

Article

Sustainable Innovation, Management Accounting and Control Systems, and International Performance

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Abstract: This study analyzes how Management Accounting and Control Systems (MACS) facilitate the appropriation of the benefits of sustainable innovations in organizations. In particular, this paper examines the moderating role of different types of MACS in the relationships between sustainable innovation and international performance at an organizational level. We collected survey data from 123 Spanish and Portuguese organizations. Partial Least Square was used to analyze the data. Results show that the effect of sustainable innovations on international performance is enhanced by contemporary rather than traditional types of MACS. Overall our findings show that MACS can help managers to develop and monitor organizational activities (e.g., customer services and distribution activities), which support the appropriation of the potential benefits from sustainable innovation. This paper responds to recent calls for in-depth studies about the organizational mechanism that may enhance the success of sustainable innovation.

Keywords: organizational performance; management accounting and control systems; sustainability-oriented innovations; environmental-innovations

1. Introduction

Researchers [1,2] and policymakers [3,4] are becoming more and more interested in sustainable innovation and its connection with organizational performance. Moreover, stakeholders are becoming increasingly aware of sustainability in international business activities. It is, therefore, crucial to develop sustainable innovation to gain access to international marketplaces [5,6]. Sustainable innovation can be understood as “innovation that improves sustainability performance, where such performance includes ecological, economic, and social criteria” [7] (p. 2). Several researchers suggest that sustainable innovation is a basic requirement to enhance international business activities [8]. However, much remains to be studied about the mechanisms that facilitate and enhance this relationship [9,10]. To this regard, Boons *et al.* [7] (p. 2) state that “while there is a considerable amount of knowledge on what drives sustainable innovation at the firm level, we know less about how sustainable innovations can be realized and how win-win business situations can be created for those involved while actually enabling sustainability at the level of production and consumption systems”. Our study addresses this latter issue by analyzing the interaction of Management Accounting and Control Systems (MACS), sustainable innovation, and international performance.

Previous researchers have argued that MACS can influence the success of innovative companies in terms of organizational performance [11,12]. MACS can be defined as a “set of procedures and processes that managers use in order to provide valuable information in decision-making, planning, monitoring and evaluating and, ultimately, to ensure the achievement of their goals and the goals of their organizations” [12] (p. 394). Chenhall and Langfield-Smith [13] classified the MACS tools as either contemporary or traditional according to the different characteristics and outcomes. Contemporary MACS, such as balanced scorecard or benchmarking, are tools directed to the external environment rather than the internal organization. They not only use financial indicators but also non-financial indicators. These tools offer a comprehensive approach for controlling internal processes (manufacturing, distribution, customer services, delivery, *etc.*) within the organizational strategy framework [13] while traditional MACS, such as cost accounting or budgetary systems, are focused on operative and internal control. Furthermore, the information provided by the latter to implement recently-developed new manufacturing processes is less useful [13]. This leads us to propose the following research question: “Are MACS one of the organizational mechanisms that facilitate the appropriation of the potential benefits of sustainable innovations in terms of international performance?”

This study aims to extend our understanding on the connection between sustainability practices and organizational performance [14–16]. To this end it draws on accounting, sustainability, and innovation literature, and it postulates that only contemporary MACS are likely to moderate the relationship between sustainable innovation and internationalization. The contribution of this paper is two-fold. Firstly, it sheds more light on the underlying mechanisms that explain the relationship between sustainable innovations and organizational performance. Previous literature recognized that the existence of certain contingent factors could explain the somewhat ambiguous link between these two variables [14]. However, to the best of our knowledge, no study to date has considered MACS a potential moderating variable. Secondly, this study also contributes to control literature by providing empirical evidence on the influence of traditional and contemporary MACS in supporting the success of sustainable production innovations. Despite the fact that the influence of control tools is likely to be different “depending on

the degree to which particular strategies are emphasized” [13] (p. 245), previous studies in control literature fail to consider the specific managerial issues behind sustainable innovation strategies. Furthermore, previous works limited the analysis to a single control tool (e.g., Dunk [17]) or a specific use of MACS (e.g., Bisbe and Otley [18] and Lopez-Valeiras *et al.* [19]).

