

Sustainable supply chain management practices: the role of supply chain strategy and structure

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Abstract

This paper studies the effectiveness of both upstream and downstream sustainability practices on a focal firm's performance. Given that the implementation of practices that aim to extend sustainability to upstream and downstream practices is complex and heavily relies on the firm's SC structure we also study the role played by both SC Strategy and Structure on the abovementioned relationship. We run a series of OLS regressions using a database of 100 European manufacturing firms. Our results highlight the role of SC Strategy on the effectiveness of sustainable SC practices and the relevance of SC Structure on the effectiveness of downstream practices.

Keywords: sustainable supply chain management; supply chain strategy; supply chain structure

Introduction

The effective deployment of a sustainability strategy requires not only the implementation of sustainable practices within the organization but also the extension of these practices throughout its supply chain (SC) (Pedersen and Andersen, 2006). In the extension of sustainability along the supply chain, a vast amount of literature has focused on practices such as supplier assessment and supplier collaboration, which aim to extend sustainability practices to the upstream side of the SC by making suppliers more socially responsible and environmentally friendly (Klassen and Vachon, 2003). However, there is scant literature that has also considered extending sustainability practices downstream the SC (e.g., Spence and Bourlakis, 2009; Strand, 2009), which is crucial in achieving a circular economy. In this paper, we study the effectiveness of both upstream and downstream sustainability practices. The combination of both practices in a single study will help us to obtain a more complete view of the extension of sustainability along the

whole SC. In addition, the extension of sustainability to both upstream and downstream practices is a complex phenomenon that might be affected by the characteristics of the supply chain. In that sense, in this paper we aim to unveil the role played by two key variables: SC Strategy and SC structure. Overall, the research question we aim to answer in this paper is the following:

What are the roles of the focal firm's strategy and the supply chain structure in the effectiveness of both upstream and downstream sustainability practices?

Theoretical Background and Hypotheses Development

To extend sustainability along the supply chain both upstream and downstream practices are to be implemented. There is evidence in the literature that the implementation of upstream practices which entail collaboration with suppliers have positive benefits for the focal firm (e.g. Sancha et al., 2016; Vachon and Klassen, 2006). Working together with suppliers and/or training them in sustainability aspects improves the reputation of the focal firm, improving its economic performance (Sancha et al., 2016). We also expect that working together with downstream partners such as logistics partners has these same positive effects for the firm. In that sense, we hypothesize the following:

H1: The extension of sustainability both (a) upstream and (b) downstream the supply chain has a positive impact on the focal firm's performance

The extension of sustainability along the SC is perceived as a complex task (Orlitzky et al., 2011) as it implies a restructuration of both upstream and downstream practices that needs to be aligned with the focal firm's overall strategy. In that sense, when studying the effectiveness of both sustainability upstream and downstream practices there are two elements that cannot be neglected: strategy and structure (e.g., Longoni and Cagliano, 2015, Parmigiani et al. 2011). First, while sustainability is becoming an essential element of supply chain managers' agendas (Kleindorfer et al., 2005), it is expected that its effectiveness is contingent upon the firm's supply chain strategy. As mentioned by Kim and Arnold (1996), firm's functional strategies (e.g., supply chain strategies) should be aligned and must be coherent with the firm's strategy. Given that sustainability priorities might be competing with traditional competitive priorities (e.g., cost, quality, delivery and flexibility), it is therefore important to gain empirical insights about the strategies that favor the effectiveness of both upstream and downstream sustainability practices. In that sense, we hypothesize:

H2: SC strategy moderates the relationship between (a) upstream practices as well as (b) downstream practices on the focal firm's performance

Second, the extension of sustainability along the supply chain implies a development and restructuration of the chain. Following Awaysheh and Klassen (2012) the nature of both upstream and downstream practices of the SC might have important implications in the development of a sustainability strategy. The length of the chain as well as its visibility might affect the effectiveness of these practices. The longer the SC or the less

visible it is; the more difficult to implement upstream and downstream sustainability practices. Therefore, we hypothesize:

H3: SC structure moderates the relationship between (a) upstream practices as well as (b) downstream practices on the focal firm's performance

Figure 1 shows our research model.

