Green supply chain practice adoption and firm performance: manufacturing SMEs in Uganda

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Abstract

Purpose – The purpose of this paper is to assess the relationship between five green practices and firm performance. In addition, this paper investigates the influence of each green practice on environmental performance, economic benefits, and economic costs.

Design/methodology/approach – Data were collected based on a cross-sectional survey of owner/managers of 200 manufacturing SME firms in Uganda, Africa. SPSS was used to find descriptive means and test relationships between green practices and performance outcomes. Structural equation modelling was used to test for the influence of each practice on performance outcomes. The structural equation modelling results were obtained using the Covariance-Based Structural Equation Modelling software. Results were compared with similar studies conducted in developing countries.

Findings – Different green practices affect different performance dimensions in different ways across different industries. For example, eco-design and internal environmental management practices significantly influence environmental performance; green purchasing and internal environmental management practices significantly influence economic benefits; and internal environmental management practices affect economic costs. Overall internal environmental management is the key to positive outcomes across the three performance criteria. The authors show how the results obtained vary from similar studies conducted in developing countries and explain possible reasons for the difference.

Research limitations/implications – Africa is a rapidly industrialising nation faced with difficult choices between economic growth and increased pollution. Because SMEs represent the majority of manufacturing firms, they are the main polluters. Hence, better understanding of the costs and benefits, both environmental and economic, is important to encourage green practice adoption for the betterment of community health and prosperity.

Originality/value – Despite numerous studies on the relationships between green practice adoption and performance outcomes, only a few studies include both economic costs and benefits in addition to environmental performance. The study covers five green supply chain practices, whereas most similar studies are limited in the number of practices examined. The African context is unique and important because industrial development and environmental protection goals are in conflict. Similar studies are predominant in an Asian context which is more developed than Africa. The findings and comparisons raise important questions for further research in relation to the roles of national regulations, geographical markets and industry types in furthering green practices in manufacturing.

Keywords Supply chain, SMEs, Sustainability

Paper type Research paper

1. Introduction

Greening the supply chain is an increasing concern for business firms because inbound and outbound logistics services are major environmental polluters. Ensuring a firm's activities do not harm the environment involves consideration of the entire supply chain. Green supply chain practices (GSCPs) commonly include: investment recovery, ecological design, green purchasing, customer cooperation and internal environmental management (Zsidisin and Hendrick, 1998; Zhu and Sarkis, 2004; Chien and Shih, 2007; Zhu *et al.*, 2008). The number of studies using GSCP adoption as an independent variable and performance as a dependent variable is fewer than those that use external motivations as the independent variable and adoption as the dependent variable. This is important because, although the motivations for adopting GSCPs include competitive advantage and improved economic and environmental

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performance (Zhu and Sarkis, 2004; Zhu *et al.*, 2004, 2007, 2008a, b; Rao and Holt, 2005), there are few studies examining the relationships between GSCPs and performance that include more than a single green practice and combine both environmental and economic performance outcomes, including economic costs and benefits. Furthermore, among these studies, the variables differ, the findings are inconsistent and, despite the relevance of green practices in supply chains to developing countries, the least developed countries are not represented.

There is a lack of consistency in the variables used to measure both practices and performance (see Table AI). Most studies on the relationship between specific GSCPs (internal environmental management, green purchasing, eco-design, investment recovery and customer cooperation) and performance outcomes focus on either one, two or three GSCPs rather than all five practices. Performance variables in studies of GSCP adoption and performance include the following variables, either singularly or in combination: environmental performance; financial performance (economic benefits); economic costs; operational performance; competitive performance; social performance; market performance; and intangible performance (see Zhu and Sarkis, 2004; Rao and Holt, 2005; Zhu *et al.*, 2007; Eltayeb *et al.*, 2011; Kim *et al.*, 2011; Yang *et al.*, 2011). Only two studies assessed the influence of the individual practices on both economic benefits and costs (Zhu and Sarkis, 2004; Zhu *et al.*, 2007). Although most research works linking GSCPs to economic performance focus on financial performance, the term "financial performance" refers to economic benefits without consideration of economic costs.

Among the findings on the relationships between GSCPs and performance, there is little agreement or explanation of the conflicting results. For instance, some studies find positive relationships between practice and performance (Zhu and Sarkis, 2004; Rao and Holt, 2005; Green *et al.*, 2012), some negative relationships (Eltayeb and Zailani, 2009) and yet others find no relationship (Laosirihongthong *et al.*, 2013). A possible reason for these inconsistencies, apart from method considerations, is the difference in contexts in which the research is conducted such as national regulations and industry type and market.

Adoption of GSCP is especially relevant in developing nations where pollution is more severe and leads to ill health, death and disabilities of millions of people annually (Oluwasola, 2014). Poverty, lack of investment in modern technology, weak environmental legislation and industrialisation combine to cause high pollution levels in developing countries (Briggs, 2003; Oluwasola, 2014). Industrialisation in developing countries is a high priority given the need for structural transformation from small-scale agriculture to manufacturing as a means to attain inclusive and pro-poor growth (Oluwasola, 2014). However, industrialisation, at least initially, requires massive use of energy resources which in itself lead to pollution and environmental degradation (Bruce and Ellis, 1993). For example, arguably China would not have achieved its impressive economic growth and development had it been concerned about pollution in its initial stages of development (Oluwasola, 2014). The growth in research on GSCPs is predominant in developing nations such as China and other Asian countries; however, most of these nations are well on the way to development (Malviya and Kant, 2015). The least developed nations such as those on the African continent have not been subject to research.

In order to address the issues outlined above, three objectives were set. The first focuses on the influence of five GSCPs (green purchasing, eco-design, investment recovery, internal environmental management and customer cooperation) on environmental performance; the second looks at the influence of the GSCPs on economic benefits, while the third embarks on the influence of GSCPs on economic costs. In addition to the overall relationship between practices and the three performance measures, we assess the relationship between each green practice and the three performance measures in total and by industry type. Our data are based on a cross-sectional survey of owner/managers of 200 Ugandan SMEs. The majority of the firms in Uganda are SMEs. The paper is structured as follows: Sections 2 and 3, respectively, discuss the theoretical perspective and development of three broad hypotheses, each with five sub-hypotheses reflecting each of the GSCPs based on previous studies; Section 4 outlines the method, and Section 5 discusses the findings and compares them to previous research in developing nations. Section 6 summarises the results and their implications for further research, and Section 7 outlines the study's contribution to literature, policy and practice, most especially its contribution to important insights into the costs and benefits of GSCP adoption in a developing African nation.

2. Theoretical perspective

We adopt a resource dependence theory (RDT) perspective in this research. Pfeffer and Salancik's (1978) work on "external control of organizations: a resource dependence perspective" serves as a foundation. RDT characterises firms as open systems that are dependent on circumstances in the external environment (Pfeffer and Salancik, 1978) and thus can be used to explain firm behaviour (Hillman *et al.*, 2009, pp. 1-12). The theory suggests that firms in a supply chain achieve higher performance if they are dependent on each other and work together (Sarkis *et al.*, 2011). For example, the implementation of GSCPs such as eco-design practices, internal environmental management practices and investment recovery practices require dependency on customers and suppliers for resources that are not available within a single firm (Sarkis *et al.*, 2011). According to RDT, not all firms have the critical resources necessary to undertake operations; hence, the need to acquire these resources motivates SMEs in particular to form strategic alliances (Dickson and Weaver, 2011). In the case of supply chains, pressures from customers and suppliers provide both impetus and resources for GSCP adoption.

3. Hypothesis development

Literature on the relationships and influence of GSCPs on performance outcomes covers five generally used GSCPs (green purchasing; eco-design; customer cooperation; investment recovery; and internal environmental management) and three performance outcomes (environmental performance, economic benefits and economic costs). We build on previous studies to develop three general hypotheses each with five specific hypotheses related to each of the five practices.

3.1 Environmental performance and adoption of GSCPs

Environmental performance includes reducing emissions, waste water, solid wastes, use of toxic substances and environmental accidents. Green practices such as eco-design, investment recovery and green purchasing activities have common environmental management strategies such as reuse, remanufacturing, recycling, repairs and refurbishing which contribute to a reduction in environmental impact (Min and Galle, 2001; Srivastava, 2008; Özceylan *et al.*, 2014). Despite common environmental strategies, some practices have unique strategies. Overall, when all GSCPs are combined, their adoption enhances environmental performance (Zhu and Sarkis, 2004; Chien and Shih, 2007; Darnall *et al.*, 2008; Zhu *et al.*, 2008). However, when each practice is treated individually, the effects differ between studies and among practices.

Previous research is characterised by conflicting findings on the influence of each GSCP on environmental performance, differences that might be based on the context or nature of the specific practice. In China, Zhu *et al.* (2007) indicated that only internal environmental management practices positively and significantly influence environmental performance, green purchasing has a negative effect on the environmental performance and the remaining practices have no influence. On the contrary, in Thailand, Laosirihongthong *et al.* (2013) found that green purchasing positively influences environmental performance, and it is the only practice of significance. In the USA, Green *et al.* (2012) found that green purchasing has no significant influence; however, eco-design, investment recovery and customer cooperation significantly and positively influence environmental performance.

It is possible that the different nature of each GSCPs results in variable influences on environmental performance including their importance at different process stages. For example, green purchasing differs from other practices during two stages: product specification and supplier selection where environmental issues are considered (Blengini *et al.*, 2011). On the other hand, eco-design occurs in every stage across the product life cycle (Blengini *et al.*, 2011). Customer cooperation may contribute to positive environmental performance through providing environmental information necessary for the eco-product innovation process and also contribute to the reduction of the environmental impact caused by the inbound and outbound logistics activities in the supply chain (Vachon and Klassen, 2008). Internal environmental management contributes to environmental performance through investing in environmental management programmes like ISO 14001 environmental certification systems, information technology and total quality environmental management (Zhu *et al.*, 2008, 2013). Accordingly, we hypothesise as follows:

H1a. Green purchasing practices are positively related to and positively influence environmental performance.

H1b. Eco-design practices are positively related to and positively influence environmental performance.

H1c. Customer cooperation practices are positively related to and positively influence environmental performance.

H1d. Investment recovery practices are positively related to and positively influence environmental performance.

H1e. Internal environmental management practices are positively related to and positively influence environmental performance.

3.2 Economic benefits and adoption of GSCPs

Owner/managers engage in GSCPs to increase economic benefits beyond the economic costs incurred. We use the term "economic" rather than "financial" performance because economic performance includes the concept of opportunity cost and because it has been used in studies relevant to our own (Zhu and Sarkis, 2007; Zhu *et al.*, 2007, 2008a, b). Economic benefits refer to the positive outcomes obtained after the adoption of GSCPs. They include cost reductions in the following: materials purchasing; energy consumption; and waste treatment and waste discharge. Although most agree that emission reduction within a supply chain provides economic benefits to its members, there is no consensus on which practices result in economic benefits. For example, investment recovery improves economic benefits in some countries, while eco-design practices reduce economic benefits because the costs outweigh the benefits (Zhu and Sarkis, 2007; Green *et al.*, 2012), and green purchasing impacts economic benefits positively and investment recovery has no effect at all (Green *et al.*, 2012). Although each GSCP contributes in different ways, it is unclear which practices generate overall benefits compared to costs. For example, within developed countries, green purchasing and internal environmental management are found either to create economic benefits (Shi *et al.*, 2012) or have no impact at all (Azevedo *et al.*, 2011). Studies in the developing countries such as China (Zhu *et al.*, 2007), India (Vijayvargy and Agarwal, 2014) and Thailand (Laosirihongthong *et al.*, 2013) find that no individual practice significantly influences economic benefits; however, the samples for these studies are predominantly medium and large firms. Additionally, a comparison of large firms in a developing nation, China, and a developed nation, Japan, indicates that Japanese firms attract higher economic benefits because of their lengthier experience in complying with government-initiated environmental management policies (Zhu *et al.*, 2010).