The empirical study was carried out in the Spanish and Portuguese agrifood industry, which ranks in a top position for its contribution to GDP. Food industry is also a strategic sector in both of these countries because of its decisive impact on rural development. Agribusiness has been confronting challenges coming from the increasing awareness of worldwide stakeholders concerning the sustainability of their activities [5]. In order to address this issue, organizations within this sector need to innovate in production processes from a sustainable point of view. Data were collected through surveys gathered from senior managers of 123 established firms. Respondents were asked to evaluate the degree of development of sustainable innovation in their companies. MACS were measured as an overall technique that comprises four individual control systems widely used in practice (traditional MACS: cost accounting and budget systems; contemporary MACS: balanced scorecard and benchmarking). Internationalization was measured through the presence of the company in international markets. Results suggest that MACS positively moderate the relationship between sustainable production and internationalization only when contemporary tools are implemented. Traditional MACS appear to have no significant moderating effect.

The remainder of this paper is structured as follows. The next section briefly reviews the literature and the subsequent section develops the hypothesis. The methodology section describes the empirical study. The results section shows the findings of the empirical analysis using a structural equation modeling. Finally, theoretical contributions, practical implications, limitations, and insights for future research are presented in the conclusions section.

2. Literature Review

2.1. Sustainable Innovation and Organizational Performance

Corporate sustainability is a multidimensional concept that includes diverse types of sustainability practices, such as the development and marketing of sustainable innovations. It can be defined as “the successful market-oriented realization and integration of ecological, social and economic challenges to a company [20]. The influence of corporate sustainability on organizational performance has been extensively analyzed over the last decades [21–23]. Particularly, several studies empirically have tested that direct relationship by conceptualizing corporate sustainability as sustainable innovation. Although management literature suggests that sustainable innovation can be a source of important benefits for companies, empirical results are not conclusive. Thus, several calls have been made to provide further evidence about the link between sustainable innovation and organizational performance [16,24,25].

Different from other types of innovation, sustainable innovation is characterized by systemness, that is, rather than dealing with the production process or product component over which they have full control, sustainable innovations engage with the larger system of which they are a part [7] (p. 3). In this regard, Maletič *et al.* [14] suggest that the relationship between sustainable innovations and organizational performance depends on contextual factors (e.g., environmental uncertainty and

competitiveness) and organizational factors (e.g., long term orientation and institutional approaches). Therefore, in order to make a sustainable innovation successful, managers actively envision the linkage between the sustainable innovation and the market [7].

Sustainable innovations often allow firms to follow a differentiation strategy and, consequently, to establish higher prices, which are expected to foster performance [26]. In the same way, sustainable innovations, through this differentiation, promote the search of new markets [27]. According to the empirical survey conducted by the Organisation for Economic Co-operation and Development (OECD) [28], the issues that influence firms to engage in the internationalization process can be disaggregated into four groups: (i) growth causes; (ii) firm's knowledge causes; (iii) reasons reflecting social ties, networks and supply chain relations; and (iv) causes related to the domestic or the foreign market. Sustainable innovation is unequivocally behind these reasons [27,29]. Sustainable innovations encourage firms to internationalization given their own features and needs, such as uniqueness of product, technological competences, economies of scale, competitive pressure, small domestic market and lack of domestic demand, overproduction, unconsolidated foreign orders, possibility to extend sales of seasonal products, and proximity to international customers [30].

