, 1984; Rozin and Royzman, 2001). Such findings are in line with the idea that when managers integrate information, they give more weight to negative information than to positive information. Thus, this study expects a prejudicial effect of negative information regarding sustainability on supplier selection:

H2: The adverse effect on supplier evaluation and selection intent of a low degree of sustainability (economic, social and environmental) will be larger than the beneficial effect of a high degree of sustainability.

The third hypothesis considers the prominence of the three sustainability dimensions in supplier evaluation and selection. Prior research on sustainable supply chain management suggests that the economic dimension outperforms the environmental and social dimensions according to the empirical evidence (Alexander et al., 2014; Ghisellini et al., 2016) and a group of experts (Hahn et al., 2010; Davis-Sramek et al., 2018). In addition to the three perspectives on sustainable supply chain management, behavioural decision-making shows that managers construct preferences when making selections (Tversky and Kahneman, 1973). Notably, it provides a reason-based explanation for their preferences, and illuminates the various decision processes that managers apply to identify optimal suppliers. On the one hand, decision-makers

discriminate between sources and types of information and focus on the most crucial dimension when reviewing a set of alternatives (Schwenk, 1984). In terms of the sustainable supplier selection, decision-makers tend to consider the economic dimension to be the most critical, because of the negative consequences if a supplier proves not to be economically viable (Van der Byl and Slawinski, 2015; Ghisellini et al., 2016). On the other hand, according to Morton and Fasolo (2009), decision-makers are inclined to draw on their own experience and familiarity in constructing their preference. In most scenarios, managers will be more familiar with the economic performance of a supplier than with its social and environmental performance (Hahn et al., 2010; Ghisellini et al., 2016). Therefore, previous experience would drive managers to pay more attention to the economic dimension in selecting a sustainable supplier. This study seeks to offer empirical validation of this point, and accordingly we hypothesise that:

H3: The economic dimension of sustainability has a stronger impact on supplier evaluation and selection intent than the social or environmental dimensions.

The fourth hypothesis concerns the moderating effect of the degree of managers' support for (i.e., or endorsement of) a specific sustainability dimension on their supplier selection decisions. The literature on sustainable supply chain management indicates that managers are inclined to assess a supplier more positively when that supplier's identity fits those managers' self-identity (Tavana et al., 2017; Villena and Gioia, 2018; Bai et al., 2019). The behavioural decision-making literature argues that identification with a company is improved when managers' perceptions of the supplier's values and traits are matched to their own values and traits (Morton and Fasolo, 2009; Alexander et al., 2014). It further argues that managers construct preferences for supplier traits more in terms of sustainability than business expertise. This is consistent with social identity theory, which suggests that managers' support for a specific socially responsible identity and support for a social agenda enhances positive evaluations of the company (Mohr and Webb, 2005; Huq et al., 2016). In particular, managers who value a supplier's social and environmental initiatives will tend to identify a stronger compatibility between themselves and that supplier (Choi and Ng, 2011; Ehrhardt et al., 2011). Therefore, we hypothesise the following moderating effect of the manager's values:

H4: Managers with a higher degree of support (or endorsement) for the sustainability dimensions give more positive evaluations and greater selection intent than managers with a lower degree of support for the sustainability dimensions.

3.0 Methodology

3.1 Why Experimental Research?

According to Falk and Heckman (2009), the experimental design is a novel research methodology in social science, and especially in the study of operations and supply chain management. Unlike conventional methodologies (e.g., survey, case study and analytical modelling), the experimental research design offers a controlled examination of the hypothesised causal relationship (Rottig et al., 2011; Chen et al., 2016). Although experimental research has been broadly applied in areas such as psychology and marketing for investigating decision-making (Tversky and Kahneman, 1973; Mantel et al., 2006; Falk and Heckman, 2009; Umphress and Bingham, 2011), its implementation has been much slower in areas such as operations and supply chain management, where the research objects are dispersed geographically or in other ways difficult for the design of laboratory experiments. Nonetheless, researchers in these areas have called for the adoption of experimental designs in the investigation of behavioural problems and to extend the current research horizon (Rottig et al., 2011; Falk and Heckman, 2009; Chen et al., 2016; Lonati et al., 2018).

Experimental research design in operations and supply chain management faces unique challenges. Unlike in psychology and economics, where target samples can be relatively easy to collect (typically in the form of MBA or postgraduate students), the required samples for operations and supply chain research are generally professionals working in practice (Katok, 2011; Chen et al., 2016; Eckerd et al., 2020). This research overcame the issue of the geographical dispersion of the sample by using an online questionnaire in the experimental research design (Mantel et al., 2006). The experiments developed in this study include random assignment to cells, manipulated independent variables and measured dependent variables. The study questionnaire was presented as a survey, with all the elements of an experimental research design, which minimises the risk of systematic variances in the respondents or the settings that could influence the results (Falk and Heckman, 2009; Lonati et al., 2018). As a result, the identified variations can be ascribed to the different experimental conditions, hence

enabling an advanced investigation with correlation analysis extended to an analysis of causality (Katok, 2011).

3.2 Experimental Design

This study adopted a series of scenario-based experiments to investigate behavioural decision-making in the context of sustainable supplier selection (Katok, 2011; Umphress and Bingham, 2011; Chen et al., 2016; Lonati et al., 2018; Eckerd et al., 2020). Experimental variables included different degrees of sustainability along its three dimensions, producing a two (economic dimension) \times two (environmental dimension) \times two (social dimension) \times one (control group with no sustainability information) factorial design for the experiments (Schmidt et al., 2001; Choi and Ng, 2011).

