Corporate social responsibility, green innovation and competitiveness – causality in manufacturing

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Abstract

Purpose – The purpose of this paper is to explore the interplay of corporate social responsibility (CSR) and green innovation in boosting competitiveness in manufacturing in an emerging market context. This study adds green innovation as mediator in the relationship between CSR and competitiveness.

Design/methodology/approach – A model with three second-order constructs is developed and tested, in a sample of 325 managers from manufacturing companies in Ecuador, using quantitative and cross-section methods.

Findings – After obtaining adjusted and validated measurement models, a structural equation model was conducted, where the main hypotheses were confirmed, providing empirical evidence that CSR and green innovation significantly influence manufacturing competitiveness in a developing economy.

Research limitations/implications – This study considers only manufacturing companies in Ecuador, focusing on CSR practices in a single territorial case study. It arguably contributes to reinforce the business case for CSR, with new evidence on the causal relationships between CSR, green innovation and competitiveness, in the context of emerging market manufacturing industries. Although the literature often points at a positive relationship between CSR and firm-level competitiveness, supporting empirical evidence remains scarce. This model, introducing green innovation as mediator in the relationship between CSR and competitiveness in developing markets, accounts for a novel theoretical approach.

Practical implications – The findings are consistent with previous research, reporting the positive influence of CSR activities on organizational competitiveness, reducing risks and cost structures, as well as improving the relationship with employees, enhancing talent attraction, retention and productivity. Incorporating formal CSR tools to the model allowed us to highlight the relevance of 'green' certifications as a means to provide a competitive edge, along with increased bargaining power in the supply chain, resulting in

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competitiveness gains. The findings on the role of green innovation suggest a transition from cost-savings to a more strategic leverage on responsible innovation as a source of competitive advantage.

Social implications – Additionally, this research contributes to shed light on the impact of green processes and product innovations on social and environmental performance, providing evidence of a more efficient use of energy and natural resources, increasing productivity and by extension, profitability. CSR shapes an innovation culture that, through the use of social, environmental and sustainability controllers, can create new business models, products, services or processes that boost both firm-level and supply chain productivity, benefits that eventually spill over to the host community.

Originality/value – This study aims at bridging the research gap on the interplay of CSR, green innovation and competitiveness in manufacturing in an emerging market context.

Keywords Competitiveness, Corporate social responsibility, Manufacturing industry, Green innovation, Market performance, Intangible performance

Paper type Research paper

1. Introduction

Social responsibility is a philosophy of action that considers the organization as a social protagonist associated with stakeholders, each playing a particular role (Davis *et al.*, 2005). When an organization acts with social responsibility, it has a permanent interest in increasing the value it delivers, both social and economic, meeting the demands of its stakeholders. Responsible business arguably yields multiple benefits, including increased brand image and reputation; higher sales revenue and customer loyalty; enhanced productivity; lower operating costs; improved attraction and retention of employees; and reduction of regulatory oversight (Panwar *et al.*, 2016; Porter and Miles, 2013; Servaes and Tamayo, 2013).

Awareness has been steadily raising around the pronounced gap between socioeconomic strata and the alarming levels of degradation and pollution worldwide. According to The World Bank (2018), 10.7% of the world's population, i.e. 760 million people, lives with $1.90 per day, up from 9.6% in 2015. Another revealing fact is that 90% of the world's poverty is concentrated in low-income countries (ibid). Social inequality and youth unemployment are growing dramatically, including a widening gender pay gap, with women's salaries on average 25% lower than men in similar jobs (Business and Sustainable Development Commission, 2017). Pollution and environmental degradation lead to the anticipated death of 12.6 million people per year (UN Environment, 2017). According to the Business and Sustainable Development Commission (2017), the frequency of natural disasters owing to climate change has doubled since the 1980s. Let alone the devastating effects of COVID-19, which spread is linked to impoverished health and sanitary conditions. A 150 years of industrialization, along with the depletion of natural resources, with no environmental foresight, have alarmingly increased the amount of greenhouse gases and climate risk.