2.2. MACS as Guide for Enhancing the Success of Innovations

Accounting literature has conceptualized MACS in different ways. Anthony [31] (p. 17) defined MACS as the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's objectives. Goold and Quinn [32] (p. 43) defined a control system as the process that allows senior management to determine whether a business unit is performing satisfactorily, and which provides motivation for business unit management to see that it continues to do so. Therefore, control systems normally involve the agreement of objectives for the business between different levels of management; monitoring of performance against these objectives; and feedback on results achieved, together with incentives and sanctions for business management." Simons [33] (p. 5) defined MACS as "the formal information-based routines and procedures that managers use to maintain or alter patterns in organizational activities". This definition includes planning systems, reporting systems, and monitoring procedures that are based on information uses [34,35]. MACS provide data to managers, which help them to align individual interests and firm interests, and also to assess how these benefits are met [35,36].

In this study we analyze four of the most used control systems in organizations: benchmarking, balanced scorecard, cost accounting and budget system. Benchmarking refers to the comparison of internal processes to an ideal standard. This management control also assesses and monitors trends in competitor sales, market share or volume. This information can provide a basis for the assessment of a competitor's market strategy [37]. The balanced scorecard makes available management with a comprehensive framework that a company's strategy into a coherent set of performance measures [38]. This management control system supplements traditional financial measures with measures from three additional perspectives: those of customers, internal business processes, and innovation and learning [39]. Budget system refers to the planning phase, in which the monitor is fed goals and other control instructions (e.g., measurement methods, frequency, *etc.*) agreed upon by managers and subordinates. This control system also includes the measurement of actual output in which the monitor

carries out the predesigned measurement instructions. Moreover, budgets details variance report after comparing actual and budgeted outputs [40]. Lastly, cost accounting captures firm's costs of production by assessing the input costs of each step of production. Cost accounting also includes the measurement and record of these costs individually, and also the deviation analysis between planned and actual results.

Previous studies in accounting found that MACS are potential inhibitors from investing in new product development [41,42]. However, recent studies found that MACS could affect positively in the relationship between product innovation and organizational performance under a planning mechanism [17] or under an interactive use of MACS [18].

3. Hypothesis Development

The development of innovations in general or sustainable production processes in particular, does not necessary guarantee a direct impact on organizational performance [43,44]. Commercialization has been generally considered as the last key step in the innovation process, and it need to be properly managed [45]. Therefore, at this point there is a need for managerial tools that allow a firm to better exploit and appropriate the potential benefits from sustainable production [46]. Specifically, a better understanding on the features, meanings and benefits of the innovative sustainable process is needed. It is also needed to understand the competitive environment [13].

According to the above discussion, organizations must align their strategies to include aspects related to innovation and marketing capabilities [47,48]. Maletič *et al.* [14] argued the potential synergies between sustainable innovation and MACS. From a sustainable innovation perspective, MACS allow the company to identify the stakeholders and their needs, measuring the progress towards organizational goals, and helping managers to “understand the current situation and the key issues they must address” [14] (p. 186).

In this regard, sustainable production innovations allow firms to follow a differentiation strategy [26]. Among other strategic priorities, differentiation strategy focuses on offering specialized product features that are valuable for costumers [26]. To implement these strategies successfully, organizations need to have an accurate vision about the current competitive situation to persuade costumers about the features of the sustainable products [49]. Nowadays, retailers and costumers demand relevant information on sustainability of products [50]. This allows organizations to obtain valuable and timely feedback about the evolution of those key features (e.g., customer service or distribution) [13]. Therefore market orientation becomes a key capability for new product introduction [51]. Thus, benchmarking may play a significant role in responding to this need by supporting organizational learning. Benchmarking is a contemporary tool that facilitates managers to develop competitive analysis and to evaluate their competitive position in order to know how better satisfy customers. The objective of benchmarking is to learn from the experience of other successful firms. This information facilitates managers to understand what costumers value and demand, and present the product/service in a way that addresses the existing gap [52,53]. Therefore, benchmarking provides a clear focus for the new product marketing strategies.

Balanced scorecard is a tool connected with benchmarking that provides a balanced focus of financial (e.g., profits and returns) and non-financial indicators (e.g., customer satisfaction or production wastes) [38] that supports the implementation of differentiation strategies. That is, balanced scorecard is a control tool

that operationalizes and translates the strategy to all the agents within the company, providing them with procedures and cues to develop strategic priorities.