The first experiment concerns the impact of long-term relationships on managers' sustainable supplier selection decisions. Notably, a long-term relationship is generally wanted by organisations in their supply chain practices (e.g., supply chain integration), whereby a smaller number of core suppliers are selected (Kumar and Van Dissel, 1996; Linton et al., 2007; Beckmann et al., 2014). Therefore, this experiment applied a core partner scenario and managers were asked to assess suppliers in a long-term relationship. The second experiment has a similar design to the first experiment but an effort is made to test the importance or size of the effect of the different sustainability dimensions. According to Thomas et al. (2014), different types of supply chain relationship can affect managers' selections of partners for a strategic alliance. Thus, instead of evaluating core suppliers in a long-term relationship, the second experiment pays particular attention to a short-term relationship, where a supplier is temporarily required (e.g., to manage peak season demands). The effects of supplier sustainability on supplier selection may be different in this case, as the selection decision is less critical. The third experiment considers two additional factors that might affect the results. On the one hand, it considers managers' length of work experience as a factor that might affect the size of any effects of the sustainability dimensions (Wu and Pagell, 2011; Rajavel and Thangarathanam, 2016). Therefore, instead of investigating operations managers, the third experiment turns from a managerial sample to a sample of undergraduate and postgraduate students to investigate the effect of work experience. Furthermore, the third experiment seeks to evaluate the supplier selection decision's justifiability, by offering more guidance to respondents. Research highlights the significance of summarising operating principles – not to

illustrate specific practices, but to outline the company's values associated with sustainable supply chain management (Davis-Sramek et al., 2018). Thus, respondents in the third experiment were informed about the Ten Principles of the United Nations Global Compact (UNGC) for Corporate Sustainability and then instructed to select suppliers that comply with the principles. These principles are expected to offer additional justification for assessing the significance of diverse sustainability dimensions.

Personal feelings or internal conflicts around the issue of sustainability may lead to social desirability bias (Katok, 2011; Rottig et al., 2011). According to Ecker et al. (2020), one of the arguments about experimental research including human subjects criticises the threat of experimental demand effect which refers to alters in behaviour by experimental subjects because of hints regarding what makes appropriate behaviour. Therefore, this study applied a projective technique to enable respondents to evaluate the scenarios and respond to questions from the perspective of different groups. This allows respondents to express their actual attitudes and react to experimental treatments without personal embarrassment. This is likely to increase the authenticity of the data, as it avoids social judgement, emotions, peer effects and other external factors (Schmidt et al., 2001; Chen et al., 2016).

3.3 Subjects and Procedures

All of the respondents in this study had at least some experience in supply chain management. Specifically, respondents in the first and second experiments were full-time managers, while respondents in the third experiment were undergraduate/postgraduate students with an educational background in supply chain management subjects. Therefore, respondents in all three experiments could understand and react appropriately to the different experimental treatments. However, respondents in the third experiment did not have much practical experience to draw upon in forming preferences in sustainable supplier selection.

In terms of data collection, for all three experiments a commercial research company was asked to identify respondents randomly from a list of members of a leading supply chain management association in China. Respondents were contacted by phone and email and requested to complete an online questionnaire. Online questionnaires have previously been used to perform controlled experiments on decision-making behaviours among industrial buyers, retailers and suppliers (Schmidt et al., 2001; Mohr and Webb, 2005; Falk and Heckman, 2009; Umphress

and Bingham, 2011). In total, 857 valid sets of responses to the questionnaire were collected in the three experiments: 293 in the first experiment, where respondents had an average work experience of 8.7 years (std = 7.84); 281 in the second experiment, where the average work experience was 7.3 years (std = 5.90); and 283 in the third experiment, in which most of the respondents were undergraduate/postgraduate students aged between 18 and 25.

Respondents were randomly distributed to one of the nine discrete experimental treatment conditions and guided to read a multi-section scenario. The scenarios applied in this study were modified from studies by Thomas et al. (2014) and Davis-Sramek et al. (2018) and were pre-tested to ensure they were realistic. In particular, the first section of the scenario presented the research purposes and ensured data confidentiality. Then, it illustrated a typical sustainable supplier selection situation for the respondents. The main objective of this section was to control for known selection measurements that were not of interest in this research. All respondents were given the same information. The second section of the scenario manipulated the independent variables (i.e., the sustainability dimensions) for the selection of a single sustainable supplier under different treatments. The supplier's performance was evaluated along all three dimensions of sustainability so that it could be compared with its competitors (i.e., other suppliers) being considered for selection. Thus, all respondents were presented with a scenario consisting of high or low degrees of economic, social, and environmental sustainability performance. All respondents were randomly assigned to groups given different scenarios. Although the approach of the third experiment was identical to that in the first and second experiments, there is one exception. That is, respondents in the third experiment were informed of the explicit principles of the Sustainable Development Goals (SDGs). After reading their different scenario-based experimental treatments, respondents were asked to fill in the questionnaire. They were asked how a manager would react in the scenario provided and were told that there were no "good" or "bad" answers.

3.4 Pre-tests and Variables

Pre-tests were performed with a group of managers and MBA students engaged in a relevant supply chain management programme at a leading public university in China, to ensure that the scenario presentations were realistic and effectively controlled the independent variables (Hyq et al., 2016; Roehrich et al., 2017). A debriefing process was used to investigate potential experimental confounds and artefacts (Katok, 2011). In these pre-tests, respondents were

unable to determine the hypothesised relationships. Thus, the risk of experimental artefacts influencing the results is minimal. Also, no specific confounds were identified that might have had a notable impact on respondents' answers. Therefore, the results of the pre-test suggested that it was appropriate for the research to move forward to actual respondents.

The independent variables used in this study were supplier performance in terms of economic, social and environmental sustainability, developed from Mohr and Webb (2005) and Davis-Sramek et al. (2018). The scenarios were designed to ensure that the variables of interest aligned with the established experimental treatments of the underlying structures. Two seven-point Likert-type items were used to assess manager's support for (i.e., endorsement of) each dimension of sustainability. Specifically, Table 1 shows detailed information regarding the independent variable measures for sustainability dimensions.