How firms manage social and environmental impact out of their value chain is likely to become a core driver of competitiveness. Even if the impact of CSR initiatives has been widely addressed in the literature, an organizational performance view focused on manufacturing and how CSR may boost competitiveness through green innovation, remains largely underexplored (Valmohammadi, 2014). Our research takes a closer look at green innovation as a mediator in the arguably causal interplay of responsible business and competitiveness, as CSR-minded innovation is increasingly perceived not just as an answer to environmental demands but also as a driver of sustainable growth (Kam-Sing Wong, 2012).

Studies on the influence of social responsibility and green innovation on competitiveness have been recurrent in developed countries, such as the USA (Auger *et al.*, 2003; Marin and Ruiz, 2007), Europe (Battaglia *et al.*, 2014; Castaldo *et al.*, 2009; Turyakira *et al.*, 2014) and selected Asian markets (Chaudhary, 2009; Chen, 2008; Kam-Sing Wong, 2012), but very little research

has been conducted in developing economies. The purpose of this study is to contribute to bridge that gap by exploring how social responsibility and green innovation influence competitiveness in the manufacturing sector in a developing market setting, assessing empirical evidence gathered from Ecuador. In Ecuador, as in many emerging economies, manufacturing is constantly striving to account for a larger share of GDP, in an attempt to leap into higher global value chains (Gereffi, 2019). Yet increased industrial output is often achieved at the expense of diminished social value and detrimental environmental impact. This pervasive tradeoff is seemingly being challenged in Ecuador by the emergence of a breed of green-minded innovators in the manufacturing sector. Our expected contribution is centered on the mediation effect of green innovation in the interplay of CSR and competitiveness in manufacturing in an emerging market context. The mediation model, together with the focus on manufacturing and emerging markets, account for gaps in the literature, worth addressing so as to provide empirical evidence to extended theoretical claims. The next section presents a critical review of relevant literature, followed by the methodology in Section 3, while the findings from our model, largely supporting our hypotheses on a positive relationship between the three constructs, are discussed in Section 4, with implications for theory, practice, policy and society summarized in the concluding Section 5.

2. Literature review

2.1 Corporate social responsibility

Corporate responsibility gains traction in the 1930s to claim a substantial role in various aspects of organizational theory, largely associated with the food industry, because of its impacts on different segments of society. However, it was not until the 1960s and 1970s that CSR matured (Carroll, 1979). Its emergence goes back to the modern era, from the 18th to the middle of the 20th century, as the Industrial Revolution sparked social concerns from some employers toward their workers and family members (Caligiuri *et al.*, 2013). In the 21st century, the development of the welfare state, with a charitable and philanthropic spirit, has promoted the creation of institutions sensitive to societal demands.

Battaglia *et al.* (2014) discussed the adoption of CSR initiatives, by classifying them into four groups related to stakeholder theory, as indicated by Perrini *et al.* (2001), who in turn claim this theory is key in the interpretation of how CSR affects performance. The four dimensions are environmental-related CSR activities, which aim at reducing the firm's negative impact on the environment (Bekmezci, 2015); workplace-related CSR activities, focused on fostering equitable opportunities, diversity and assistance for better work-life balance (Caligiuri *et al.*, 2013); community-related CSR activities, which refer to how business operations affect society (Olanrewaju, 2012); and marketplace-related CSR activities, which indicate how organizations operate based on their suppliers, customers and other players along the supply chain (Bhardwaj, 2016; Tabesh *et al.*, 2016). In studies that conducted exploratory factor analyses, a fifth factor emerged, named formal CSR tools, representing standardized managerial practices, such as the use of sustainability labels, as well as management and sustainability certification and reporting (Battaglia *et al.*, 2014; Turyakira *et al.*, 2014).

2.2 Competitiveness

From an institutional economics perspective, competitiveness refers to the success of a production system, whether local, regional or national, as part of an appropriate institutional context (Cetindamar and Kilitcioglu, 2013). Competitiveness is represented under different parameters and its scope remains debatable. Vilanova *et al.* (2009) define competitiveness as a function of the market, that is, the factors that shape competition. Battaglia *et al.* (2014),

argue that firm-level competitiveness is shaped by the company's sustainability capacity, that is, its endurance, as measured by market share, profitability and returns.