Although the adoption of GSCPs is meant to result in economic benefits through cost reductions, the effects are unclear. Engagement in investment recovery activities creates a reduction in disposal costs through reusing and repairing items and an increase in revenues through the sale of remanufactured and recycled goods (Eltayeb *et al.*, 2011). Conversely, investment recovery activities may require unique capabilities that differ among firms to signify an additional investment cost. While investment recovery activities deal with the end of supply chain waste, green purchasing activities deal with the prevention of waste at the beginning of the supply chain. Owner/managers must ensure that the raw materials acquired from suppliers can be recyclable, reusable and remanufacture enabled (Rao and Holt, 2005). This results in a cost reduction for materials purchased and lower fees for waste treatment and discharge. Waste from raw materials can be converted into a marketable state or be used during the manufacture of new products; however, this depends on customer demand. Both green purchasing and investment recovery practices are associated with eco-design practices (see Zhu *et al.*, 2008). During the eco-design stage of production, owner/managers must ensure that product designs comply with the various environmental standards for recycling, reuse, remanufacturing and repairing (Eltayeb and Zailani, 2009). Not only are environmental designs incorporated into products but consideration is also given to the amount of energy, water and other resources that may be consumed during product production as well as emissions from the production process which may increase benefits and/or costs (Marchi *et al.*, 2012). Despite the uncertainty over costs and benefits, we hypothesise the following:

H2a. Green purchasing practices are positively related to and positively influence economic benefits.

H2b. Eco-design practices are positively related to and positively influence economic benefits.

H2c. Customer cooperation practices are positively related to and positively influence economic benefits.

H2d. Investment recovery practices are positively related to and positively influence economic benefits.

H2e. Internal environmental management practices are positively related to and positively influence economic benefits.

3.3 Economic costs and adoption of GSCPs

The relationship with and influence of individual GSCPs on economic costs are generally overlooked in the green supply chain management empirical research; thus, there is little to draw upon apart from definitions and observations by Zhu *et al.* (2007). Economic costs include increased costs associated with investment, operations, training, and purchase of environmentally friendly materials. Although GSCPs enhance economic benefits, economic costs are incurred through investing in the practices (Zhu *et al.*, 2007). For example, green purchasing practices increase economic costs through green supplier development, employee training in green purchasing and environmental audit competences (Min and Galle, 2001); investment recovery practice costs include transportation of waste, return handling and production and packaging for remanufactured or recycled products (Ramírez and Morales, 2014; Ravi and Shankar, 2015). Internal environmental management practice costs include the following: environmentally friendly raw material; wages for environmentally competent employees; environmentally friendly equipment acquisition;

and purchase of pollution or emission control technology (Orji and Wei, 2016). Eco-design costs include knowledge gathering (Blengini *et al.*, 2011) and administration such as communication (Hong and Schniederjans, 2000). We hypothesise that:

H3a. Green purchasing practices are positively related to and positively influence economic costs.

H3b. Eco-design practices are positively related to and positively influence economic costs.

H3c. Customer cooperation practices are positively related to and positively influence economic costs.

H3d. Investment recovery practices are positively related to and positively influence economic costs.

H3e. Internal environmental management practices are positively related to and positively influence economic costs.

3.4 Conceptual model

Based on the above hypotheses, the resultant conceptual model has five independent variables, i.e. the five GSCPs (green purchasing, eco-design practices, customer cooperation practices, investment recovery practices, and internal environmental management practices) and three dependent variables (environmental performance, economic benefits and economic costs). The model is depicted in Figure 1 where the arrows moving from the five GSCPs to performance outcomes indicate the different hypotheses.

4. Method

This section outlines the sample, data collection, instrument and data analysis.

4.1 Sample

Our unit of analysis was the firm, but the unit of enquiry was a single owner/manager from each of 200 SME manufacturing firms in Uganda. Small firms are those having employees between 5 and 49, while medium-sized firms are those that employ between 50 and 100 employees. Owner/managers make most decisions related to green practices adoption in SMEs (Yahya *et al.*, 2014). The owner/managers' firms were selected using the simple random sampling method where owner/managers in the sample were randomly selected from the Ugandan Government SME Business Register without replacement. A random sample was generated using the RAND () function in the Excel work sheet (Quirk *et al.*, 2013). In line with Ugandan culture, each owner/manager was contacted by telephone and, upon agreement, personally delivered a hardcopy of the survey. The response rate was 67 per cent with a respondent profile as follows: 70 per cent of firms had operated for over ten years including 41 per cent having operated for between 11 and 20 years; 66 per cent employed over 50 employees; and 60 per cent were in the non-food manufacturing category. In Uganda, manufacturing firms are categorised as either food or non-food (Uganda Bureau of Statistics report, 2011).

4.2 Data collection and instrument

Data were collected via a hardcopy survey questionnaire with 35 items. The five independent variables, the GSCPs, had 20 items (three to four per variable), the three dependent performance variables had 12 items (four per variable) and there were three control variables (firm age, size and industrial type – only industrial type is included in this paper). Responses were plotted on a seven-point Likert scale in line with similar studies

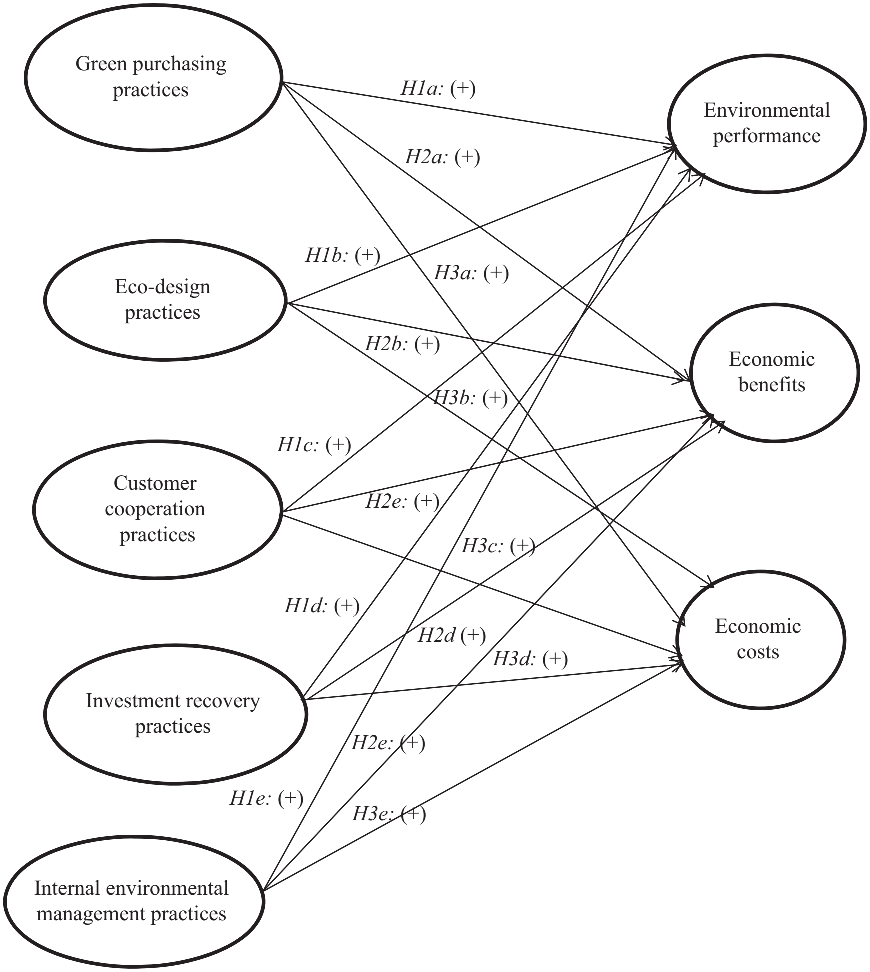

Figure 1.
Conceptual model

(see Tables AII and AIII for the measurement items for the practices and performance outcomes, respectively). Although similar studies have used a five-point Likert scale, a seven-point Likert scale is more commonly used because it is slightly better than a five-point Likert scale. A seven-point Likert scale provides more detailed information necessary for decision making, promotes accuracy in terms of reliability and validity and is easy to use (Chang, 1994; Darbyshire and McDonald, 2004; Finstad, 2010). Measurement items used for the independent practice variables were adapted from Zhu *et al.* (2007, 2008a,b) (see Table AII). Items for economic benefits included cheaper costs and fees in relation to the following: materials purchasing; energy consumption; waste treatment; and waste discharge. Items for economic costs included increased costs related to the following: investment; operations; training; and purchase of environmentally friendly materials (see Table AIII). The items for firm economic benefits and costs were adapted from Zhu and Sarkis (2007), Zhu *et al.* (2005) and Hervani *et al.* (2005). The three control variables were selected based on previous studies, indicating that the engagement of SMEs with environmental issues is sensitive to firm size, age and industry type. (Williams and Schaefer, 2013).

4.3 Data analysis

Data were entered in SPSS software and checked through tests for normality, multicollinearity, common method variance, convergent validity and discriminant validity. Confirmatory factor analysis was carried out to obtain the standardised loadings for each construct's measurement items and fit indices. Hypothesis testing was conducted using SPSS and AMOS software version 21.

The data were normally distributed with skewness values less than 2 and kurtosis values less than 7 for all variables. Previous research on normality suggests that the absolute value of univariate skewness should be <2, while the absolute value for univariate kurtosis should be <7 (Curran *et al.*, 1996; Xiong and King, 2015). Skewness values for all variables were less than 2 with a range from −0.027 to −0.706, while kurtosis values for all variables were less than 7 with a range from −0.119 to 0.896 (see Table AIV). Skewness or kurtosis values lying between +1.0 and −1 indicate the existence of a normal distribution (George and Mallery, 2006). Harman's single factor in SPSS was used to test for common method variance and all factors were well below 50 per cent as recommended for validating the data (Hazen *et al.*, 2011) (see Table AV). Similarly, there were no multicollinearity issues because the variance inflation factors (VIFs) were less than 10.0 and the tolerance factors were above 0.10. The tolerance values ranged from 0.446 to 0.885, while the VIF factors range from 1.13 to 2.241 (see Table I). The variables exhibited convergent validity with all average variance extracted (AVE) values above the minimum of 0.40 with values ranging from 0.53 to 0.73 (see Table I). Discriminant validity was confirmed because all item crossing loadings of the respective constructs with other constructs were higher on their respective constructs compared to other constructs (see Table AVI). Reliability values were above 0.70 as recommended (Nunnally and Bernstein, 1978).