Table 1: Independent variable measures for sustainability dimensions

Sustainability dimension	Item	Alpha coefficient (experiments 1, 2 and 3)		
Economic	The supplier has an excellent economic performance.	0.89	0.87	0.85
	The extent to which you think the suppliers manage their operations for economic sustainability.			
Social	The supplier has an excellent social performance.	0.91	0.85	0.86
	The extent to which you think the suppliers manage their operations for social sustainability.			
Environmental	The supplier has an excellent environmental performance.	0.91	0.85	0.86
	The extent to which you think the suppliers manage their operations for environmental sustainability.			

Respondents were required to assess the supplier and explain their motivation to select that supplier according to the different scenarios given in the experimental treatments. Two measurements were adopted from studies by Grewal et al. (1998), and Choi and Ng (2011). On the one hand, three seven-point semantic differential items were applied for supplier evaluation, anchored by bad/good, unfavourable/favourable, and harmful/beneficial. The alpha coefficients in the three experiments were 0.93, 0.90 and 0.91, respectively. On the other hand, the managers' responses regarding selection intent were measured by three seven-point

semantic differential items as “How likely is it that managers would select the supplier...?” (With responses ranging from “very unlikely” to “very likely”), “How certain do you think it is that the supplier would be selected...?” (From no chance to certain) and “How possible is it that managers would select the supplier...?” (From impossible to very possible). The alpha coefficients for the three experiments were 0.91, 0.92 and 0.90, respectively.

4.0 Results

4.1 Experiment One: Long-term relationship

Checks on manipulation, credibility and confounding

Manipulation checks were conducted to ensure the experimental treatments were effective (Katok, 2011; Chen et al., 2016; Lonati et al., 2018). Because sustainability is illustrated differently for the three dimensions, analyses were performed for each dimension separately. The results show that respondents perceived sustainability in the intended direction for the economic ($F_{\text{evaluation}} = 173.52$; $F_{\text{selection intent}} = 162.20$; $p < 0.01$), social ($F_{\text{evaluation}} = 75.60$; $F_{\text{selection intent}} = 82.36$; $p < 0.01$) and environmental ($F_{\text{evaluation}} = 68.86$; $F_{\text{selection intent}} = 80.14$; $p < 0.01$) dimensions. This suggests that the manipulations significantly and strongly influenced the perceived variables as expected.

Credibility checks were conducted to ensure the experimental treatments were sufficiently realistic to induce authentic replies from the respondents (Mantel et al., 2006; Lonati et al., 2018). Respondents were asked whether they could see themselves in the supplier selection context to evaluate the credibility of the experimental treatments. The results show that the experimental design was authentic, with a mean value of 5.59 on a seven-point credibility check scale. A three-way ANOVA was performed to examine whether any specific treatment influenced credibility and it was determined that none of the interaction or main effects were remarkable, indicating comparable perceived credibility among all experimental treatments.

To further ensure the manipulations of the independent variables did not affect each other, a check on confounding was conducted (Katok, 2011; Eckerd et al., 2020). Similar to the study by Haq et al. (2016), interactions among the manipulation group of variables on the measures of those variables were tested. No significant interactions were identified (p -values > 0.05) from the check, which suggests the experimental results can be presented straightforwardly.

Test of Hypotheses

Hypothesis 1 posits a positive effect of sustainability on supplier evaluation and selection intent. A MANOVA followed by univariate ANOVAs were conducted to verify the hypothesis, Table 2 shows the results. The MANOVA suggests a significant main effect for overall sustainability (Wilks' $\lambda = 0.27$, $F = 288.18$, $p < 0.01$) as well as for the three separate dimensions of sustainability (economic: Wilks' $\lambda = 0.62$, $F = 90.61$, $p < 0.01$; social: Wilks' $\lambda = 0.78$, $F = 42.13$, $p < 0.01$; environmental: Wilks' $\lambda = 0.77$, $F = 40.29$, $p < 0.01$). The univariate ANOVAs suggest that the overall multivariate interaction effect is ascribable to the impacts on supplier evaluation and selection intent. Therefore, the results support Hypothesis 1 and suggest that a high degree of sustainability leads to significantly more positive supplier evaluation and selection intent than a low degree of sustainability.

Table 2: Impacts of sustainability on supplier evaluation and selection intent (H1)

Independent variables	MANOVA results		Univariate results			
			Evaluation		Selection intent	
	Wilks' λ	F	Mean	F	Mean	F
Sustainability	0.27	288.18**		494.35**		255.83**
Low			2.87		2.78	
High			5.67		5.73	
Sustainability: economic dimension	0.62	90.61**		173.52**		162.20**
Low			2.70		2.87	
High			5.85		5.88	
Sustainability: social dimension	0.78	42.13**		75.60**		82.36**
Low			2.94		2.79	
High			5.60		5.67	
Sustainability: environmental dimension	0.77	40.29**		68.86**		80.14**
Low			2.96		2.69	
High			5.57		5.65	

Hypothesis 2 addresses negativity bias by investigating if a low degree of sustainability will have a larger (negative) effect on supplier evaluation and selection intent than a high degree of sustainability. Considering the impacts of various degrees of sustainability on supplier evaluation and selection intent, six MANOVAs followed by univariate ANOVAs were performed. Notably, the groups with different degrees of sustainability (i.e., high or low) were compared with the control group, who were offered no information regarding the supplier's sustainability. Table 3 presents the results, which show that information on the supplier's low degree of sustainability greatly decreases evaluation and selection intent; this applies for all

three dimensions of sustainability, economic, social and environmental. Despite the fact that information on the supplier's high degree of economic sustainability increases evaluation ($F = 10.26$; $p < 0.05$) and selection intent ($F = 8.58$; $p < 0.05$), the size of the effect is less than that for a low degree of sustainability ($F_{\text{evaluation}} = 30.56$; $p < 0.01$; $F_{\text{selection}} = 31.75$; $p < 0.01$). Thus, the results support Hypothesis 2.