Such view centered on the firm, was spotlighted in Porter's *The Competitive Advantage of Nations* (Porter, 1990; Ketels, 2006). The fundamental claim emerging from such seminal reference, is that competitiveness is a firm-level outcome. This outcome results from the productivity gains attained by re-tooling the primary and supporting activities of the firm's value chain. Yet such productivity is also contingent on the business environment, as argued by Porter (1990, 2004) through his Diamond Model, highlighting the critical choice of location in unleashing competitiveness (Alcácer and Chung, 2007). In developing economies such as Ecuador, country-specific advantages tend to carry more weight in shaping the competitiveness of firms, particularly that of emerging market multinational enterprises (Gugler, 2017). Productivity is indeed at the core of Porter's definition of competitiveness (Porter, 2004). For those efficiency gains to lead to a competitive positioning sustainable over time, the value created by the firm should in turn meet the demands of its various stakeholders (Collazzo-Yelpo and Kubelka, 2019). Such is the underlying logic of the creating shared value (CSV) concept coined by Porter and Kramer (2011), namely, that firms should deliver to its diverse set of stakeholders to stay competitive – some stakeholders pursue social value while others pursue economic value.

Based on the review of multiple studies that adopted quantitative methods to demonstrate a positive relationship between CSR and competitiveness, Battaglia *et al.* (2014) focused on certain dimensions of competitiveness, namely, market performance and intangible assets performance. Market performance is arguably the most common indicator to measure the competitive status of an organization. The ability to generate benefits in the medium and long term becomes an important factor for the economic performance of the firm (Battaglia *et al.*, 2014; Tomšič *et al.*, 2015), measurable through indicators such as profitability on own resources, sales performance, or cash flow (Morioka and de Carvalho, 2016). Battaglia *et al.* (2014) measured the profitability of the organization using four indicators: sales or turnover trend; demand of traditional customers; demand of new customers; and level of attraction of new members and partners to business (Apospori *et al.*, 2012; Carroll and Shabana, 2010; Turyakira *et al.*, 2014). On the other hand, "the resource-based view of the firm, explicitly recognizes the importance of intangible assets, such as knowledge (human capital), corporate culture and reputation" (Battaglia *et al.*, 2014, p. 878). Therefore, resources are classified into intangible, tangible and personnel-based. Intangible resources include reputation, technology and organizational knowledge; the latter also encompassing culture, training, employees' experience, commitment and loyalty (Battaglia *et al.*, 2014; Tomšič *et al.*, 2015).

There has been a heated debate about the influence of the strategic application of social responsibility on competitiveness. Theoretically, CSR is important in the financial and competitive practice of the organization (Lee and Min, 2015). Several CSR scholars highlight the upside for the firm, such as economic benefits, as responsible business tends to reduce costs (Reverte, 2012), unlocking both social benefits, by improving relations with the community (Battaglia *et al.*, 2014) and environmental benefits, for instance by reducing emissions resulting from process optimization and rational resource management. Some argue that economic and social objectives are fully connected in the long-term (Windolph *et al.*, 2014). Smith (2005) stated that institutional and social investors have found a common basic premise for business long-term well-being that referred to the importance of having good corporate, social and administrative practices. In addition, the mistake arguably made when questioning social value practices, lies in the expectations of short-term results, ending in a misinterpretation of unnecessary spending, when in fact they should be evaluated in the

long-term to capture benefits such as sustainable competitiveness (Porter and Miles, 2013). That is, companies cannot even function if they choose to isolate themselves from the social environment, because their competitiveness and overall operations depend largely on the circumstances of the location in which they compete (Porter and Kramer, 2002).

In terms of market performance, the literature suggests that CSR is an influential element to improve product and service quality, as it responds to stakeholders' expectations (Windolph *et al.*, 2014). Moreover, practices that grant fair treatment to employees, along with an optimal management of resources, generate a feeling of return for the hosting community. This in turn improves consumers' perception and company revenues (Turyakira *et al.*, 2014). There is arguably a growing demand for green products, by both traditional and new clients, mainly fueled by economic globalization and information transparency, which have favored the emergence of socially responsible consumers. In addition, investors give increasing importance to aspects such as the environment, social impact and corporate governance (ESG) practices when deciding where to invest (Humphrey *et al.*, 2015). Regarding performance steaming from intangible assets, human capital productivity may generate additional benefits by having talented employees managing those assets, unlocking sustainable competitive advantages (Antonietti and Marzucchi, 2014). The implementation of CSR-related practices is likely to have a positive effect on human talent, reducing costs associated with staff retention and absenteeism (Windolph *et al.*, 2014).