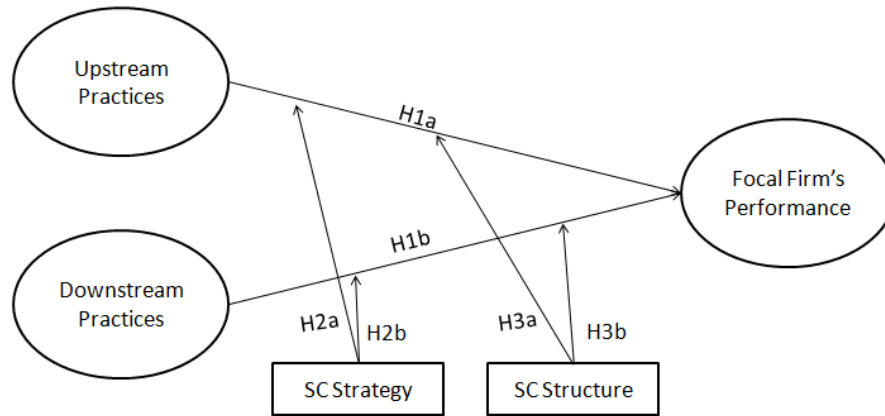


Figure 1 – Research model

Methodology

To achieve our research objectives, we developed a questionnaire based on previous literature. In the survey we collected data about the adoption of different practices to extend sustainability practices to both upstream and downstream in a SC as well as various measures of sustainability performance dimensions. The questionnaire also contains information regarding supply chain strategy and structure. Data was collected between 2016 and 2017 and a sample of 100 European manufacturing firms was obtained.

The following variables are included in our model: upstream practices and downstream practices (independent variables), focal firm's performance (dependent variables) and SC structure and SC strategy (moderating variables). Upstream practices comprise items related to the performance of audits, joint efforts with suppliers as well as visits to suppliers' facilities. Downstream practices are related to the actions that the firm takes with their distribution partners, such as the use of environmentally friendly transportation modes as well as audits and joint efforts with logistic partners. The focal firm's performance is a mix of economic and financial indicators. SC structure comprises items related to the awareness of the end user with respect to the characteristics of the supply chain (e.g., raw materials used, partners involved in the manufacture of the product). All items are measured in a 1 to 5 Likert scale. Finally, for the SC strategy concept we included the dimensions of cost, quality, delivery and flexibility. Appendix 1 includes a list of the specific items used.

To assess the validity of our constructs we performed Exploratory Factor Analysis

(EFA) and checked for convergent as well as discriminant validities. We also checked for reliability using Cronbach alpha. The results of the EFA are shown in Table 1. Convergent validity is met both at the item and construct levels. For the item level, all loadings are higher than the 0.7 suggested threshold. For construct level, the Average Variance Extracted (AVE) values for all constructs is greater than 0.5. Discriminant validity is also met as the square root value of AVE is higher than the inter-construct correlations. Finally, reliability is also met given that the Cronbach alpha values of all constructs are higher than 0.7.

Table 1. Exploratory Factor Analysis

Item	Mean	Std. Dev.	Loadings	% explained variance (unid.)	Cronbach α	AVE
<i>Upstream Practices</i>						
UP1	2.86	1.31	0.763	79.89	0.915	0.63
UP2	2.64	1.25	0.852			
UP3	2.73	1.36	0.859			
UP4	2.56	1.26	0.700			
<i>Downstream Practices</i>						
DP1	2.86	1.18	0.740	66.00	0.868	0.58
DP2	2.43	1.06	0.800			
DP3	2.44	1.17	0.737			
DP4	1.97	1.07	0.736			
DP5	2.33	1.14	0.793			
<i>Focal Firm's Performance</i>						
FP1	3.23	0.80	0.772	75.36	0.917	0.69
FP2	3.25	0.75	0.838			
FP3	3.29	0.84	0.815			
FP4	3.10	0.74	0.853			
FP5	3.07	0.77	0.860			
<i>Supply Chain Structure</i>						
SCS1	2.93	1.35	0.845	63.51	0.883	0.64
SCS2	3.36	1.42	0.849			
SCS3	2.63	1.47	0.860			
SCS4	2.66	1.21	0.785			
SCS5	3.21	1.41	0.753			
SCS6	3.69	1.33	0.700			

Table 2. Discriminant validity

	(1)	(2)	(3)	(4)
Upstream Practices (1)	0.79 ^a			
Downstream Practices (2)	0.58 ^b	0.76		
Focal Firm's Performance (3)	0.27	0.01	0.83	
SC Structure (4)	0.15	0.23	-0.12	0.80

^a AVE Square root

^b Correlations

To test direct and moderating effects we run a series of OLS regressions. For the moderation effects we included the interaction terms in the regression as well as the moderating variable. The results of the regressions can be found at Table 3. These results will be presented and discussed in the following section.