Table 3: Relative impacts of high and low levels of sustainability on supplier evaluation and selection intent (H2)

Independent variables	MANOVA results		Univariate results			
			Evaluation		Selection intent	
	Wilks' λ	F	Mean	F	Mean	F
Economic dimension						
Sustainability	0.95	5.27*		10.26*		8.58*
High			5.85		5.88	
Control group			4.68		4.69	
Sustainability	0.84	17.14**		30.56**		31.75**
Low			2.70		2.87	
Control group			4.68		4.69	
Social dimension						
Sustainability	0.98	1.20		2.10		2.32
High			5.60		5.67	
Control group			4.68		4.69	
Sustainability	0.89	11.15**		19.02**		21.89**
Low			2.94		2.79	
Control group			4.68		4.69	
Environmental dimension						
Sustainability	0.99	0.91		1.36		1.83
High			5.57		5.65	
Control group			4.68		4.69	
Sustainability	0.88	12.82**		21.00**		24.60**
Low			2.96		2.69	
Control group			4.68		4.69	

* $p < 0.05$, ** $p < 0.01$

Hypothesis 3 addresses the hierarchy of the sustainability dimensions in supplier selection. Two ANOVAs were conducted on the dependent variables of supplier evaluation and selection intent with economic, social, and environmental sustainability dimensions. The results are presented in Table 4. Consistent with the results of Hypothesis 1, the main effects indicate that all three sustainability dimensions have a large impact on a manager's evaluation of a supplier and selection intent. Nonetheless, the effect size was calculated to investigate the relative significance of each sustainability dimension. Unlike from statistical hypothesis tests, the effect

size can evaluate the dominance of particular variables, as it is not affected by increased sample size and allows researchers to identify whether their results are of practical significance (Davis-Sramek et al., 2018). Specifically, the effect sizes of the social (0.24 for evaluation and 0.28 for selection intent) and environmental (0.25 for evaluation and 0.33 for section intent) dimensions are relatively minor compared with the effect size of the economic (0.50 for evaluation and 0.67 for selection intent) dimension. This supports Hypothesis 3 and suggests that the economic dimension is the most critical when evaluating a supplier or selecting a new supplier for sustainable supply chain management.

Table 4: Relative size of the effects of the three sustainability dimensions on supplier evaluation and selection intent (H3)

Independent variables	ANOVA results			
	Evaluation		Selection intent	
	F	Effect size	F	Effect size
Main effect				
Economic sustainability (ECO)	180.48**	0.50	240.56**	0.67
Social sustainability (SOC)	71.65**	0.24	96.87**	0.28
Environmental sustainability (ENV)	94.10**	0.25	154.80**	0.33
Two-way interactions				
ECO*SOC	3.28	0.02	1.36	0.01
ECO*ENV	2.40	0.02	0.68	-
SOC*ENV	0.29	-	2.11	-
Three-way interactions				
ECO x SOC x ENV	5.63*	0.03	9.86*	0.04

*p < 0.05, **p < 0.01

Hypothesis 4 posits that the support (or endorsement) of managers for the sustainability dimensions will moderate the impact of sustainability on supplier evaluation and selection intent. As managers' support for the sustainability dimensions are measured using continuous variables, dichotomisation of continuous predictor variables would have significant adverse effects (Irwin and McClelland, 2003; Choi and Ng, 2011). Therefore, a regression analysis was performed to examine the moderation effects. The regression model was estimated as follows, and the main and interaction impacts were determined accordingly.

$$Y_{iq} = \alpha + \beta_1 \text{SustainDomain}_i + \beta_2 \text{Support}_i + \beta_3 \text{SustainDomain}_i * \text{Support}_i + \varepsilon_{iq}$$

$$\text{SustainDomain}_i = \begin{cases} 0, & \text{if treatment } i \text{ suggests low sustainability} \\ 1, & \text{otherwise} \end{cases}$$

Y_{iq} is manager q 's assessment (i.e., evaluation and selection intent) of the supplier illustrated in experimental treatment condition i . $Support_i$ refers to the degree of managers' support for the sustainability dimension presented in experimental treatment condition i . The results (as shown in Table 5) suggest that the moderating effects of the manager's support for all three dimensions of sustainability on the effect of supplier sustainability on the manager's evaluation and selection intent are significant: for the economic dimension, $\beta = 0.86$, $t = 4.04$, $p < 0.01$ and $\beta = 0.46$, $t = 2.10$, $p < 0.05$ for evaluation and intent, respectively; for the social dimension $\beta = 1.31$, $t = 5.17$, $p < 0.01$ and $\beta = 0.85$, $t = 3.31$, $p < 0.01$, respectively; and for the environmental dimension, $\beta = 0.96$, $t = 14.11$, $p < 0.01$ and $\beta = 0.86$, $t = 11.46$, $p < 0.01$, respectively. Therefore, Hypothesis 4 is significantly supported: sustainability in any of the three dimensions will have a more significant impact on supplier evaluation and selection intent for managers who believe that those suppliers have responsibilities in that dimension than for those managers who believe that suppliers have few responsibilities in that dimension.