Contrarily, traditional MACS, as cost accounting and budgets, are unlikely to support product differentiation strategies [13]. Those tools are internally oriented and mainly emphasize on controlling costs. Thus, the information that traditional MACS provide does not generally suit the complex and diverse environment that involves a product differentiation strategy [13]. Therefore, we formulate the following hypothesis:

H1: Contemporary MACS are more likely to have a positive moderator effect than traditional MACS on the relationship between sustainable production innovations and internationalization.

Our research model is displayed in Figure 1.

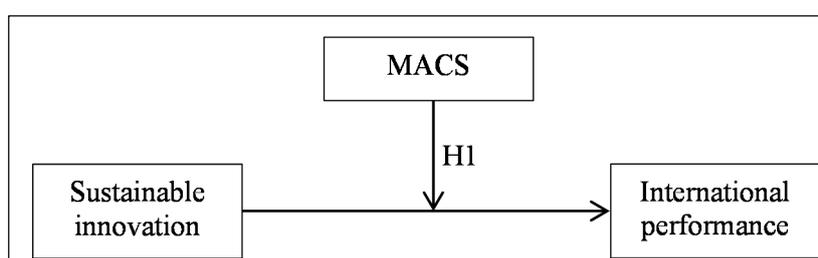


Figure 1. Research model.

4. Methodology and Measurement

4.1. Study Design

We conducted a survey to test our hypothesis. Our survey sample included firms in the Spanish and Portuguese agrifood industry. The sample was obtained from Galician Agri-food Technology Platform and Nervir (business association from Vila Real (Portugal)) databases. This setting has a high environmental impact and is therefore relevant for sustainable innovation. The small size of most of the companies in the sample prevents us to get answers from more than one respondent per organization. CEOs were chosen because they are knowledgeable about the firm's innovation strategy, MACS, and organizational performance. They were interviewed face-to-face, obtaining 123 valid questionnaires (63 Spanish and 60 Portuguese companies), representing a response rate of 98%. Table 1 provides demographics data about the sample structure.

To assess the quality of our research design, a pre-test was performed with six practitioners and five researchers. A pilot study was also carried out with six companies. We tested for nonresponse bias by comparing first and last respondents. Results show no significant differences in their variable responses. Hence, nonresponse bias is not likely a serious concern in this study.

The absence of common method variance caused by single-source bias was analyzed using Harman's one-factor test, which yielded four factors with eigenvalues greater than one, with the first factor explaining 23.22% of the variance, supporting that no single factor was dominant.

Table 1. Demographics data ($n = 123$).

	Number	%
Size (Number of Employees)		
<10	35	28.45
10–49	42	34.15
50–199	32	26.02
200–499	11	8.94
>500	3	2.44
Age (years)		
<10	37	30.08
10–25	42	34.15
26–50	24	19.51
>50	20	16.26

4.2. Variables Measurement

Sustainable innovation: CEOs were asked to indicate the degree of development in their companies of four sustainable innovation production issues on 1–5 Likert scale: (SI1) Development of technologies and new eco-efficient and biodegradable materials; (SI2) Development of processes for reclamation of subproducts and waste; (SI3) Handling and preservation of the local biological resources, especially with its relationship with the natural environment and cultural values; (SI4) Development and improvement of technologies and new equipment for the development sustainable of the natural resources. Those topics were inspired by the first strategic research agenda of the European Research and Technology Platform “Food for Life”.

MACS: Based on Chenhall and Langfield-Smith [13], MACS were classified into two main groups: traditional and contemporary. Cost accounting and budget systems were considered as traditional MACS and balanced scorecard and benchmarking were classified as contemporary MACS. These four tools are widely used in practice in the agrifood industry. Respondents were asked to indicate the degree of use of each control tool on 1–5 Likert scale.