Confirmatory factor analysis demonstrated a good fit for the constructs and their measurement items for all variables while factor loadings for measurement items were above 0.30 (see Table II). The goodness-of-fit indexes, comparative fit indexes, normed fit indexes and adjusted goodness-of-fit indexes were greater than 0.9; root-mean-square residuals were less than 0.05; root-mean-square error of approximations met the maximum value of 0.08; and CMIN/dfs were less than the maximum value of 5. Hence, the reliability and validity of the instrument were confirmed. Critical ratios were used to examine the relevance of the items to respective constructs. All items had critical ratios above 1.96 which is the minimum threshold which therefore means that all the critical ratios were relevant to their respective constructs.

5. Findings and discussion

This section provides the findings based on descriptive mean statistics, correlations and regression tests. Means scores were used to gauge the extent of implementation of each

Table I.
Reliability and convergent validity results

Constructs	Reliability values	Average variance extracted (AVE)	Collinearity statistics Tolerance	VIF
Internal environmental management	0.85	0.53	0.446	2.241
Green purchasing	0.85	0.55	0.489	2.043
Customer cooperation	0.85	0.7	0.664	1.506
Eco-design	0.86	0.61	0.599	1.669
Investment recovery	0.86	0.73	0.743	1.346
Environmental performance	0.86	0.61	0.721	1.386
Economic benefits	0.86	0.89	0.885	1.13
Economic costs	0.86	0.89	0.681	1.468

Construct	Items	Standardised loadings	Critical ratios	Fit indices
Investment recovery	My firm engages in recovery (sale) of excess inventories/materials	0.78	9.683	GFI = 1.000 CFI = 1.000 NFI = 1.000 RMR = 0.000
	My firm engages in the sale of scrap and used materials	0.80	9.771	
	My firm engages in the sale of excess capital equipment	0.74	14.706	
Customer cooperation	My firm cooperates with its customers on product eco-designs	0.64	8.446	GFI = 1.000 CFI = 1.000 NFI = 1.000 RMR = 0.000
	My firm cooperates with its customers on cleaner production (environmentally friendly production)	0.84	10.610	
	My firm cooperates with its customers on green packaging	0.75	8.333	
Eco-design	My firm develops products designs that consume less material/energy	0.85	5.558	GFI = 1.000 CFI = 1.000 NFI = 1.000 RMR = 0.000
	My firm designs products for reuse, recycle, recovery of material and component parts	0.70	5.336	
	My firm designs products to avoid or reduce the use of hazardous products and/or manufacturing processes	0.42	7.575	
Internal environmental management	My firm is committed to engagement in GSCPs	0.70	8.704	GFI = 0.978 CFI = 0.982 NFI = 0.964 RMSEA = 0.070AGFI = 0.933 CMIN (χ^2), p-value = 0.055 CMIN/df = 1.974
	My firm engages in cross-functional cooperation for environmental improvements	0.71	8.834	
	My firm aims at achieving total quality environmental management	0.59	7.410	
	My firm employs environmental compliance and auditing programmes to achieve better environmental performance	0.62	7.797	
	My firm obtained an ISO 14001 certification in order to produce environmentally friendly goods	0.66	8.249	
	My firm has made investments in environmental management systems	0.69	10.989	
Green purchasing	My firm provides design specifications to suppliers that include environmental requirements for the purchased item	0.61	8.112	
	My firm cooperates with suppliers on environmental objectives	0.67	8.962	
	My firm carries out environmental management audits for its suppliers' internal management	0.67	9.002	
	My suppliers are ISO-14000 certified	0.62	8.218	

(continued)

Table II. Standardised item loadings continued

Construct	Items	Standardised loadings	Critical ratios	Fit indices
	My firm evaluates second-tier suppliers for environmentally friendly practices	0.76	9.444	
Environmental performance	Reduction of pollutant emissions	0.71	13.889	GFI = 0.989 CFI = 0.990 NFI = 0.983
	Reduction of waste water	0.83	9.595	RMSEA = 0.077
	Reduction of solid wastes	0.77	9.155	AGFI = 0.944
	Decrease of consumption for hazardous/harmful/toxic materials	0.50	6.016	CMIN (χ^2), p-value = 0.112 CMIN/df = 2.193
Economic benefits	Decrease of cost for materials purchasing	0.73	11.805	GFI = 0.994 AGFI = 0.938 NFI = 0.994 CFI = 0.996
	Decrease of cost for energy consumption	0.70	11.328	TLI = 0.979 RMSEA = 0.086
	Decrease of fee for waste treatment	0.87	15.060	CMIN/df = 2.483
	Decrease of fee for waste discharge	0.88	9.900	RMR = 0.021
Economic costs	Increase in investment	0.52	7.788	GFI = 0.999
	Increase in operational cost	0.86	16.762	NFI = 0.999
	Increase in training cost	0.95	19.344	CFI = 1.000
	Increase in cost due to purchasing of environmentally friendly materials	0.88	8.403	AGFI = 0.987 TLI = 0.950 CMIN/df = 0.521 RMR = 0.017 RMSEA = 0.000

Table II.

practice and extent of performance outcomes, including by industry type. The findings are discussed in relation to: extent of implementation of each practice based on mean scores; extent of performance outcomes; industry differences; and specific practices and outcomes for each of the three general hypotheses.

5.1 Extent of GSCP implementation and firm outcomes: descriptive statistics

The level of implementation of practices and achievement of outcomes as judged by the mean scores is discussed for each of the five GSCPs and the three performance outcomes. The means cover a possible range from 1 to 7, where 1 is the lowest and 7 the highest.

5.1.1 Mean levels of GSCP implementation. The majority of statistical means for practice implementation are between 4.00 and 5.00, indicating a reasonable level of implementation of green practices (see Table III). The highest means were recorded for specific practices related to the following: total quality environmental management; produce designs to reduce the use of hazardous materials; and engagement in the sale of excess capital equipment.

5.1.2 Mean levels of performance outcomes. Although the environmental outcomes are reasonable with means around 5.00 and above, the means for economic benefits and economic costs are lower with means between 3.00 and 4.00 (see Table IV). The low level of economic benefits might imply a low customer demand for environmentally friendly products in Uganda and the lower economic costs may be the result of the considerable support obtained from the United Nations sponsored Cleaner Production Centres. Reductions in emissions, waste water and solid wastes may be the result of pressure from the Uganda National Environmental Regulations Authority, a government body that pressures firms to develop an environmental management policy and to install waste

	Mean	SD
Internal environmental management		
My firm is committed to engagement in green supply chain practices	4.9550	1.28500
My firm engages in cross-functional cooperation for environmental improvements	4.8600	1.27220
My firm aims at achieving total quality environmental management	5.0700	1.27405
My firm employs environmental compliance and auditing programmes to achieve better environmental performance	4.7900	1.38037
My firm obtained an ISO 14001 certification in order to produce environmentally friendly goods	4.6750	1.41754
My firm has made investments in environmental management systems	4.9800	1.21531
Green purchasing		
My firm provides design specifications to suppliers that include environmental requirements for the purchased item	4.7300	1.26694
My firm cooperates with suppliers on environmental objectives	4.7850	1.30279
My firm carries out environmental management audits for its suppliers' internal management	4.7200	1.33435
My suppliers are ISO-14000 certified	4.4900	1.45964
My firm evaluates second-tier suppliers for environmentally friendly practices	4.8600	1.36002
Customer cooperation		
My firm cooperates with its customers on product eco-designs	4.4250	1.54151
My firm cooperates with its customers on cleaner production (environmentally friendly production)	4.5000	1.51043
My firm cooperates with its customers on green packaging	4.4650	1.44193
Eco-design		
My firm develops products designs that consume less material/energy	4.6850	1.34716
My firm designs products for reuse, recycle, recovery of material and component parts	4.6700	1.40748
My firm designs products to avoid or reduce the use of hazardous products and/or manufacturing processes	5.2200	1.24068
Investment recovery		
My firm engages in recovery (sale) of excess inventories/materials	4.970	1.0793
My firm engages in the sale of scrap and used materials	4.9400	1.28243
My firm engages in the sale of excess capital equipment	5.0800	1.07208

Table III. Means for GSCP implementation

	Mean	SD
Environmental performance		
Reduction of pollutant emissions	5.0550	1.07131
Reduction of waste water	5.1350	1.15039
Reduction of solid wastes	5.1450	1.06284
Decrease of consumption for hazardous/harmful/toxic materials	4.9250	1.12056
Economic benefits		
Decrease of cost for materials purchasing	3.5000	1.46311
Decrease of cost for energy consumption	3.4500	1.49958
Decrease of fee for waste treatment	3.3700	1.38299
Decrease of fee for waste discharge	3.3400	1.42286
Economic costs		
Increase in investment	3.4800	1.47665
Increase in operational cost	3.8700	1.55731
Increase in training cost	3.9000	1.63811
Increase in cost due to purchasing of environmentally friendly materials	3.8500	1.95103

Table IV. Performance means and standard deviations (1 – lowest to 7 – highest) treatment plants and environmentally friendly technologies through the threat of closure of non-complying firms. Further, other bodies like the Uganda National Bureau of Standards make regular inspections to ensure that products comply with national and international quality product and environmental standards. Both the Uganda Cleaner Production Centre and the Ugandan National Bureau of Standards provide environmental training. Additionally, the Uganda Cleaner Production Centre provides a wider range of services and resources such as advice, technical assistance, aid in waste generation reduction, conservation of materials, recovering, recycling and reusing of by-products and substitution of poisonous and hazardous materials.

5.2 Levels of GSCP implementation and performance outcomes by industry: descriptive statistics

The 200 firms in the sample covered 15 specific industries, including one we describe as "other" because of single representation. Because the sample sizes of each industry are small, we could only make a comment on the descriptive data; hence, our observations based on this data are very preliminary but insightful. Details of descriptive statistics showing the means and standard deviations for implementation of practices and performance outcomes across the 15 industries are provided in Table AVI. Six industries have the highest means (above 5.00) for green purchasing practices, in descending order: grain manufacturing; animal feeds; coffee and tea processing; leather and related products; rubber and plastic products and refined petroleum products. These industries are most likely to have international customers. No industry had a mean less than 4.0 for implementation of green purchasing practices. In terms of customer cooperation practices, the coffee and tea processing industry had the highest mean (above 6.0) followed by leather and related products and refined petroleum product manufacturing with means above 5.0. No industry had a mean below 4.0 for customer cooperation. For eco-design practices, again the coffee and tea processing industry had the highest mean (mean above 6.0) and no industry mean was below 4.0. For investment recovery practices, four industries had means between 5.00 and 6.00, the highest being petroleum products (5.833) and coffee and tea processing (5.778) and no industry mean was below 4.0. Finally, for internal environmental management practices, seven industries had a mean above 5.0 with five of the seven related to food manufacturing. Food industries in Africa are more likely to be part of global food chains.

The means for environmental performance outcomes were higher than those for economic benefits and costs. Environmental performance had a range of means between 4.75 and 5.75 with 5 of the 15 industries achieving means of above 5.0 led by the coffee and tea processing industry. Economic benefits had much lower mean scores ranging from 2.24 (leather and related products) to 3.36 (meat and fish processing). Similarly, but even lower, the means for economic costs ranged from 1.83 (meat and fish processing) to 2.86 (grain milling products). Clearly, owner/managers perceive environmental outcomes to be more substantial than the economic benefits arising from investment in green practices, although they perceive the economic costs to be low.