Table 5: The moderating effects of managers' support for sustainability dimensions on supplier evaluation and selection intent (H4)

	Economic			Environmental			Social		
	Coefficients	Std.	Standardized	Coefficients	Std.	Standardized	Coefficients	Std.	Standardised
	(t)	Error	coefficients	(t)	Error	coefficients	(t)	Error	coefficients
Evaluation									
(Constant)	3.51** (9.87)	0.36		2.71** (14.23)	0.19		4.33** (10.50)	0.41	
Sustainability	-3.40** (-3.21)	1.06	-1.07	-4.74** (-11.97)	0.40	-1.57	-5.72** (-4.47)	1.28	-1.82
Support for the dimension	0.06 (0.44)	0.13	0.06	0.40** (5.82)	0.07	0.48	-0.12 (-0.85)	0.14	-0.12
Sustainability × support	0.86** (4.04)	0.21	1.60	0.96** (14.11)	0.07	1.63	1.31** (5.17)	0.25	2.40
Adjusted R ²	0.38			0.55			0.53		
F statistic	59.69**			113.55**			37.53**		
Selection Intent									
(Constant)	3.28** (8.943)	0.37		3.04** (14.55)	0.21		3.91** (9.36)	0.42	
Sustainability	-1.08 (-0.99)	1.09	-0.34	-3.67** (-8.44)	0.44	-1.20	-3.12* (-2.41)	1.30	-0.98
Support for the dimension	0.08 (0.59)	0.13	0.09	0.26** (3.44)	0.08	0.31	-0.05 (-0.365)	0.14	-0.05
Sustainability × support	0.46* (2.10)	0.22	0.85	0.86** (11.46)	0.08	1.45	0.85** (3.31)	0.26	1.54
Adjusted R ²	0.35			0.46			0.31		
F statistic	53.41**			81.33**			37.07**		

*p < 0.05, **p < 0.01

4.2 Summary of Experiment Two: Short-term relationship

Similar to the first experiment, a series of checks were conducted to make sure that the measures were valid, the experimental treatment conditions were realistic, and the effects of the manipulations were significant and not confounded. The results indicate that the second experiment can be presented without concern.

To address Hypothesis 1, the results of a MANOVA followed by univariate ANOVAs suggest a significant overall main effect for sustainability (Wilks' $\lambda = 0.38$, $F = 228.90$, $p < 0.01$) and the three dimensions of sustainability (economic: Wilks' $\lambda = 0.61$, $F = 88.07$, $p < 0.01$; social: Wilks' $\lambda = 0.78$, $F = 38.68$, $p < 0.01$; environmental: Wilks' $\lambda = 0.79$, $F = 36.49$, $p < 0.01$). The results show that a high degree of sustainability leads to significantly greater supplier evaluation and selection intent than a low degree of sustainability. This supports Hypothesis 1 in the context of short-term business relationships.

To verify Hypothesis 2, the results of six MANOVAs followed by univariate ANOVAs show that information on the supplier's low degree of sustainability greatly decreases evaluation and selection intent on the economic ($F_{\text{evaluation}} = 32.29$, $p < 0.01$; $F_{\text{selection intent}} = 31.83$, $p < 0.01$), social ($F_{\text{evaluation}} = 20.56$, $p < 0.01$; $F_{\text{selection intent}} = 22.10$, $p < 0.01$) and environmental ($F_{\text{evaluation}} = 21.08$, $p < 0.01$; $F_{\text{selection intent}} = 25.40$, $p < 0.01$) dimensions of sustainability. It further indicates that, in a short-term relationship, information on the supplier's high degree of sustainability has a positive impact on evaluation ($F = 5.57$, $p < 0.05$) and selection intent ($F = 9.91$, $p < 0.05$) for the economic sustainability dimension. Thus, the results support Hypothesis 2 in a short-term relationship and imply an enhanced effect of negativity bias on sustainable supplier selection according to the manager's evaluation and selection intent.

To address Hypothesis 3, the results of two ANOVAs and the effect sizes of the sustainability dimensions suggest that the main effects are observed for the economic ($F_{\text{evaluation}} = 233.27$, $p < 0.01$; $F_{\text{selection intent}} = 310.50$, $p < 0.01$), the social ($F_{\text{evaluation}} = 87.73$, $p < 0.01$; $F_{\text{selection intent}} = 73.32$, $p < 0.01$), and the environmental ($F_{\text{evaluation}} = 77.43$, $p < 0.01$; $F_{\text{selection intent}} = 81.52$, $p < 0.01$) dimensions of sustainability. Compared with the first experiment, the dominance of the economic dimension evaluated by effect size (0.61 for evaluation and 0.74 for selection intent) is strengthened, while the social (0.22 for evaluation and 0.23 for selection intent) and environmental (0.23 for evaluation and 0.21 for selection intent) dimensions are reduced; that is, in a short-term relationship they have less impact on supplier selection. Hence, the results

support Hypothesis 3 and indicate a mitigated effect of social and environmental sustainability on supplier selection, but a strengthened dominance of the economic dimension.

To examine Hypothesis 4, the results of a regression analysis again show that support for the dimensions of sustainability has a significantly moderating effect on the relationship between sustainability and supplier evaluation and selection intent only for the economic dimension (evaluation: $\beta = 0.60$, $t = 2.39$, $p < 0.05$; intent: $\beta = 0.55$, $t = 2.54$, $p < 0.05$). In terms of the environmental and social dimensions, the results are significant on evaluation ($\beta = 0.63$, $t = 3.12$, $p < 0.05$ for environmental; $\beta = 0.49$, $t = 2.06$, $p < 0.05$ for social) but not on selection intent ($\beta = 0.17$, $t = 0.66$ for environmental; $\beta = -0.21$, $t = -0.87$ for social). Therefore, the Hypothesis 4 is partly supported in a short-term relationship.

To further investigate the comparative effects of sustainability on sustainable supplier selection, a post hoc analysis was performed comparing the overall sustainability of the first and second experiments based on the manager's evaluation and selection intent (Schmidt et al., 2001). As displayed in Figure 1, the direction of the interactions suggest that sustainability influenced the supplier evaluation and selection intent more significantly in a long-term relationship than in a short-term relationship on this trait ($t_{\text{evaluation}} = 4.64$ $p < 0.05$; $t_{\text{selection intent}} = 5.28$ $p < 0.05$). In summary, after changing the buyer-supplier relationship from a long-term to a short-term temporary scenario, the findings still support the hypotheses and are in line with the first experiment. Nonetheless, a lesser effect was found of sustainability on suppliers' evaluation and selection intent, but a strengthened negativity bias and enhanced dominance of the economic dimension for sustainable supplier selection were found.