Internationalization: It was measured according to an adapted version of the procedures from Gerpott and Jakopin [54], and Lu and Beamish [55], which include the degree of internationalization on a five-point Likert scale from very low to very high. Descriptive statistics of all the variables are reported in Table 2.

Table 2. Descriptive statistics.

Construct	Mean	Standard Deviation
Sustainable innovation	2.47	0.87
Traditional MACS	3.57	1.10
Contemporary MACS	2.45	1.04
Internationalization	2.64	1.28

5. Empirical Results

We used SmartPLS v.3 software to obtain partial least squares (PLS) estimates for both the measurement and structural parameters. The PLS technique is very suitable for small samples, and it places minimum requirements on measurement levels [56]. By following Hulland [57], our PLS model was analyzed in two stages. The first involved the assessment of the reliability and validity of the measurement model and the second involved the assessment of the structural model.

The model of the current research includes multiplicative interaction terms, which are developed following the procedure outlined in Chin *et al.* [58]. With the objective of minimizing the degree of multicollinearity, all items reflecting the predictor and moderator constructs were standardized.

5.1. Measurement Model: Assessing Psychometric Properties

To analyze the measurement model, we used composite scale reliability and average variance extracted (AVE). The composite scale reliability ranged between 0.685 and 0.857. The AVE ranged from 0.510 to 0.752 and thus exceeded the 0.5 cut-off value [54]. To examine convergent validity, we checked the factor loadings of the measures on their respective constructs. Table 3 shows the PLS analysis results, which confirmed the proposed constructs. Items were loaded on their respective latent variable at greater than 0.7, except in two cases. One item loading was lower than 0.7 but greater than 0.6, and another one was lower than 0.7 but greater than 0.5, which was acceptable.

Table 3. Psychometric properties of measures.

	Standardized Loadings	Composite Reliability	Average Variance Extracted	Cronbach Alpha
<i>Sustainable innovation</i>		0.685	0.510	0.690
SI1. Eco-efficient and biodegradable materials	0.674			
SI2. Reclamation of subproducts and waste	0.859			
SI3. Local biological resources	0.565			
SI4. New equipment	0.598			
<i>Traditional MACS</i>		0.857	0.752	0.707
TMACS1. Cost accounting	0.766			
TMACS2. Budget system	0.957			
<i>Contemporary MACS</i>		0.840	0.724	0.618
CMACS1. Balanced Scorecard	0.854			
CMACS2. Benchmarking	0.847			

Discriminant validity was analyzed by comparing the AVE of each construct and the variance shared between such constructs and other constructs in the model. Table 4 displays the correlations between different constructs in the lower left off-diagonal element of the matrix, and the square root of AVE along the diagonal. The diagonal elements are significantly greater than the off-diagonal elements in the corresponding rows and columns. Results on Table 4 show support for discriminant validity.

Table 4. Discriminant validity coefficients.

	Sustainable Innovation	Traditional MACS	Contemporary MACS	Internationalization
Sustainable innovation	0.628	-	-	-
Traditional MACS	0.395 ***	0.867	-	-
Contemporary MACS	0.382 ***	0.469 ***	0.851	-
Internationalization	0.285 ***	0.346 ***	0.329 ***	N/A

The square root of the AVE value for each of the construct along the diagonal (in bold); Correlations between different constructs in the lower left-off-diagonal of the matrix; *** $p < 0.01$ (two-tailed test).

5.2. Structural Model

The second step in the PLS analysis is the estimation of the specified structural equations. PLS does not make any assumption about data distribution. Thus, the statistical significance of analyzed paths is examined by non-parametric techniques. We used a bootstrapping procedure with 500 resamples. The structural model was tested in three stages, independently, for traditional and contemporary MACS: (1) Main effect of sustainable innovation on Internationalization; (2) Effect of MACS on Internationalization; and (3) Interaction effect. To determine the exploratory power of the structural model, we analyzed the R-square adjusted values of the dependent variable.