5.3 Influence of GSCPs on performance outcomes: correlation results

Correlation tests were carried out to assess the influence of each GSCP on each of the three performance outcomes (see Table V). All five GSCPs are positively correlated with environmental performance. Likewise, all but one practice, customer cooperation, is significantly related to economic benefits. Three practices had a positive correlation with economic costs, in ascending order, internal environmental management, green purchasing and investment recovery. A comparison of our findings is made with previous research in developing countries.

Correlational results for customer cooperation, green purchasing practices and environmental performance relationships are supported by the RDT theory. Given SMEs are resource constrained, they need to establish alliances with customers and suppliers in order to implement environmentally friendly practices. With the establishment of the alliances, owner/managers obtain access to free information resources on markets, technology, resource availability, expertise and finance.

Our finding of positive correlations between all five GSCPs and environmental performance is confirmed in several studies (Vachon and Klassen, 2008; Blengini *et al.*, 2011; Zhu *et al.*, 2013). Green purchasing contributes to environmental performance through involving environmental issues in product specification and supplier selection (Blengini *et al.*, 2011; Min and Galle, 1997). Eco-design practices contribute to environmental performance through employing a product life cycle analysis process concerned with the environmental soundness of the product from the first design stage to the disposal stage (Blengini *et al.*, 2011). Although customer cooperation has a direct impact on environmental performance, its influence on economic benefits is indirectly achieved through environmental performance (Green *et al.*, 2012). The positive correlation between customer cooperation and environmental performance is somewhat unexpected as Uganda is characterised as having a lack of cooperation between firms and their customers because of a less trusting environment. Ugandan firms fear that customer involvement in business decisions might lead to information leaking to competitors (Yigitbasioglu, 2004). The contribution of internal environmental management practices arises through its support for environmental management initiatives and investment in environmental management programmes like ISO 14001 environmental certification systems, information technology and total quality environmental management (Zhu *et al.*, 2008a, 2013).

In the case of economic benefits, internal environmental management, green purchasing and investment recovery practices correlate significantly and positively with economic benefits. Internal environmental management contributes to economic performance through encouraging the acquisition of competence and expertise in environmental management that results in engagement in investment and income-generating environmental programmes and related activities such as investment recovery activities, production of environmentally friendly products and cost reduction activities such as production processes that consume less energy, fuel and water (De Giovanni and Esposito Vinzi, 2012). Through green purchasing, owner/managers ensure that the raw materials acquired from suppliers can be recycled, reused and remanufactured, resulting in a reduction in materials purchased and reduced fees for waste treatment and discharge (Rao and Holt, 2005). Waste from such raw materials can be converted into a marketable state in several different ways or be used during the manufacture of new products. Engagement in investment recovery activities creates a reduction in disposal costs through reusing and repairing items and an increase in revenues through the sale of remanufactured and recycled products (Eltayeb *et al.*, 2011).

Table V. GSCPs and performance outcomes: correlation results

Green supply chain practices	Performance outcomes (standardised βs) Environmental performance	Economic benefit	Economic costs
Green purchasing	0.46***	0.325***	0.255***
Customer cooperation	0.35***	0.126	0.064
Eco-design	0.42***	0.18	0.106
Investment recovery	0.83***	0.216***	0.163**
Internal environmental management	0.14***	0.358***	0.297***

Notes: $^{**}p < 0.01$; $^{***}p < 0.001$

The significant correlations between economic cost and the practices of internal environmental management, green purchasing and investment recovery are reasonably obvious. Internal environmental management practices require financial investment in various environmental management systems, training and technologies (Zhu *et al.*, 2005; Vachon and Klassen, 2006). Green purchasing requires investment costs in green supplier development, employee training in green purchasing and environmental audit competences (Min and Galle, 2001). Investment recovery increases operational costs for waste transportation, return handling and remanufactured or recycled products for resale and packaging of the remanufacture or recycled products (Ramírez and Morales, 2014; Ravi and Shankar, 2015). Extra investment recovery costs occur through investments in information technologies required to support investment recovery activities at different stages such as provision of product arrival information for the products to be returned, customer demand product information and information on product quality of waste product arrivals and recycled or remanufactured products (Ravi and Shankar, 2015).

Comparing our correlation results with those of Zhu and Sarkis (2004) in a Chinese context, there are several important differences. For example, Zhu and Sarkis (2004) found a positive correlation between customer cooperation and economic benefits, while we find no correlation between the two. Zhu and Sarkis (2004) explained the findings in terms of Chinese firms experiencing international customer pressure arising from strong collaborations with international customers. In Uganda, customers tend to be local or regional rather than international such that customer cooperation and demand for environmentally friendly practices is low. Furthermore, there is a general lack of cooperation and trust between owner/managers and their customers in Uganda and a fear that involving customers in business decisions may result in leaking business information to competitors (Yigitbasioglu, 2004).

A second conflict is between our finding of a positive correlation between investment recovery practices and economic costs and the finding of Zhu and Sarkis (2004) and Zhu *et al.* (2007) in which there is no relationship. The difference may be explained in terms of the greater strength of Chinese environmental regulations requiring firms to implement investment recovery practices and, as a result, Chinese managers perceive investment recovery practices a costly but necessary evil (Zhu and Sarkis, 2007). Compared to manufacturing firms in African countries, Chinese firms experience high competition, low customer demand for remanufactured products but are, however, forced into costly continuous improvement in remanufacturing technologies (see Zhu and Tian, 2016). On the contrary, and in the absence of strong regulations in Uganda, investment recovery practices are viewed as income generating rather than a necessary evil. Furthermore, the much wider global spread of customers of Chinese firms implies a complex supply chain that is harder to manage and requires more financial and labour resources for implementing investment recovery activities. Manufacturing firms in Uganda have a more restricted domestic and regional customer base where reverse logistics activities are more easily facilitated.

A third conflict is in our finding of no correlation between eco-design practices and economic costs, while Zhu and Sarkis (2004) found a positive correlation. This is possibly explained by Chinese manufacturing firms investing in advanced environmentally friendly manufacturing technologies. The increase in the labour costs in China has led to an influx of labour-intensive Chinese manufacturing firms relocating to Africa where labour costs and environmental regulations are much lower. In Uganda, the adoption of advanced environmentally friendly technologies is still in its early stages.

5.4 GSCPs and performance outcomes: structural equation modelling results

Structural equation modelling results explaining the influence of each of the practices on environmental performance, economic benefits and economic costs are presented below.

Comparisons of the results with previous findings are made and a discussion in support of the research findings is provided. See Table VI for a summary of the hypotheses testing outcomes.

In relation to environmental performance, investment recovery practices had the greatest impact on environmental performance, followed by green purchasing, eco-design, customer cooperation and internal environmental management. There were significant relationships between economic benefits and internal environmental management, and green purchasing and investment recovery practices. Economic costs were significantly affected by only one practice, i.e. internal environmental management (see Figure 2).

Although all the GSCPs positively correlated with environmental performance, structural equation modelling results indicate only eco-design ($\beta = 0.261$), and internal environmental management significantly ($\beta = 0.171$) predicted environmental performance. Environmental excellence begins with product and process designs with the environmental influence of the product being locked within the product design stage where materials and production processes are selected and product environmental performance is largely determined (Lai and Cheng, 2009). Further, making product returns profitable depends on good designs that make investment recovery practices reliant on eco-design practices so products may be disassembled, recycled or used in other investment recovery activities (Lai and Cheng, 2009). Ultimately, success in environmental performance depends on management commitment and internal management practices. Owner/manager support is an antecedent for the successful implementation of green purchasing practices, eco-design practices, customer cooperation and investment recovery practices (Green *et al.*, 2012). The success of environmental management initiatives requires owner/manager commitment (Lai and Cheng, 2009) to enable the adoption of a full green life cycle approach in an SME firm (Lai and Cheng, 2009), hence indicating the importance of internal environmental management practices.

While three practices were significantly and positively correlated with economic benefits, only two of them, internal environmental management ($\beta = 0.229$) and green purchasing ($\beta = 0.158$), significantly and positively influenced economic benefits. Internal environmental management practices increase economic benefits through focus on knowledge acquisition, competence and expertise in environmental management which, in turn, results in engagement in income-generating environmental activities such as investment recovery, production of environmentally friendly products, and cost reducing

Hypotheses	Hypothesis path	Result
H1a	Green purchasing → Environmental performance	Not supported
H1b	Customer cooperation → Environmental performance	Not supported
H1c	Eco-design → Environmental performance	Supported
H1d	Investment recovery → Environmental performance	Not supported
H1e	Internal environmental management → Environmental performance	Supported
H2a	Green purchasing → Economic benefits	Supported
H2b	Customer cooperation → Economic benefits	Not supported
H2c	Eco-design → Economic benefits	Not supported
H2d	Investment recovery → Economic benefits	Not supported
H2e	Internal environmental management → Economic benefits	Supported
H3a	Green purchasing → Economic costs	Not supported
H3b	Customer cooperation → Economic costs	Not supported
H3c	Eco-design → Economic costs	Not supported
H3d	Investment recovery → Economic costs	Not supported
H3e	Internal environmental management → Economic costs	Supported

Table VI.
GSCPs and performance outcomes: structural model results

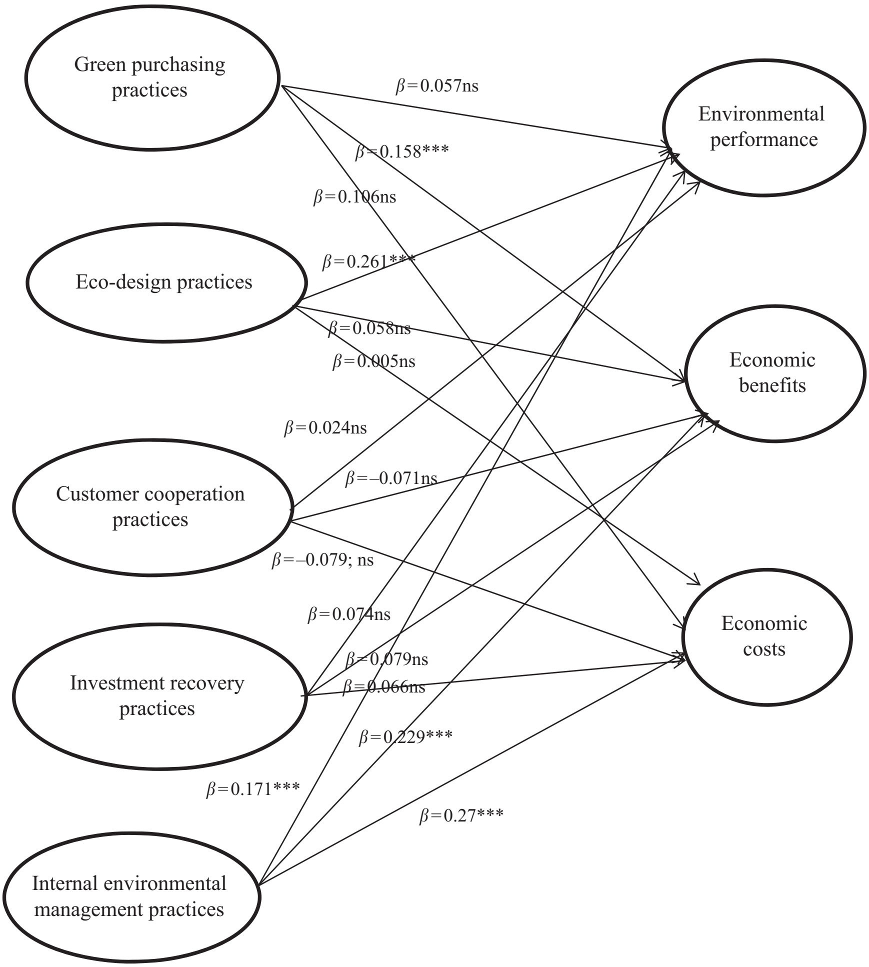

Figure 2.
Relationship between GSCP and performance outcomes: structural equation modelling results

Notes: Fit indicators: NFI=0.921; GFI=0.962; CFI=0.923; IFI=0.927; CMIN/df=15.234. ns, not significant. ***$p<0.001$

production processes that consume less energy, fuel and water (De Giovanni and Esposito Vinzi, 2012). Green purchasing increases economic benefits by reducing purchasing costs through ensuring that raw materials can be recycled, reused and remanufactured to decrease both materials costs and fees paid for waste treatment and discharge (Rao and Holt, 2005). Waste from raw materials can be converted into a marketable state in several different ways or be used during the manufacture of new products.