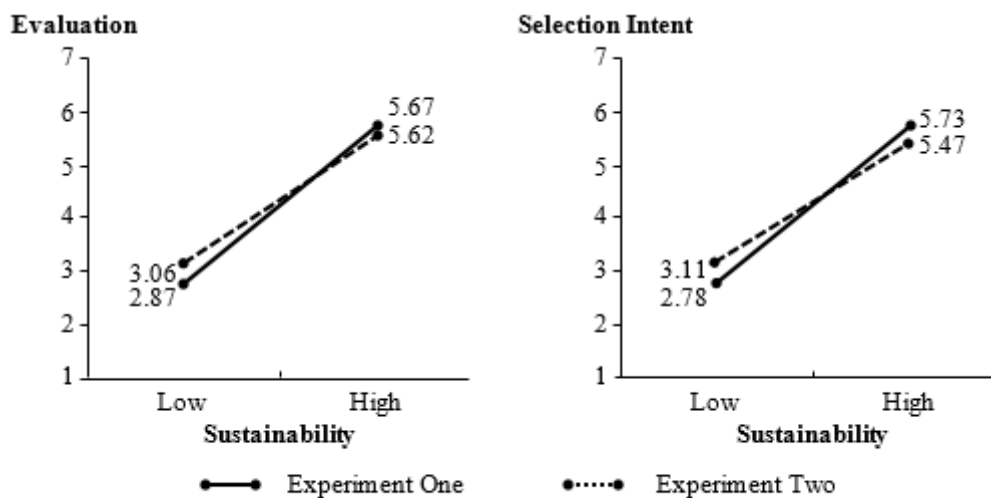


Figure 1: Effects of sustainability on evaluation and selection intent

4.3 Summary of Experiment Three: Impact of the experience

As with the previous experiments, the examinations of the set-up of the third experiment suggested that all conventional experimental checks and tests performed as anticipated. Thus, the results can be presented straightforwardly.

The results regarding Hypothesis 1 show a significant main effect for overall sustainability (Wilks' $\lambda = 0.39$, $F = 222.17$, $p < 0.01$) and the three dimensions of sustainability (economic: Wilks' $\lambda = 0.67$, $F = 70.26$, $p < 0.01$; social: Wilks' $\lambda = 0.78$, $F = 39.34$, $p < 0.01$; environmental: Wilks' $\lambda = 0.77$, $F = 40.86$, $p < 0.01$). This suggests that a high degree of sustainability leads to significantly greater supplier evaluation and selection intent than a low degree of sustainability. Thus, the results support Hypothesis 1.

The results regarding Hypothesis 2 suggest that information on a supplier's low degree of sustainability greatly decreases evaluation and selection intent for the economic ($F_{\text{evaluation}} = 16.78$, $p < 0.01$; $F_{\text{selection intent}} = 25.98$, $p < 0.01$), social ($F_{\text{evaluation}} = 11.53$, $p < 0.01$; $F_{\text{selection intent}} = 17.44$, $p < 0.01$) and environmental ($F_{\text{evaluation}} = 14.08$, $p < 0.01$; $F_{\text{selection intent}} = 15.89$, $p < 0.01$) dimensions of sustainability. Also, information on a supplier's high degree of sustainability has a positive impact on selection intent ($F = 7.94$, $p < 0.05$) for the economic sustainability dimension. Hence, Hypothesis 2 is supported.

The results regarding Hypothesis 3 show that main effects were observed for the economic ($F_{\text{evaluation}} = 152.43$, $p < 0.01$; $F_{\text{selection intent}} = 186.40$, $p < 0.01$) and social ($F_{\text{evaluation}} = 33.58$, $p < 0.01$; $F_{\text{selection intent}} = 46.14$, $p < 0.01$) dimensions of sustainability. The analysis of effect sizes indicates that the economic dimension is still the most important driver (0.48 for evaluation and 0.50 for selection intent) in sustainable supplier selection. The social dimension had a much smaller effect (0.11 for evaluation and 0.21 for selection intent), while the environmental dimension had no statistically significant effect ($p > 0.05$). Therefore, the findings support Hypothesis 3 but indicate a lesser effect on supplier selection for all the sustainability dimensions.

The results regarding Hypothesis 4 suggest that the moderation effects of managers' support for sustainability were not significant for the economic (evaluation: $\beta = -0.33$, $t = -1.30$; intent: $\beta = -0.30$, $t = -1.29$), social (evaluation: $\beta = -0.16$, $t = -0.60$; intent: $\beta = -0.38$, $t = -1.58$), and environmental (evaluation: $\beta = -0.36$, $t = -1.52$; intent: $\beta = -0.36$, $t = -1.62$) dimensions. As a result, Hypothesis 4 is rejected, which indicates that the support of managers for the

sustainability dimensions does not moderate the impact of sustainability on supplier evaluation and selection intent.

Although the third experiment used a student sample to control experience and offered more insightful explanations to change the justifiability mechanism, findings from the experiment are mostly consistent with those of experiments one and two (except for the hypothesis 4). Notably, a post hoc analysis was performed to compare the overall effects of sustainability in the three experiments on evaluation and selection intent, as shown in Figure 2. The direction of the interactions suggests that sustainability influenced managers' supplier evaluation and selection intent much less for decision-makers without much previous working experience than for experienced managers in either long-term or short-term relationships with their suppliers.