Empirical evidence exposes CSR as an exogenous variable. To validate this argument, DeMelo *et al.* (2017) analyzed the relationship between CSR and competitiveness over a period of 19 years. In a bibliometric study, 344 articles related to the subject were reviewed through the Web of Science citation networks. The first publication on this relationship dates back to 1996, but it has been from 2006 onwards that we see a considerable increase in scientific output. Results showed that the benefits of consistent responsible business increase firm competitiveness (Apospori *et al.*, 2012; Del Brío and Junquera, 2012; Lu *et al.*, 2016). Consequently, we developed the first of our hypotheses, to be addressed in the following sections:

H1. Social responsibility practices are positively related to the competitiveness of companies in the Ecuadorian manufacturing sector.

2.3 Green innovation

Chen *et al.* (2006) defined green innovation as physical and virtual innovation, in hardware or software, through the improvement of products and processes, considering technologies related to energy saving, pollution prevention, waste recycling, eco-friendly product design, the use of ecological packaging and the environmental management of companies. Based on the above, there is a difference between a conventional innovation and a green innovation, being the latter driven by the need to comply with environmental regulations or meet the ecological concerns of the market (Bekk *et al.*, 2016). The study of green innovation is relatively new and the literature has focused mainly on its definition and theoretical explanation (Hermundsdottir and Aspelund, 2021).

A conventional innovation generates value through efficiency, productivity, or performance improvements. On the other hand, green innovation creates value by addressing environmental concerns of the market, industry, firm and/or consumers through products and processes (Albort-Morant *et al.*, 2017; Charmondusit *et al.*, 2016). There are two green innovation dimensions: green product innovation; and green process innovation. Green product innovation is about the application of innovative ideas aimed at the design, manufacture and strategic communication of new products, whose novelty and ecological design far exceed conventional

products (Bhardwaj, 2016; Kam-Sing Wong, 2012). Green process innovation is related to energy saving, pollution prevention, waste recycling and non-toxicity (Chen *et al.*, 2006).

According to Boehe and Barin-Cruz (2010), attention to environmental impact allows product differentiation and improves internationalization opportunities to markets where green consumers are more active, thus improving market performance and business turnover in the long-term (Lu *et al.*, 2016). This is where the green innovation variable impacts competitiveness (Sellitto *et al.*, 2020). Innovation must create value, and for that it should unlock productivity gains, generating either higher margins, higher profits, greater value for stakeholders, higher market share, better corporate image, performance improvement in ecological terms or a combination of the above, leading to increased competitiveness (Bornschlegl *et al.*, 2016; Chen *et al.*, 2012; Tu and Wu, 2020).

Organizations are likely to invest in green innovations because they help develop opportunities for new markets and create a competitive advantage by positioning themselves as eco-friendly businesses (Chen *et al.*, 2006; Kam-Sing Wong, 2012). A successful green innovation benefits the firm by achieving greater efficiency and strengthening its eco-friendly image, ultimately contributing to higher profitability (Chen, 2008). Corporations, which are pioneers in innovation, are likely to demand higher prices for green products, improve corporate image, better sell their environmental technologies or services and, eventually develop new markets to gain competitive advantage. Based on the above literature and the evidence provided, we developed our second hypothesis:

H2. Green innovation is positively related to the competitiveness of companies in the Ecuadorian manufacturing sector.

2.4 Mediating effect

Firms with a specific type of CSR orientation can enhance their innovative capability (Bocquet *et al.*, 2013; Marin *et al.*, 2017). The value of green innovation arguably lies in the opportunity to increase environmental management performance, while meeting environmental protection requirements. As such, green innovation is perceived not only as an answer to environmental demands but also as an opportunity to boost sustainable corporate growth (Bekmezci, 2015). However, prior to implementing green innovation, organizations need to consider the benefits that consumers could perceive (Chen *et al.*, 2006).