A possible explanation for investment recovery practices significantly correlating with economic benefits but not significantly predicting economic benefits is as follows. Investment recovery practices fail to produce economic benefits because economic benefits depend on the availability of markets for remanufactured products and the willingness of customers to return the product waste (Guide *et al.*, 2003). Additionally, owner/managers may experience difficulties in transforming returned waste into a useable form (Mishra and Napier, 2014), may not be able to determine demand for recycled products and/or the investment recovery operation costs may outweigh the profits. The costs include the following: transportation from the customer's premises, expert labour and training. The absence of a predictive relationship between investment recovery practices and economic benefit implies low or no demand for remanufactured products in Uganda.

Although three practices had positive significant correlations with economic costs, only internal environmental management was able to positively predict economic costs. This relationship is reasonable, given that investment in internal environmental management practices is key to the adoption of environmentally friendly practices and represents considerable costs to the firm. It is possible that GSCPs other than internal environmental management are not predictors of economic cost because they are subsumed into internal environment management practices, that is, the successful implementation of GSCPs ultimately depends on internal environment management (Green *et al.*, 2012).

5.5 Comparison of research findings with similar research in developing countries

Our findings in Uganda have commonalities and differences with regression tests in similar studies in manufacturing industries in the developing countries such as China (Zhu *et al.*, 2007), Thailand (Laosirihongthong *et al.*, 2013) and India (Vijayvargy and Agarwal, 2014). First, in relation to individual practices and environmental performance, we find eco-design and internal management practices to be positively and significantly related to environmental performance with none of the remaining practices having a significant relationship whether positive or negative. In the Chinese context, Zhu *et al.* (2007) reported similar results in relation to internal management; however, green purchasing practices have a significant negative relationship with environmental performance. In contrast, and in a Thai context, Laosirihongthong *et al.* (2013) found that only green purchasing practices positively influence environmental performance. In India, none of the practices influence environmental performance (Vijayvargy and Agarwal, 2014). In the case of the Chinese and Thai studies, it is likely the different findings may be the consequence of sample differences in industry size and type rather than country contexts. Our sample consisted of SME firms in a range of manufacturing industries, while Zhu *et al.*'s (2007) sample is based on large firms in the automobile industry and Laosirihongthong *et al.*'s sample is from local and multinational manufacturing companies with ISO 14001 certification.

Second, our findings on the influence of individual practices on economic benefits were inconsistent with those carried out in China, Thailand and India. In contrast to our finding that green purchasing and internal environmental management practices positively influence economic benefits, none of the other three studies finds a positive and significant relationship between any single practice and economic benefits. The insignificant findings in these studies are explained respectively as being because Chinese firms lack the capacity to monitor performance associated with GSCPs (Zhu *et al.*, 2007), Thai manufacturers fail to exploit the positive impact that green purchasing practices have on their products and image (Laosirihongthong *et al.*, 2013) and Indian owner/managers lack willingness and commitment to implement GSCPs (Vijayvargy and Agarwal, 2014). It is not entirely obvious why Ugandan owner/managers perceive green purchasing and internal environmental management practices as positively affecting economics benefits apart from the obvious link to good management practices and commitment as explained above.

Third, apart from our study, only Zhu *et al.* (2007) examined economic costs and found that internal management practices are the only practice to significantly influence economic costs. However, Zhu *et al.* also found a significant but negative relationship between green purchasing and economic cost. This finding might be explained by China having a more international customer base which demands the adoption of costly environmental management practices.

6. Conclusions and further research

The extent of GSCP adoption in Uganda is surprisingly strong given the country's early stage of industrialisation, the relatively government-imposed weak environmental regulations and controls, the lack of trust in buyer and supplier relationships, and the restricted geographical markets. The practices are making a positive difference in terms of improving environmental performance; however, the economic benefits are generally low but in the context of even lower economic costs. The industries with the highest environment performance and economic benefits not only appear to have the highest economic costs but also the most international customers. In line with resource dependency theory, our very preliminary and descriptive findings on industry differences provide early indications of the importance of geographic markets, especially international customers, in not only encouraging the adoption of GSCPs for greater economic benefits but also at a greater economic cost. The role of international markets requires further research with much larger samples to allow more substantial statistical testing.

In Uganda, the importance of internal environmental management practices to improved environmental performance and economic benefit appears to be the fundamental GSCP for SME manufacturers. Unlike China, where owner/managers resent the interference and costs imposed by strict government environmental regulations and controls (Zhu and Tian, 2016), Ugandan owner/managers appear to hold a more positive and pro-active view of government policy. The role of government regulation in the adoption of GSCPs is well researched, however, little if any attention is given to the effect of perceived compulsion on the motivation of firm owners to more fully commit to internal environmental management practices. This lends itself to further research among industries with different levels of regulation as well as cross-national studies between countries with varying levels of regulatory environmental controls. Furthermore, the importance of adopting internal environmental management practices in Uganda raises the issue from Zhu *et al.*'s (2010) research as to whether the length of time and firm experience with GSCPs increase the performance outcomes.

Comparisons of our findings with those of similar studies in China, Thailand and India, although compromised by methodological differences, especially sample characteristics, raise important issues for further investigation. If cross-national studies were undertaken with more similar samples and methods, better understanding could be achieved of the extent to which differences in the three areas of performance outcomes that we found are the result of industry differences (including size, type and geographic markets), national context differences such as stage of industrialisation, government environmental controls, or national cultural differences.

Our research findings from Uganda and their comparison with similar studies in developing nations provide rich material for further research both in Africa and across nations. Two methodological suggestions for future research arise from the major limitation of our research being its cross-sectional survey design. Behavioural variables such as GSCPs are better studied through longitudinal research which better explains causality. Finally, given the potentially important influence of individual owner/manager attitudes and circumstances in GSCP adoption and perceived performance outcomes, qualitative methods such as interviews would provide a finer grained understanding of the motivations and factors affecting their perceptions and actions as well as unearthing other variables of relevance.

7. Contributions and implications of the research

In addition to raising important questions for further research, our study provides a unique contribution to the literature on GSCPs and their performance outcomes by including a larger range of GSCPs and performance variables than previous studies, five GSCPs (green purchasing, customer cooperation, investment recovery, internal environmental management and eco-design practices) and three performance outcomes, environmental, economic benefit and economic cost. Previous research mainly limits the number of practices that are linked to environmental performance and economic benefits with few examining the impact of the practices on economic costs. Including more variables is important because the relationships between cost and benefits in particular are fundamental to firm adoption of GSCPs and government policy. For African governments and the United Nations, which play a key role in development and environmental protection in Africa, our findings suggest greater attention should be given to encourage internal environmental management practices in firms as this appears central to successful investment in other GSCPs. Similarly, for firms and policy makers alike, understanding and promoting the likely performance outcomes for each GSCP are of practical value in decisions about which practices to adopt and in which order.

Two specific findings are of especially managerial relevance. The finding that economic costs are possibly lower than they might otherwise be because of subsidies from the United Nations implies this is a successful strategy in encouraging GSCP adoption and promoting both environmental and economic performances such that these programmes might be continued and expanded. Questions raised in our research about the role of international markets in encouraging GSCP adoption and performance are not only fruitful for further research but also have policy implications for extending markets to outside Africa in order for firms to improve performance by leveraging more advanced expertise and technology from international buyers.

Finally, because our research has its context in Africa, its major contribution is to address the paucity of research on greening supply chains in this continent. Manufacturing supply chains are not only vital to the development of Africa but are also the greatest contributors to pollution. Contributions to further understanding and action in GSCPs in Africa are greatly needed.

References

Azevedo, S.G., Carvalho, H. and Cruz Machado, V. (2011), "The influence of green practices on supply chain performance: a case study approach", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 47 No. 6, pp. 850-871, available at: http://dx.doi.org/10.1016/j.tre.2011.05.017

Blengini, G.A., Busto, M., Fantoni, M. and Fino, D. (2011), "Eco-efficient waste glass recycling: integrated waste management and green product development through LCA", *Waste Management*, Vol. 32, pp. 1000-1008.

Briggs, D. (2003), "Environmental pollution and the global burden of disease", *British Medical Bulletin*, Vol. 68 No. 1, pp. 1-24.

Bruce, N. and Ellis, G.M. (1993), *Environmental Taxes and Policies for Developing Countries*, Vol. 1177, World Bank Publications.

Carter, C., Kale, R. and Grimm, C. (2000), "Environmental purchasing and firm performance: an empirical investigation", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 36 No. 3, pp. 219-228.

Chan, R.Y.K., He, H., Chan, H.K. and Wang, W.Y.C. (2012), "Environmental orientation and corporate performance: the mediation mechanism of green supply chain management and moderating effect of competitive intensity", *Industrial Marketing Management*, Vol. 41 No. 4, pp. 621-630, available at: http://dx.doi.org/10.1016/j.indmarman.2012.04.009

Chang, L. (1994), "A psychometric evaluation of 4-point and 6-point Likert-type scales in relation to reliability and validity", *Applied Psychological Measurement*, Vol. 18 No. 3, pp. 205-215.

Chien, M. and Shih, L. (2007), "An empirical study of the implementation of green supply chain management practices in the electrical and electronic industry and their relation to organizational performances", *International Journal of Environmental Science and Technology*, Vol. 4 No. 3, pp. 383-394.

Curran, P.J., West, S.G. and Finch, J.F. (1996), "The robustness of test statistics to non-normality and specification error in confirmatory factor analysis", *Psychological Methods*, Vol. 1 No. 1, pp. 16-29.

Darbyshire, P. and McDonald, H. (2004), "Choosing response scale labels and length: guidance for researchers and clients", *Australasian Journal of Market Research*, Vol. 12 No. 2, pp. 17-26.