The results in Tables 5 and 6 indicated a significant path between Sustainable innovation and Internationalization ($\beta = 0.285$, $p < 0.10$). Furthermore, the results supported our hypothesis since there was a positive and significant interaction effect of Contemporary MACS on the relationship between Sustainable innovation and Internationalization ($\beta = 0.193$, $p < 0.05$). The interaction effect of Traditional MACS on the relationship between Sustainability and Internationalization was not significant.

Table 5. PLS structural model results: path coefficients and R2. Traditional MACS model.

Paths	Traditional MACS		
	Stage I	Stage II	Stage III
Sustainable innovation → Internationalization	0.285 *	0.190 *	0.164
Traditional MACS → Internationalization		0.278 ***	0.273 ***
Sustainable innovation x Traditional MACS → Internationalization			0.127
R ² adjusted	0.101	0.168	0.189

* $p < 0.10$ (two-tailed test); *** $p < 0.01$ (two-tailed test).

Table 6. PLS structural model results: path coefficients and R2. Contemporary MACS model.

Paths	Contemporary MACS		
	Stage I	Stage II	Stage III
Sustainable innovation → Internationalization	0.285 *	0.203 *	0.188 *
Contemporary MACS → Internationalization		0.252 ***	0.205 **
Sustainable innovation x Contemporary MACS → Internationalization			0.193 **
R ² adjusted	0.101	0.170	0.199

* $p < 0.10$ (one-tailed test); ** $p < 0.05$ (one-tailed test); *** $p < 0.01$ (one-tailed test).

6. Conclusions

The relationship between corporate sustainability and organizational performance has been widely studied in last decades. However, literature reveals inconclusive results and there is still a lack of empirical research on the nature of this relationship. Consistently, with recent calls for in-depth studies in this field [14,24,59], our paper analyzed the relationship between sustainable innovation and international performance at organizational level. It also analyzed the potential interaction of MACS in such relationship. In particular, we postulated that MACS types (contemporary vs. traditional) have different moderating effects on the relationship between sustainable innovation and international performance. We expected a stronger moderator effect of contemporary MACS than traditional MACS. Our results supported our expectations, by showing a positive moderating effect of Balanced Scorecard and benchmarking controls (*i.e.*, contemporary MACS).

These findings extend existing management accounting and sustainability literature. Firstly, results are in line with previous research, suggesting that companies that follow differentiation strategies may benefit from the use of contemporary MACS [13]. Specifically, MACS with similar features of contemporary types of control are able to enhance the impact of innovation developments into organizational performance [17,18]. Secondly, from a sustainability perspective, our paper confirms the existence of critical organizational capabilities that may be displayed in order to enhance the impact of sustainable innovations into organizational performance [7]. In this line, Maletić *et al.* [14] (p. 186) suggested that sustainable innovations should be complemented with “the capability of an organization to measure and manage the interaction among business, society and the environment”. Similarly, Boons *et al.* [7] recommend building a shared project vision and creating broad and reflexive learning processes in order to make successful market introduction. In this line, this paper makes it clear that contemporary MACS play a central role in actively guiding the linkage between sustainable innovation and customer. The use of this tool supports the necessary systemic perspective on marketing [7] that facilitates the introduction of sustainable innovations into international markets.

This paper has several limitations. Firstly, it used a general conceptualization of sustainable innovation. Future research may use more in-depth conceptualizations that allow the gaining of greater insight about the relationship between sustainable innovations, MACS and organizational performance. As Maletić *et al.* [14] suggested, the exploration vs. exploitation sustainable innovations paradox should be empirically developed. Furthermore, as with many other studies in management accounting literature, this paper only considered a limited number of MACS tools. This limitation implies that results should be interpreted with care. Future research could analyze empirically the dynamics of MACS in the relationship between sustainable innovation and organizational performance.

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Author Contributions

All authors contributed equally to this work. Ernesto Lopez-Valeiras conceived and drafted the paper; Jacobo Gomez-Conde analyzed the data; David Naranjo-Gil reviewed related studies. All authors wrote, reviewed and commented on the manuscript. All authors have read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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