Green innovation has been presented in different empirical studies mainly as an exogenous variable, in some cases as a control variable and rarely as a mediating variable (Albort-Morant *et al.*, 2017; Bhardwaj, 2016; Chen *et al.*, 2012; Kam-Sing Wong, 2012). A large share of the literature on green innovation is theoretical, aimed at its conceptualization and development, mostly as the meaning and scope of green innovation are arguably still in the making (Bekk *et al.*, 2016; Chen *et al.*, 2012; Del Brío and Junquera, 2012; Lee and Min, 2015). Our study expects to make a contribution by exploring the mediation of green innovation in the relationship between CSR and competitiveness, operationalized through the following hypotheses:

H3. CSR is positively related to green innovation in the Ecuadorian manufacturing sector.

H4. Green innovation mediates the relationship between CSR and competitiveness.

The hypotheses above are formulated separately so as to purposely capture the relationship between the CSR measurement and the mediator (green innovation) on the one hand and the interplay of green innovation and the dependent variable on the other.

2.5 Research model

Building on the literature reviewed and the hypotheses derived thereof, a research model (Figure 1) was developed, with three second-order constructs, by adapting elements of previous research, namely, CSR activities and competitiveness from Battaglia *et al.* (2014) and green innovation from Chen (2008), aiming to evaluate Ecuadorian managers' perceptions about the performance impact of CSR-related activities, the degree of green innovation, and their judgment on how CSR and green innovation shape their firms' competitiveness.

The survey instrument evaluated five CSR dimensions through 14 items: formal CSR tools, with five items; workplace-related CSR, with three items; environment-related CSR, with three items; marketplace-related CSR, with three items; and community-related CSR, with two items (statistically non-significant as shown by the pretest). Competitiveness was measured through two dimensions: market performance, with four items; and intangible assets performance, with five items. Finally, green innovation was measured through two dimensions: green product innovation, with four items; and green process innovation, with five items.

Control variables are introduced to better understand when and how CSR practices and green innovation might influence competitiveness. Three control variables were added: export capacity (H_5), as it is necessary to develop competitive advantages to operate successfully in the global market (Galbreath, 2019); firm's age (H_6); and administrative management (H_7), as they are relevant for innovation and competitiveness (Younis *et al.*, 2020).

3. Methodology

The current research has a quantitative paradigm, with deductive logic and causal scope. Indeed, quantitative methods were used to examine the link between CSR dimensions, green innovation and competitiveness. A pen-and-paper questionnaire was developed for data collection and submitted to respondents who held managerial and administrative positions in manufacturing companies.

All items, except demographic information, were measured on a five-point Likert scale, ranging from 1 for "strongly disagree," to 5 for "strongly agree," to evaluate CSR trends, green innovation and competitiveness dimensions in the period 2013–2017 and provide evidence on the effectiveness of their actions (Battaglia *et al.*, 2014; Kam-Sing Wong, 2012). As the items for each dimension were adapted from previous research and modified to meet the needs of this study, a pretest, a pilot test, a confirmatory factor analysis (CFA) and Cronbach's alpha test were used to guarantee scale reliability.

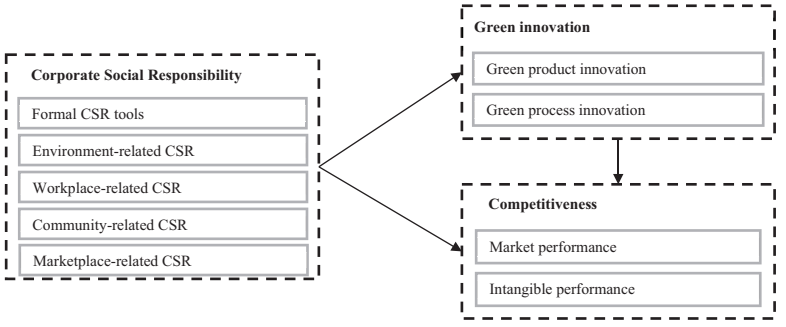

Figure 1.
Research model

3.1 Pretest and pilot test

To validate the questionnaire's translation to the Ecuadorian context, with a native Spanish language, the original instrument was translated from English to Spanish, retranslated from Spanish to English by experts and then adjusted according to the needs of this research. However, as there were certain modifications in the writing and translation, a preliminary test was performed, to provide content validity and reliability of scales. The unknown terms for respondents were omitted, to keep simple, specific and concise questions, to reduce bias and minimize ambiguity.