Darnall, N., Jolley, G.J. and Handfield, R. (2008), "Environmental management systems and green supply chain management: complements for sustainability?", *Business Strategy and the Environment*, Vol. 17 No. 1, pp. 30-45.

De Giovanni, P. and Esposito Vinzi, V. (2012), "Covariance versus component-based estimations of performance in green supply chain management", *International Journal of Production Economics*, Vol. 135 No. 2, pp. 907-916, available at: http://dx.doi.org/10.1016/j.ijpe.2011.11.001

de Sousa Jabbour, A.B.L., Jabbour, C.J.C., Latan, H., Teixeira, A.A. and de Oliveira, J.H.C. (2014), "Quality management, environmental management maturity, green supply chain practices and green performance of Brazilian companies with ISO 14001 certification: direct and indirect effects", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 67, pp. 39-51.

Diab, S.M., AL-Bourini, F.A. and Abu-Rumman, A.H. (2015), "The impact of green supply chain management practices on organizational performance: a study of Jordanian food industries", *Journal of Management and Sustainability*, Vol. 5 No. 1, pp. 149-157.

Dickson, P.H. and Weaver, K.M. (2011), "Institutional readiness and small to medium-sized enterprise alliance formation", *Journal of Small Business Management*, Vol. 49 No. 1, pp. 126-148.

Eltayeb, T.K. and Zailani, S. (2009), "Going green through green supply chain initiatives towards environmental sustainability", *Operations and Supply Chain Management*, Vol. 2 No. 2, pp. 93-110.

Eltayeb, T.K., Zailani, S. and Ramayah, T. (2011), "Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes", *Resources, Conservation and Recycling*, Vol. 55 No. 5, pp. 495-506.

Eng Ann, G., Zailani, S. and Abd Wahid, N. (2006), "A study on the impact of environmental management system (EMS) certification towards firms' performance in Malaysia", *Management of Environmental Quality: An International Journal*, Vol. 17 No. 1, pp. 73-93.

Finstad, K. (2010), "Response interpolation and scale sensitivity: evidence against 5-point scales", *Journal of Usability Studies*, Vol. 5 No. 3, pp. 104-110.

Gandhi, A. (2016), "Exploring correlations in components of green supply chain practices and green supply chain performance", *Competitiveness Review*, Vol. 26 No. 3, pp. 332-368.

George, D. and Mallery, P. (2006), *SPSS for Windows Step by Step: A Simple Guide and Reference*, Allyn Bacon, Boston, MA.

Green, K.W. Jr, Zelbst, P.J., Meacham, J. and Bhadauria, V.S. (2012), "Green supply chain management practices: impact on performance", *Supply Chain Management: An International Journal*, Vol. 17 No. 3, pp. 290-305.

Guide, V.D.R., Jayaraman, V. and Linton, J.D. (2003), "Building contingency planning for closed-loop supply chains with product recovery", *Journal of Operations Management*, Vol. 21 No. 3, pp. 259-279.

Hazen, B.T., Cegielski, C. and Hanna, J.B. (2011), "Diffusion of green supply chain management: examining perceived quality of green reverse logistics", *International Journal of Logistics Management, The*, Vol. 22 No. 3, pp. 373-389.

Hervani, A.A., Helms, M.M. and Sarkis, J. (2005), "Performance measurement for green supply chain management", *Benchmarking: An International Journal*, Vol. 12 No. 4, pp. 330-353.

Hillman, A.J., Withers, M.C. and Collins, B.J. (2009), "Resource dependence theory: a review", *Journal of Management*, Vol. 35 No. 6, pp. 1404-1427.

Hong, S.K. and Schniederjans, M.J. (2000), "Balancing concurrent engineering environmental factors for improved product development performance", *International Journal of Production Research*, Vol. 38 No. 8, pp. 1779-1800.

Kim, J. and Rhee, J. (2012), "An empirical study on the impact of critical success factors on the balanced scorecard performance in Korean green supply chain management enterprises", *International Journal of Production Research*, Vol. 50 No. 9, pp. 2465-2483.

Kim, J.H., Youn, S. and Roh, J.J. (2011), "Green supply chain management orientation and firm performance: evidence from South Korea", *International Journal of Services and Operations Management*, Vol. 8 No. 3, pp. 283-304.

Lai, K.-h. and Cheng, T.E. (2009), *Just-in-Time Logistics*, Gower Publishing.

Laosirihongthong, T., Adebanjo, D. and Tan, K.C. (2013), "Green supply chain management practices and performance", *Industrial Management & Data Systems*, Vol. 113 No. 8, pp. 1088-1109.

Malviya, R.K. and Kant, R. (2015), "Green supply chain management (GSCM): a structured literature review and research implications", *Benchmarking: An International Journal*, Vol. 22 No. 7, pp. 1360-1394.

Mao, Z., Zhang, S. and Li, X. (2016), "Low carbon supply chain firm integration and firm performance in China", *Journal of Cleaner Production*, Vol. 153, pp. 1-8.

Marchi, V.D., Maria, E.D. and Micelli, S. (2012), "Environmental strategies, upgrading and competitive advantage in global value chains", *Business Strategy and the Environment*, Vol. 22 No. 1, pp. 62-72.

Min, H. and Galle, W.P. (1997), "Green purchasing strategies: trends and implications", *Journal of Supply Chain Management*, Vol. 33 No. 2, pp. 10-17.

Min, H. and Galle, W.P. (2001), "Green purchasing practices of US firms", *International Journal of Operations & Production Management*, Vol. 21 No. 9, pp. 1222-1238.

Mishra, R. and Napier, R. (2014), "Reverse logistics: antecedents of successful implementation and firm performance effects", *Journal of Supply Chain and Operations Management*, Vol. 12 No. 2, pp. 33-49.

Mitra, S. and Datta, P.P. (2014), "Adoption of green supply chain management practices and their impact on performance: an exploratory study of Indian manufacturing firms", *International Journal of Production Research*, Vol. 52 No. 7, pp. 2085-2107.

Nunnally, C. and Bernstein, H. (1978), *Psychometric Theory*, McGraw-Hill, New York, NY.

Oluwasola, O. (2014), "Environmental pollution is inevitable in developing countries", available at: http://breakingenergy.com/2014/09/23/environmental-pollution-is-inevitable-in-developing-countries/accessed (accessed 8 June 2016).

Orji, I. and Wei, S. (2016), "A detailed calculation model for costing of green manufacturing", *Industrial Management & Data Systems*, Vol. 116 No. 1, pp. 65-86.

Özceylan, E., Paksoy, T. and Bektaş, T. (2014), "Modeling and optimizing the integrated problem of closed-loop supply chain network design and disassembly line balancing", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 61, pp. 142-164, available at: http://dx.doi.org/10.1016/j.tre.2013.11.001

Peng, Y.S. and Lin, S.S. (2008), "Local responsiveness pressure, subsidiary resources, green management adoption and subsidiary's performance: evidence from Taiwanese manufactures", *Journal of Business Ethics*, Vol. 79 Nos 1-2, pp. 199-212.

Pfeffer, J. and Salancik, G.R. (1978), *The External Control of Organizations: A Resource Dependence Perspective*, Harper and Row, New York, NY.

Quirk, T.J., Quirk, M.H. and Horton, H.F. (2013), *Excel 2010 for Physical Sciences Statistics: A Guide to Solving Practical Problems*, Springer Science & Business Media, available at: https://scholar.google.com.au/scholar?hl=en&q=Excel+2010+for+Physical+Sciences+Statistics%3A+A+Guide+to+Solving+Practical+Problems.&btnG=&as_sdt=1%2C5&as_sdtp=/retrieved January2015

Ramírez, A.M. and Morales, V. (2014), "Improving organisational performance through reverse logistics", *The Journal of the Operational Research Society*, Vol. 65 No. 6, pp. 954-962, available at: http://dx.doi.org.ezproxy.newcastle.edu.au/10.1057/jors.2013.61

Rao, P. and Holt, D. (2005), "Do green supply chains lead to competitiveness and economic performance?", *International Journal of Operations & Production Management*, Vol. 25 No. 9, pp. 898-916.

Ravi, V. and Shankar, R. (2015), "Survey of reverse logistics practices in manufacturing industries: an Indian context", *Benchmarking: An International Journal*, Vol. 22 No. 5, pp. 874-899.

Rusinko, C. (2007), "Green manufacturing: an evaluation of environmentally sustainable manufacturing practices and their impact on competitive outcomes", *IEEE Transactions on Engineering Management*, Vol. 54 No. 3, pp. 445-454.

Sarkis, J., Zhu, Q. and Lai, K.-h. (2011), "An organizational theoretic review of green supply chain management literature", *International Journal of Production Economics*, Vol. 130 No. 1, pp. 1-15.

Sezen, B. and Çankaya, S.Y. (2013), "Effects of green manufacturing and eco-innovation on sustainability performance", *Procedia-Social and Behavioral Sciences*, Vol. 99, pp. 154-163.

Shi, V.G., Koh, S.L., Baldwin, J. and Cucchiella, F. (2012), "Natural resource based green supply chain management", *Supply Chain Management: An International Journal*, Vol. 17 No. 1, pp. 54-67.

Srivastava, S.K. (2008), "Network design for reverse logistics", *International Journal of Management Science*, Vol. 36, pp. 535-548.

Testa, F. and Iraldo, F. (2010), "Shadows and lights of GSCM (green supply chain management): determinants and effects of these practices based on a multi-national study", *Journal of Cleaner Production*, Vol. 18 No. 10, pp. 953-962.

Uganda Bureau of Statistics (2011), "Census Business Establishments report 2010/2011", available at: www.ubos.org/onlinefiles/uploads/ubos/pdf%20documents/2010%20COBE%20Report.pdf/ (accessed August 2014).

Vachon, S. and Klassen, R.D. (2006), "Extending green practices across the supply chain: the impact of upstream and downstream integration", *International Journal of Operations & Production Management*, Vol. 26 No. 7, pp. 795-821.

Vachon, S. and Klassen, R.D. (2008), "Environmental management and manufacturing performance: the role of collaboration in the supply chain", *International Journal of Production Economics*, Vol. 111 No. 2, pp. 299-315.

Vijayvargy, L. and Agarwal, G. (2014), "Empirical investigation of green supply chain management practices and their impact on organizational performance", *IUP Journal of Supply Chain Management*, Vol. 11 No. 4, pp. 25-42.

Williams, S. and Schaefer, A. (2013), "Small and medium sized enterprises and sustainability: managers' values and engagement with environmental and climate change issues", *Business Strategy and the Environment*, Vol. 22 No. 3, pp. 173-186.

Xiong, L. and King, C. (2015), "Motivational drivers that fuel employees to champion the hospitality brand", *International Journal of Hospitality Management*, Vol. 44, pp. 58-69.

Yahya, N., Nair, S.R. and Piaralal, S.K. (2014), "Green practices adoption framework for small and medium sized logistics firms in Malaysia", *Sains Humanika*, Vol. 2 No. 3, pp. 79-84.

Yang, M.G.M., Hong, P. and Modi, S.B. (2011), "Impact of lean manufacturing and environmental management on business performance: an empirical study of manufacturing firms", *International Journal of Production Economics*, Vol. 129 No. 2, pp. 251-261.