Table 3. Regression Results

	<i>M1. Direct Effects</i>	<i>M2. SC Structure</i>	<i>M3. SC Strategy</i>
IV			
Upstream Practices	0.22***	n.s.	n.s.
Downstream Practices	n.s.	-0.74***	n.s.
Mod. Var.			
SC Structure		-0.52***	
StructXUpstream		n.s.	
StructXDownstream		0.22***	
SC Strategy Cost			n.s.
SC Strategy Qual			n.s.
SC Strategy Del			n.s.
SC Strategy Flex			n.s.
CostXUpstream			n.s.
QualXUpstream			n.s.
DelXUpstream			n.s.
FlexXUpstream			n.s.
CostXDownstream			n.s.
QualXDownstream			n.s.
DelXDownstream			n.s.
FlexXDownstream			0.20**

*p ≤ 0.10; ** p ≤ 0.05; *** p ≤ 0.00

Results and Discussion

Table 3 shows the three models run, related to our three hypotheses. First, Model 1, analyses the direct effect between both types of practices (i.e., upstream and downstream) and focal firm's performance. The results show that the implementation of sustainability practices on the upstream side of the focal firm's supply chain has a positive impact on the firm's performance regardless of the SC structure and the SC strategy followed. The results imply that putting efforts into assessing suppliers, visiting their facilities and closely collaborating with them results in positive outcomes for the firm, in the form of increased sales and benefits. However, contrary to what we expected, the implementation of downstream sustainability practices is not related to higher outcomes. These results provide partial support for H1 (only H1a is supported)

Model 2 analyses the moderating role of SC structure (e.g., awareness of the characteristics of the focal firm's supply chain by the end user). As we can see in this model, extending sustainability downstream the SC implies costs for the focal firm. Interestingly, when the end user is aware of the SC structure the negative impact of Downstream Practices on the Firm's Economic Performance is reduced. While the implementation of these practices with downstream partners might result costly for the firm; if there is higher transparency the negative effect can be counterbalanced. These

results provide partial support for H2, as only H2b is supported.

Finally, Model 3, suggests that from all competitive priorities (i.e., cost, quality, delivery and flexibility), only flexibility interacts with downstream practices. These results are surprising, since they show that the SC strategy followed (except for flexibility) does not impact the effectiveness of practices that aim to extend sustainability to both upstream and downstream partners. These results provide partial support for H3 as only H3b is supported. The fact that downstream practices have a positive impact in performance when the firm is competing on flexibility can be explained as follows. Under this competitive environment, using cleaner and less nosy transportation modes and assessing TPL and collaborating with them improves firms' performance.

Conclusions

In this paper, we provide a better understanding on how both upstream and downstream sustainability practices contribute to achieving a more socially and environmentally friendly supply chain. In addition, we clarify the role played by strategy and structure of a SC in achieving better performance results. Based on our results we can provide managers with recommendations in two different aspects: (1) flexibility strategies improve the effectiveness of downstream SC sustainability practices and (2) the more visible the SC the less the negative impact of downstream practices on performance.

It is important to take into account that our findings should be interpreted in the specific context of European firms operating in an environment where basic sustainability standards are guaranteed by legislation. In that sense, future research should also analyze these relationships in the context of countries that do not have environmental and social oriented legislations.

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Appendix 1. List of items

Construct	ID	Item
Upstream Practices	UP1	We assess our suppliers' sustainability performance through formal evaluation, using established guidelines and procedures
	UP2	We perform sustainability audits for our suppliers' internal management systems
	UP3	We provide our suppliers with feedback about the results of the sustainability evaluation
	UP4	We make joint efforts with our suppliers to improve our sustainability performance
Downstream Practices	DP1	Our company employs cleaner transportation modes in distribution
	DP2	Our company employs less noisy transportation modes in distribution
	DP3	Our company assesses our logistic provider's sustainability performance (e.g., environmental audits)
	DP4	Our company offers training/education in sustainability issues to our logistic provider
	DP5	Our company makes joint efforts with our logistic provider's to improve their sustainability performance
Focal Firm's Performance	FP1	Return on Sales
	FP2	Growth in return on Sales
	FP3	Growth in Profit
	FP4	Return on Investment
	FP5	Growth in Return of Investment
SC Structure	SCS1	The end user is aware of how our product is manufactured
	SCS2	The end user is aware of the type of raw materials that go in the product
	SCS3	The end user is aware of where the raw materials are sourced
	SCS4	The end user is aware of the structure of our supply chain
	SCS5	The end user is aware of the name of the company that manufactures the product
	SCS6	The end user is aware of our brand name (product name)
SC Strategy		Cost
		Quality
		Delivery
		Flexibility