In the preliminary test, five managers were invited to complete the questionnaire and interviewed by the researchers for approximately 20 min to gather their comments. Based on those comments, questions were reworded and redefined. Both the theory and the empirical evidence, showed that the dimensions had an adequate model adjustment, revalidated in the CFA. The refined questionnaire was tested with 30 manufacturing company managers. Respondents were asked to use a five-point scale to assess the frequency they adopt CSR actions and improvements in their products and processes related to green innovation in the past five years. They were also asked to evaluate competitiveness indicators in the past five years, using a five-point scale, to provide evidence on the effectiveness of CSR and green innovation actions on competitiveness variables. Results of the pilot test were satisfactory, fulfilling the first step for the application of structural equations.

3.2 Sample

Research conducted by Battaglia *et al.* (2014), Turyakira *et al.* (2014) and Kam-Sing Wong (2012), suggested studying manufacturing in areas other than the production of technological items and textiles, as those sectors have traditionally received more attention owing to their usually higher environmental impact. Therefore, manufacturing companies (NACE code C) that most contribute to the Ecuadorian Gross Domestic Product were considered, such as those related to the production of food and beverage products (C11 and C12), chemical-pharmaceutical substances (C20 and C21) and rubber and plastic products (C22), adding up to 2,119 companies. According to data sourced from the National Institute of Statistics and Censuses of Ecuador (National Institute of Statistics and Censuses, 2020), manufacturing makes a significant contribution to the country's GDP, with an average share of 14% over the past five years. In addition, the report states that the manufacturing industry production index has experienced a steady increase of 41.76% in the period 2015–2020, with the remarkable performance of some sectors, including food and beverage products, chemical-pharmaceutical substances, and rubber and plastic products, as driving factors (ibid).

The study was carried out in the city of Guayaquil, where 50.4% of the country's manufacturing companies – and all of the relevant industries mentioned above – were located. Surveys were conducted in late 2017, with prior consent from respondents, who assessed CSR initiatives and green innovation practices implemented by their firms in the past five years. A stratified sampling was applied, using the formula for finite populations. We randomly sampled 400 companies. The questionnaires were answered by a mix of e-mail, telephone and face-to-face interviews. After the data exploration process, we obtained 325 valid responses (81.25% rate). To minimize common method bias, we compared e-mail, telephone and face-to-face responses, revealing no systematic differences in the measurements.

The majority of respondents represented companies from the food and beverage industry (60% or 193/325), followed by chemical-pharmaceutical (25% or 82/325) and rubber and

plastic (15% or 50/325). Participants were mostly middle-level managers (58% or 187/325), followed by senior managers (42% or 138/325). The data were, therefore, sourced from seasoned managers, with full command of operations and having relevant technical expertise so as to properly assess the interplay of the variables in the model. Moreover, 45% of the firms have more than 20 years in business (147/325), followed by 17% operating between 16 and 20 years (54/325). In terms of headcount, 35% have between 10 and 45 employees (115/325), followed by 25% employing between one and nine workers (80/325) and 20% between 50 and 100 workers (65/325). A mean difference test was performed to determine if observations from different sectors belong to the same population. No significant differences were found.

4. Results

Data analysis was conducted in two phases. First, a confirmatory factorial analysis (CFA) with AMOS 9.0 was performed on the questionnaire data, to examine model fit and assess construct validity and reliability. Finally, structural equation modeling (SEM) was used to test the hypotheses (see Appendix). Reliability was assessed using Cronbach's alpha and average variance extracted (AVE) values.

4.1 Measurement model

A measurement model was developed to verify model fit and obtain the standardized loadings across dimensions and their items and between each pair of dimensions. Before computing estimates through SEM, it is important to test whether the measurement model is acceptable, by conducting a CFA. Table 1 shows a summary of CFA results for the four CSR

		Factor			
Factor/items		Formal CSR tools	Environment-related CSR	Workplace-related CSR	Marketplace-related CSR
Formal CSR tools					
CSR14	ISO 14001	0.818	–	–	–
CSR15	EMAS	0.794	–	–	–
CSR16	Ethic certif.	0.850	–	–	–
CSR17	Product certif.	0.833	–	–	–
CSR18	CSR report	0.787	–	–	–
Environment-related CSR					
CSR19	Audit	–	0.893	–	–
CSR20	Monitoring system	–	0.940	–	–
CSR21	Raw material/products	–	0.773	–	–
Workplace-related CSR					
CSR22	Codes of conduct	–	–	0.824	–
CSR23	Benefits employ	–	–	0.930	–
CSR24	Staff evaluation	–	–	0.879	–
Marketplace CSR					
CSR27	SC agreement	–	–	–	0.755
CSR28	GSCM env.	–	–	–	0.923
CSR29	GSCM env/eth certif.	–	–	–	0.885