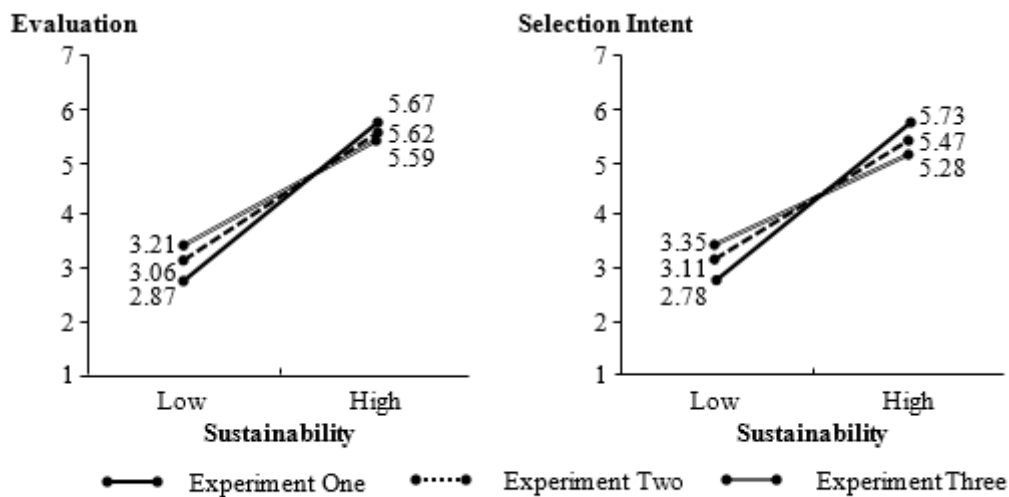


Figure 2: Effects of sustainability on evaluation and selection intent

5.0 Discussion

Recent research has called for more empirical examinations and theoretical refinements in improving sustainable supply chain management (Boone and Ganeshan, 2007; Roehrich et al., 2017; Villena and Gioia, 2018). This study addresses the calls by adopting a logic from behavioural decision-making to empirically verify the impact of sustainability in the supplier selection context. Table 6 summarises the research findings. It is worth pointing out that the main focus of this study is not the justifiability of managerial perspectives, but to concede that managerial preferences exist and investigate how they are formed and prioritised. The findings offer a comprehensive understanding of sustainable supply chain management by

concentrating on how managers actually behave in supplier selection as opposed to how managers should behave according to various prescriptive perspectives.

Table 6: Summary of results

Hypothesis	Objective	Results	Post Hoc Analysis*
Experiment one: long-term relationship			
H1	The impact of sustainability is significantly positive on supplier evaluation and selection intent	Support	n/a
H2	The impact of negative information is stronger than the impact of positive information	Support	n/a
H3	The impact of the economic dimension is the strongest of the three dimensions	Support	n/a
H4	The moderating effect of managers' support is significant on supplier evaluation and selection intent	Support	n/a
Experiment two: short-term relationship			
H1	The impact of sustainability is significantly positive on supplier evaluation and selection intent	Support	$\alpha > \beta$
H2	The impact of negative information is stronger than the impact of positive information	Support	$\beta > \alpha$
H3	The impact of the economic dimension is the strongest of the three dimensions	Support	$\beta > \alpha$
H4	The moderating effect of managers' support is significant on supplier evaluation and selection intent	Partially support	$\alpha > \beta$
Experiment three: Impact of experience			
H1	The impact of sustainability is significantly positive on supplier evaluation and selection intent	Support	$\alpha > \beta > \gamma$
H2	The impact of negative information is stronger than the impact of positive information	Support	$\beta > \alpha > \gamma$
H3	The impact of the economic dimension is the strongest of the three dimensions	Support	$\beta > \alpha > \gamma$
H4	The moderating effect of managers' support is significant on supplier evaluation and selection intent	Reject	$\alpha > \beta > \gamma$

*Duncan multiple range tests ($p < 0.05$). α = Experiment one; β = Experiment two; γ = Experiment three

First of all, the results from all three experiments show that sustainability has a significantly positive influence on the evaluation of suppliers and selection intent. Also, the participants respond more to negative information than to positive information when compared with the control groups offered no sustainability information. These findings suggest that managers react favourably to information regarding suppliers' sustainability strategies and attitudes. In particular, managers pay more attention to a supplier's sustainability defects than to a supplier's merits, and respond negatively to weak sustainability. As a result, for suppliers, low

sustainability strategies and attitudes will harm the evaluation of the company and the opportunity to become a supplier will be lost (Linton et al., 2007).

Moreover, the results verified the hypothesis that the economic dimension will dominate in the supplier selection context. According to the behavioural decision-making literature, managers tend to form a hierarchy of factors to consider when reasoning to make a decision, and to concentrate on the most critical factor(s) (Hahn et al., 2010; Alexander et al., 2014; Ghisellini et al., 2016). This dominance of the economic dimension was still significant in the second and third experiments, which aimed to decrease the dominance of a single factor by changing the business relationship with the supplier from long-term to short-term and by changing the length of work experience and the justifiability mechanisms (Thomas et al., 2014; Rajavel and Thangarathanam, 2016). This finding is consistent with previous studies as decision-makers tend to consider the economic dimension to be the most critical dimension in their supplier selection (Van der Byl and Slawinski, 2015; Ghisellini et al., 2016). Besides, the findings of the second and third experiments confirmed the effect of the social and environmental dimensions on a supplier's evaluation and selection intent, but still to a lesser extent than the economic dimension.

Furthermore, the only hypothesis that did not receive full support in this study was the one predicting that managers' support (or endorsement) for the sustainability dimension would moderate the effect of sustainability on supplier evaluation and selection intent. The findings show that for a long-term buyer-supplier relationship (in the first experiment), managers tend to evaluate a supplier more positively if that supplier shares the collective attitudes and strategies of the managers for a particular sustainability dimension. In other words, managers prefer suppliers they identify with. This influence can moderate the detrimental effects of modern limitless development recognised as an advantage by Boone and Ganeshan (2007). However, the results are less significant in a short-term relationship (in the second experiment) and insignificant when considering the impact of length of work experience (in the third experiment). This contradicts the findings of Mohr and Webb (2006) and Choi and Ng (2011), where significant interaction effects were identified with more particular attitudinal variable support for the sustainability dimensions. It suggests that managers' length of work experience plays a vital role to affect the decisions on sustainable supplier selection.