Yigitbasioglu, O. (2004), "Upstream information flow in the supply chain: the case of Finnish manufacturers", MSc dissertation, The Swedish School of Economics and Business Administration, available at: https://scholar.google.com.au/scholar?cites=12551287589098033766&as_sdt=2005&sciodt=0,5&hl=en/retrieved (accessed June 2016).

Zhu, Q. and Sarkis, J. (2004), "Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises", *Journal of Operations Management*, Vol. 22 No. 3, pp. 265-289, available at: http://dx.doi.org/10.1016/j.jom.2004.01.005

Zhu, Q. and Sarkis, J. (2007), "The moderating effects of institutional pressures on emergent green supply chain practices and performance", *International Journal of Production Research*, Vol. 45 Nos 18-19, pp. 4333-4355.

Zhu, Q. and Tian, Y. (2016), "Developing a remanufacturing supply chain management system: a case of a successful truck engine remanufacturer in China", *Production Planning & Control*, Vol. 27 No. 9, pp. 708-716, doi: 10.1080/09537287.2016.1166282.

Zhu, Q., Cordeiro, J. and Sarkis, J. (2013), "Institutional pressures, dynamic capabilities and environmental management systems: investigating the ISO 9000-environmental management system implementation linkage", *Journal of Environmental Management*, Vol. 114, pp. 232-242.

Zhu, Q., Feng, Y. and Choi, S.B. (2016), "The role of customer relational governance in environmental and economic performance improvement through green supply chain management", *Journal of Cleaner Production*, Vol. 155, pp. 1-8.

Zhu, Q., Sarkis, J. and Geng, Y. (2004), "Green supply chain management in China: pressures, practices and performance", *International Journal of Operations & Production Management*, Vol. 25 No. 5, pp. 449-468.

Zhu, Q., Sarkis, J. and Geng, Y. (2005), "Green supply chain management in China: pressures, practices and performance", *International Journal of Operations & Production Management*, Vol. 25 No. 5, pp. 449-468.

Zhu, Q., Sarkis, J. and Lai, K.-H. (2007), "Green supply chain management: pressures, practices and performance within the Chinese automobile industry", *Journal of Cleaner Production*, Vol. 15 No. 11, pp. 1041-1052.

Zhu, Q., Sarkis, J. and Lai, K.-H. (2008a), "Confirmation of a measurement model for green supply chain management practices implementation", *International Journal of Production Economics*, Vol. 111 No. 2, pp. 261-273, available at: http://dx.doi.org/10.1016/j.ijpe.2006.11.029

Zhu, Q., Sarkis, J. and Lai, K.-H. (2008b), "Green supply chain management implications for 'closing the loop'", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 44 No. 1, pp. 1-18.

Zhu, Q., Geng, Y., Fujita, T. and Hashimoto, S. (2010), "Green supply chain management in leading manufacturers: case studies in Japanese large companies", *Management Research Review*, Vol. 33 No. 4, pp. 380-392.

Zhu, Q., Sarkis, J., Cordeiro, J.J. and Lai, K.-H. (2008), "Firm-level correlates of emergent green supply chain management practices in the Chinese context", *Omega*, Vol. 36 No. 4, pp. 577-591.

Zsidisin, G.A. and Hendrick, T.E. (1998), "Purchasing's involvement in environmental issues: a multi-country perspective", *Industrial Management & Data Systems*, Vol. 98 No. 7, pp. 313-320.

Further reading

Borchardt, M., Wendt, M.H., Peirera, G.M. and Sellitto, M.A. (2011), "Redesign of a component based on eco-design practices: environmental impact and cost reduction achievements", *Journal of Cleaner Production*, Vol. 19, pp. 49-57.

Demirel, P. and Kesidou, E. (2011), "Stimulating different types of eco-innovation in the UK: government policies and firm motivations", *Ecological Economics*, Vol. 70 No. 8, pp. 1546-1557.

Esfahbodi, A., Zhang, Y., Watson, G. and Zhang, T. (2016), "Governance pressures and performance outcomes of sustainable supply chain management – an empirical analysis of UK manufacturing industry", *Journal of Cleaner Production*, pp. 1-13.

Hong, P., Kwon, H.-B. and Roh, J.J. (2009), "Implementation of strategic green orientation in supply chain: an empirical study of manufacturing firms", *European Journal of Innovation Management*, Vol. 12 No. 4, pp. 512-532.

Ministry of Finance, Planning and Economic Development (2011), "The National Micro, Small and Medium Enterprise (MSME) Policy Draft", available at: http://int.search.tb.ask.com/search/GGmain.jhtml?searchfor=the+national+micro%2C+small+and+medium+enterprise+%28msme%29+policy%29+draft&n=781b8c4f&p2=^HJ^xdm005^YYA^au&ptb=F5BD3650-5519-4C3F-BD41-2EF29F84E5FA&qs=&si=CJ_MlZD61sYCFYaWvQod4Z0DHw&ss=sub&st=bar&tpr=sbt&ts=1464833833342/ (accessed 10 March 2015).

Okello-Obura, C., Minishi-Majanja, M.K., Cloete, L. and Ikoja-Odongo, J.R. (2009), "Proposed business information system design (BISD) for small and medium enterprises (SMEs) in Northern Uganda", *Libri*, Vol. 59 No. 1, pp. 31-44.

Platcheck, E.R., Schaeffer, L., Kindlein, W. and Cândido, L.H.A. (2008), "Eco-design: case of a mini compressor re-design", *Journal of Cleaner Production*, Vol. 16 No. 14, pp. 1526-1535.

Appendix 1

Reference	EP	EB	EC	CP	IP	OP	MP	SP	Examination of the influence for each of the individual practices
Zhu and Sarkis (2004)	✓	✓	✓						Considers all practices
Zhu *et al.* (2010)	✓	✓				✓			Qualitative study
Zhu *et al.* (2007)	✓	✓	✓						Considers all practices
Rao and Holt (2005)		✓		✓					Internal environmental management practices do not influence performance
Green *et al.* (2012)	✓	✓				✓			Only four practices
Chien and Shih (2007)	✓	✓							Looks at green supply chain practice adoption as an overall construct
Azevedo *et al.* (2011)	✓	✓				✓			Looks at all practices but a case study approach is taken
Zhu *et al.* (2013)	✓	✓				✓			Considers all practices
Testa and Iraldo (2010)	✓			✓					No focus on the impact of each practice is made
Chan *et al.* (2012)		✓							Looks at only green purchase, customer cooperation and investment recovery
De Giovanni and Esposito Vinzi (2012)	✓	✓							Focuses only on internal environmental practices and green purchasing
Laosirihongthong *et al.* (2013)	✓	✓							Focus is on eco-design, green purchasing and reverse logistics practices
de Sousa Jabbour *et al.* (2014)	✓								Green purchasing and customer cooperation
Kim *et al.* (2011)	✓	✓				✓		✓	Considers all practices
Mitra and Datta (2014)		✓		✓					Green purchasing, eco-design, green manufacturing
Gandhi (2016)	✓								Eco-design, internal environmental management practices and investment recovery
Eng Ann *et al.* (2006)	✓						✓		Internal environmental management practices
Peng and Lin (2008)		✓			✓				Internal firm practices
Kim and Rhee (2012)		✓							Customer cooperation
Zhu *et al.* (2016)	✓	✓							Eco-design, Green purchasing
de Sousa Jabbour *et al.*	✓	✓							Qualitative study of combined effect of green supply chain practices
Diab *et al.* (2015)	✓	✓		✓		✓			Considers all practices
Mao *et al.* (2016)	✓	✓							Considers all practices
Carter *et al.* (2000)	✓	✓							Green purchasing
Rusinko (2007)	✓			✓	✓	✓	✓		Qualitative study: considers only green manufacturing
Sezen and Çankaya (2013)	✓	✓							Green manufacturing
Vijayvargy and Agarwal (2014)	✓			✓					Considers all practices

Table AI.
Green supply chain practices and performance outcomes: summary of research outcomes

Appendix 2

Rate the extent to which your firm engages in the following practices. Tick the appropriate number	Much lower	Lower	Slightly lower	Neutral	Slightly higher	Higher	Much higher
Internal environmental management							
My firm is committed to engagement in green supply chain practices	1	2	3	4	5	6	7
My firm engages in cross-functional cooperation for environmental improvements	1	2	3	4	5	6	7
My firm aims at achieving total quality environmental management	1	2	3	4	5	6	7
My firm employs environmental compliance and auditing programmes to achieve better environmental performance	1	2	3	4	5	6	7
My firm obtained an ISO 14001 certification in order to produce environmentally friendly goods	1	2	3	4	5	6	7
My firm has made investments in environmental management systems	1	2	3	4	5	6	7
Green purchasing							
My firm provides design specifications to suppliers that include environmental requirements for the purchased item	1	2	3	4	5	6	7
My firm cooperates with suppliers on environmental objectives	1	2	3	4	5	6	7
My firm carries out environmental management audits for its suppliers' internal management	1	2	3	4	5	6	7
My suppliers are ISO-14000 certified	1	2	3	4	5	6	7
My firm evaluates second-tier suppliers for environmentally friendly practices	1	2	3	4	5	6	7
Customer cooperation							
My firm cooperates with its customers on product eco-designs	1	2	3	4	5	6	7
My firm cooperates with its customers on cleaner production (environmentally friendly production)	1	2	3	4	5	6	7
My firm cooperates with its customers on green packaging	1	2	3	4	5	6	7
Eco-design							
My firm develops products designs that consume less material/energy	1	2	3	4	5	6	7
My firm designs products for reuse, recycle, recovery of material and component parts	1	2	3	4	5	6	7
My firm designs products to avoid or reduce the use of hazardous products and/or manufacturing processes	1	2	3	4	5	6	7
Investment recovery							
My firm engages in recovery (sale) of excess inventories/materials	1	2	3	4	5	6	7
My firm engages in the sale of scrap and used materials	1	2	3	4	5	6	7
My firm engages in the sale of excess capital equipment	1	2	3	4	5	6	7

Sources: Zhu *et al.* (2007, 2008a, b) and Zhu and Sarkis (2007)

Table AII. Measurement scales for each green supply chain practice

Appendix 3

Table AIII. Measure scales for firm performance

Rate the extent to which your firm has made an improvement in its performance based on green supply chain practice adoption	Much lower	Lower	Slightly lower	Neutral	Slightly higher	Higher	Much higher
Environmental performance							
Reduction of pollutant emissions	1	2	3	4	5	6	7
Reduction of waste water	1	2	3	4	5	6	7
Reduction of solid wastes	1	2	3	4	5	6	7
Decrease of consumption for hazardous/harmful/toxic materials	1	2	3	4	5	6	7
Economic performance with positive impact							
Decrease of cost for materials purchasing	1	2	3	4	5	6	7
Decrease of cost for energy consumption	1	2	3	4	5	6	7
Decrease of fee for waste treatment	1	2	3	4	5	6	7
Decrease of fee for waste discharge	1	2	3	4	5	6	7
Economic performance with negative impact							
Increase in investment	1	2	3	4	5	6	7
Increase in operational cost	1	2	3	4	5	6	7
Increase in training cost	1	2	3	4	5	6	7
Increase in cost due to purchasing of environmentally friendly materials	1	2	3	4	5	6	7

Sources: Zhu *et al.* (2005) and Hervani *et al.* (2005)

Appendix 4

Table AIV. Skewness and kurtosis normality results

Variables	Skewness statistics	Kurtosis statistics
Green purchasing	−0.186	−0.544
customer cooperation	−0.027	−0.81
Eco-design	−0.269	−0.468
Investment recovery	−0.557	−0.17
Internal environmental management	−0.141	−0.701
Environmental performance	−0.706	0.896
positive economic performance	−0.487	−0.296
negative economic performance	−0.09	−0.119

Appendix 5

Total variance explained

Component	Initial eigenvalues Total	% of variance	Cumulative %	Extraction sums of squared loadings Total	% of variance	Cumulative %
1	8.352	26.099	26.099	8.352	26.099	26.099
2	3.205	10.016	36.115			
3	2.888	9.025	45.140			
4	2.204	6.887	52.027			
5	1.540	4.813	56.840			
6	1.373	4.292	61.132			
7	1.209	3.778	64.909			
8	1.165	3.639	68.548			
9	0.926	2.893	71.442			
10	0.818	2.556	73.997			
11	0.762	2.380	76.377			
12	0.744	2.324	78.701			
13	0.673	2.103	80.804			
14	0.612	1.912	82.716			
15	0.545	1.704	84.421			
16	0.523	1.634	86.055			
17	0.460	1.439	87.494			
18	0.410	1.283	88.776			
19	0.409	1.278	90.055			
20	0.382	1.193	91.248			
21	0.361	1.127	92.375			
22	0.333	1.041	93.416			
23	0.299	0.935	94.351			
24	0.272	0.851	95.202			
25	0.260	0.813	96.016			
26	0.253	0.790	96.806			
27	0.229	0.715	97.521			
28	0.197	0.616	98.136			
29	0.197	0.614	98.750			
30	0.151	0.471	99.222			
31	0.147	0.459	99.681			
32	0.102	0.319	100.000			

Note: Extraction method: principal component analysis

Table AV. Common method variance results

Appendix 6

Variable item	CC	ED	ECO-B	ECO-C	ENV-P	GP	IEM	INV-R
CC1	0.79	0.51	0.14	0.028	0.28	0.32	0.28	0.24
CC2	0.87	0.54	0.12	0.116	0.20	0.29	0.24	0.39
CC3	0.85	0.51	0.08	0.015	0.22	0.32	0.32	0.37
ED1	0.64	0.84	0.06	0.043	0.26	0.26	0.34	0.32
ED2	0.50	0.81	0.14	0.041	0.37	0.17	0.25	0.34
ED3	0.32	0.70	0.29	0.267	0.24	0.27	0.40	0.25
ENV-P1	0.34	0.31	0.32	0.070	0.78	0.29	0.32	0.23
ENV-P2	0.24	0.28	0.33	0.079	0.86	0.20	0.25	0.20
ENV-P3	0.17	0.31	0.37	0.002	0.83	0.21	0.26	0.25
ENV-P4	0.12	0.25	0.37	0.120	0.66	0.16	0.23	0.14
GP1	0.25	0.15	0.25	0.159	0.11	0.68	0.54	0.19
GP2	0.27	0.21	0.23	0.226	0.14	0.76	0.50	0.29
GP3	0.22	0.19	0.35	0.311	0.21	0.76	0.48	0.28
GP4	0.32	0.28	0.25	0.025	0.28	0.70	0.47	0.28
GP5	0.32	0.28	0.34	0.240	0.28	0.81	0.58	0.35
INV-R1	0.33	0.41	0.21	0.144	0.26	0.27	0.35	0.86
INV-R2	0.37	0.33	0.23	0.102	0.21	0.39	0.37	0.87
INV-R3	0.33	0.25	0.20	0.181	0.21	0.31	0.30	0.83
IEM1	0.23	0.21	0.28	0.243	0.22	0.55	0.76	0.36
IEM2	0.33	0.33	0.30	0.297	0.22	0.52	0.78	0.41
IEM3	0.17	0.32	0.32	0.300	0.29	0.37	0.68	0.26
IEM4	0.19	0.36	0.42	0.244	0.25	0.45	0.70	0.24
IEM5	0.29	0.30	0.26	0.084	0.21	0.57	0.71	0.26
IEM6	0.24	0.31	0.29	0.140	0.30	0.55	0.74	0.19
ECO-B1	0.13	0.15	0.78	0.085	0.45	0.24	0.30	0.22
ECO-B2	0.06	0.14	0.71	0.102	0.44	0.24	0.30	0.19
ECO-B3	0.10	0.20	0.82	0.123	0.34	0.31	0.32	0.18
ECO-B4	0.13	0.11	0.80	0.112	0.38	0.31	0.29	0.15
ECO-C1	0.04	0.15	0.085	0.689	0.14	0.17	0.20	0.12
ECO-C2	0.07	0.06	0.102	0.902	0.06	0.21	0.20	0.11
ECO-C3	0.12	0.12	0.123	0.903	0.04	0.25	0.30	0.18
ECO-C4	0.003	0.076	0.112	0.918	0.06	0.26	0.30	0.15

Notes: CC, customer cooperation; ED, eco-design; ECO-B, economic benefits; ECO-C, economic costs; EP, environmental performance; GP, green purchasing; IEM, internal environmental management; INV-R, investment recovery

Table AVI. Discriminant validity results

Appendix 7

Variable	Industry	Mean	SD
Green purchasing	Meat and fish processing	4.6000	0.21909
	Grain milling products	5.3667	0.27039
	Animal feeds	5.3500	0.77621
	Manufacture of bakery products	4.4923	0.22360
	Coffee and tea processing	5.6667	0.29059
	Beer and spirits	4.9667	0.38442
	Soft drinks and mineral water	4.6000	0.17112
	Leather and related products	5.2000	0.41633
	Construction materials	4.1579	0.19621
	Paper products and printing	4.9750	0.26323
	Rubber and plastic products	5.0667	0.44920
	Metal products	4.9846	0.30589
	Refined petroleum products	5.6000	0.40825
	Chemicals and chemical products	4.9111	0.24212
	Other products	4.5040	0.13489
Customer cooperation	Meat and fish processing	4.2000	0.22608
	Grain milling products	4.5000	0.66528
	Animal feeds	4.4167	0.59900
	Manufacture of bakery products	4.5256	0.21418
	Coffee and tea processing	6.2222	0.40062
	Beer and spirits	4.9444	0.46680
	Soft drinks and mineral water	4.0185	0.27937
	Leather and related products	5.0000	0.38490
	Construction materials	4.1579	0.25791
	Paper products and printing	4.7708	0.30689
	Rubber and plastic products	4.3889	0.36935
	Metal products	4.6410	0.42275
	Refined petroleum products	5.5833	0.69887
	Chemicals and chemical products	4.7593	0.32428
	Other products	4.1533	0.17721
Eco-design	Meat and fish processing	4.8000	0.29059
	Animal feeds	4.5000	0.34694
	Manufacture of bakery products	4.7051	0.18976
	Coffee and tea processing	6.1111	0.48432
	Beer and spirits	5.2778	0.26411
	Soft drinks and mineral water	4.5926	0.20086
	Leather and related products	4.5556	1.11111
	Construction materials	5.0175	0.24645
	Paper products and printing	5.0417	0.23149
	Rubber and plastic products	5.0556	0.31525
	Metal products	4.9231	0.37393
	Refined petroleum products	5.4167	0.68550
	Chemicals and chemical products	5.0556	0.26023
	Other products	4.5867	0.15895
Investment recovery	Meat and fish processing	4.6000	0.49889
	Grain milling products	4.3333	0.52352
	Animal feeds	4.1667	0.61614
	Manufacture of bakery products	4.8718	0.19311
	Coffee and tea processing	5.7778	0.29397
	Soft drinks and mineral water	4.8704	0.20370
	Leather and related products	4.8889	0.67586
	Construction materials	4.9474	0.25777

(continued)

Table AVII. Descriptive statistics for each GSCP and performance outcome by industry

Variable	Industry	Mean	SD
	Paper products and printing	5.5000	0.22771
	Rubber and plastic products	5.3333	0.40369
	Metal products	5.1282	0.28629
	Refined petroleum products	5.8333	0.50000
	Chemicals and chemical products	4.8148	0.21427
	Other products	4.9867	0.12379
Internal environmental management	Meat and fish processing	4.3667	0.17795
	Grain milling products	5.2778	0.33793
	Animal feeds	4.4167	0.52924
	Manufacture of bakery products	5.0064	0.17795
	Coffee and tea processing	5.4444	0.58794
	Beer and spirits	5.1667	0.38968
	Soft drinks and mineral water	5.1667	0.16667
	Leather and related products	4.0000	0.72648
	Construction materials	4.9825	0.20900
	Paper products and printing	5.2708	0.19830
	Rubber and plastic products	4.7222	0.37185
	Metal products	4.8077	0.34738
	Refined petroleum products	5.4583	0.36878
	Chemicals and chemical products	4.6296	0.23086
	Other products	4.6833	0.14578
Environmental performance	Meat and fish processing	4.8000	0.25495
	Grain milling products	5.3333	0.23863
	Animal feeds	5.3125	0.25769
	Manufacture of bakery products	4.8365	0.17918
	Coffee and tea processing	5.7500	0.90139
	Beer and spirits	4.7500	0.58808
	Soft drinks and mineral water	4.8472	0.18318
	Leather and related products	4.7500	0.94648
	Construction materials	5.1842	0.16539
	Paper products and printing	5.2188	0.18802
	Rubber and plastic products	5.3333	0.08333
	Metal products	4.8846	0.33567
	Refined petroleum products	5.6875	0.57168
	Chemicals and chemical products	5.0900	.69759
	Other products	5.0650	.86029
Economic benefits	Meat and fish processing	2.2571	0.29416
	Grain milling products	3.0000	0.32156
	Animal feeds	2.6786	0.46793
	Manufacture of bakery products	2.3187	0.15000
	Coffee and tea processing	2.5238	0.54917
	Beer and spirits	2.5714	0.34007
	Soft drinks and mineral water	2.5952	0.10601
	Leather and related products	2.2381	0.38978
	Construction materials	2.4962	0.14384
	Paper products and printing	2.8661	0.15456
	Rubber and plastic products	2.8810	0.17464
	Metal products	2.6703	0.21964
	Refined petroleum products	3.3571	0.55174
	Chemicals and chemical products	2.6032	0.17950
	Other products	2.6686	0.09619
Economic costs	Meat and fish processing	1.8286	0.24075
	Grain milling products	2.8571	0.31515
	Animal feeds	2.6429	0.27664

Table AVII.

(continued)

Variable	Industry	Mean	SD
	Manufacture of bakery products	2.3956	0.15874
	Coffee and tea processing	1.9048	0.19048
	Beer and spirits	2.5476	0.43081
	Soft drinks and mineral water	2.7460	0.16192
	Leather and related products	2.5714	0.14286
	Construction materials	2.3233	0.18502
	Paper products and printing	2.5268	0.25645
	Rubber and plastic products	1.9524	0.41677
	Metal products	2.6264	0.22734
	Refined petroleum products	2.5000	0.35714
	Chemicals and chemical products	2.2540	0.15817
	Other products	2.3200	0.11841

Table AVII.

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