According to Hegmon (2017), as sustainability decision-making provides both opportunities and challenges for companies, decisions regarding the trade-offs between long-term

sustainability and short-term profitability are risky and uncertain. Typically, companies always concentrate on sustainability requirements in a long-term relationship, which can significantly moderate the effect of sustainability on supplier evolution and selection intent. In a short-term relationship, the moderating effect tends to be less significant, as companies often pay more attention to economic measurements for their growth and competitiveness. Additionally, by controlling the effect of length of work experience as a factor, the moderating effect becomes insignificant for students in making the supplier selection decision. This contradicts the studies by Remus (1986) and Crchota (2015), who contend that decision-making by managers often seems to parallel that of students. More specifically, Remus (1986) performed an experiment to compare the decision making of experienced line managers with that of students with no managerial experience, and the findings show no significant differences between the two groups. However, from the results of our study, it suggests that the effect of work experience plays a critical role in sustainable supplier selection. As decision-making is a complicated process, the findings indicate that students may not be adequate substitutes for managers, at least in the context of selecting sustainable suppliers.

5.1 Implications for research and practice

This study makes theoretical contributions to the three normative perspectives on sustainable supply chain management. While the findings are not entirely consistent with any of the perspectives, it is essential not to disregard their importance. In terms of the win-win perspective, the behavioural decision-making literature suggests that managers would not accept trade-offs among the dimensions of sustainability, as all of the dimensions can improve company performance (Elkington, 1994; Wu and Pagell, 2011). However, the findings show that managers subordinated the social and environmental dimensions to the economic dimension. Although it has been argued that the win-win perspective hinders the process that companies should take, it is essential to address how companies should think about sustainability in their business models (Beckmann et al., 2014). Therefore, the win-win perspective remains a fundamental approach for sustainability, as recent studies identify that most companies are still not broadly applying sustainability initiatives (Gold et al., 2018). The trade-off and ecological perspectives both highlight an essential component of critical theory. If the sustainability paradigm changes the research, then alterations in business are more likely to happen (Hahn et al., 2010; Van der Byl and Slawinski, 2015). This aligns with Huq et al.

(2016), who argue that theory can refine social realities and ultimately become self-fulfilling. To promote changes, advocates could combine existing theory with proposals for practical support and identify fundamental mechanisms that might become a focus of change.

This study has implications for managers and policymakers. On the one hand, by recognising the impact of sustainability and its different dimensions on supplier selection, suppliers can better differentiate themselves by developing capabilities along those dimensions. Specifically, although investments in social and environmental practices can be beneficial in supplier selection decisions, they can become harmful if the practices diminish a supplier's financial performance. Therefore, if efforts are made to tackle urgent sustainability challenges regarding the social and environmental dimensions, it would be wise for the supplier to offer more information to lower uncertainties and risks in supplier selection. On the other hand, researchers and practitioners in areas associated with eco-innovation, for example, have appealed for a comprehensive policy for promoting sustainability throughout supply chains (Braathen, 2007). Notably, policymakers need to be mindful that expensive investment might detrimental to the resource efficiency and viability for suppliers. Although large-scale firms have led the adoption of sustainability practices, researchers anticipate that small-scale firms, which constitute the majority of the supply chain capacity, could be damaged by the expense of instituting sustainability practices (Hahn et al., 2010). In addition, the United Nations Department for Sustainable Development (2019) has introduced regulations for companies to decrease their consumption of resources and adopt energy-efficient technologies for production. However, this could lead to greater capital investments and maintenance expenses. Policymakers need to be aware that the imposition of sustainability rules will affect suppliers' ability to operate profitably. As the supply chain system has a significant influence on a country's economy, a particular focus must be on the intensity of regulation. In short, if government regulations have an unfavourable economic impact on small-scale suppliers, the findings indicate that economically weak suppliers will tend to be undervalued and neglected by buyers when the supply chain capacity is adequate and buyers have substitutes.

5.2 Limitations and directions for future research

While the use of experimental research in this study maximises internal validity and enhances our theoretical understanding of the impact of sustainability on supplier selection, it has limitations. Mainly, according to Falk and Heckman (2009), experimental manipulations are

relatively weak, and researchers must design scenario-based treatments extremely well to enable respondents to perceive the experimental conditions as intended. In other words, experimental research may develop scenarios that are not completely realistic. Thus, the data being generated can be inaccurate, but still look like it is authentic. This should be addressed in future studies by implementing a multi-method research design to triangulate findings and counterbalance intrinsic methodological limitations. For instance, longitudinal qualitative data could be collected as a supplement to provide an in-depth view of manager's decision-making process in a real supplier selection context.

Besides, it is generally argued that socio-psychological preferences and supplier selection behaviour are independent (Schaltegger et al., 2014; Govindan et al., 2018). Therefore, only limited demographic information was gathered from the respondents, and no individual biases for or against sustainability were identified in the experiments. However, some studies suggest that individual characteristics can influence preference construction and decision-making behaviour (Luce et al., 2000; Mantel et al., 2006). For example, the study of Mantel et al. (2006) suggests that decision-makers' behavioural factors and personal characteristics can significantly affect their decisions to outsource or insource the manufacture of a particular product. However, considering the random allocation of respondents to experimental conditions and the replication of the findings across different experiments and samples, it is believed that the results are robust and reliable in this study. Nonetheless, decision-makers' personal characteristics should be collected for additional analysis, and future studies can be conducted to investigate the potential impacts of different characteristics on sustainable supply chain management.

6.0 References

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