Note: $n = 325$

Table 1. Confirmatory factor loadings of CSR questionnaire items

dimensions. The measurement model was estimated using the maximum likelihood method. Correlations between each pair of dimensions were in the range between 0.30 and 0.64 (Table 4). Factor loadings were in the range between 0.75 and 0.94, significant at $p < 0.001$. Indices such as degrees of freedom = 71, the normed chi-square statistic ($\chi 2$/df) = 2.24, the comparative fit index (CFI) = 0.974, the residual square mean root (SRMR) = 0.053 and the root mean square error of approximation (RMSEA) = 0.062, evidenced that data presented a good fit. Cronbach's coefficients were in the range between 0.88 and 0.91, which were higher than the 0.7 convenience level suggested by literature. AVE values were in the range between 0.67 and 0.77, exceeding the 0.5 acceptance limit, which indicated that the variations captured by the questionnaire items were much higher than the variation caused by the measurement error (Raykov, 2012).

Table 2 shows a summary of CFA results for the two dimensions of green innovation. Factor loadings were in the range between 0.76 and 0.93, significant at $p < 0.001$. The degrees of freedom = 26, the normed chi-square statistic ($\chi 2$/df) = 2.40, the comparative fit index (CFI) = 0.984, the residual square mean root (SRMR) = 0.047 and the root mean square error of approximation (RMSEA) = 0.066, showed satisfactory goodness-of-fit indices. Correlation between product and process green innovation was 0.611, below 0.85, which reveals no multicollinearity (Table 4). AVE from the global model was 0.72. Cronbach's alpha values for all dimensions were greater than 0.5 and 0.924 for the entire model, reinforcing reliability.

Table 3 presents a summary of CFA results for the two dimensions of competitiveness, i.e. market performance and intangible assets performance. With maximum likelihood model estimation, the correlation between both dimensions was 0.564 (Table 4) and the factor loadings were in the range between 0.74 and 0.93, significant at $p < 0.001$. The data showed satisfactory goodness-of-fit indices (CFI = 0.979, SRMR = 0.058, RMSEA = 0.073). The $\chi 2$ statistic was 70.40 with 26 degrees of freedom ($p < 0.001$), giving a χ^2/df ratio of 2.708, below the limit of 5, which indicated a good model fit. Cronbach's coefficients were 0.896 and 0.919, respectively, higher than the 0.7 limit. AVE values were 0.705 and 0.693, indicating that the variations captured by the questionnaire items were much higher than the variation caused by the measurement error (Table 5). In summary, the results of all previous tests evidenced adequate reliability and validity of the questionnaire items and dimensions.

CSR had a global reliability of 0.92, green innovation a Cronbach's alpha of 0.924 and competitiveness an alpha of 0.913. According to these results, reliability and validity in this study are adequate. In addition, we applied the Fornell and Larcker measure of the AVE, to assess discriminant validity. To satisfy the discriminant validity requirement, the AVE square root of a latent variable must be greater than the correlations between dimensions in the model. For instance, the AVE square root for formal CSR tools and environment-related CSR dimensions were 0.857 and 0.879 in Table 5, which are greater than their correlation of 0.635 in Table 4. Therefore, the results demonstrated discriminant validity between both dimensions. All AVE square roots in Table 5 were greater than correlations between all dimensions in Table 4. Thus, discriminant validity was acceptable.

4.2 Structural model

With the measurement models (CFA) of second-order constructs, the next step was to perform the evaluation of the structural model (Appendix). Table 6 reports the results and the structural path estimates. Measures indicated that goodness-of-fit of the complete model is acceptable ($\chi 2$/df = 1.54, CFI = 0.97, SRMR = 0.07, RMSEA = 0.041). In addition, all estimated paths were significant and supported the hypotheses of this study, suggesting convergent validity. The expected positive impact of CSR on competitiveness (*H1*), green

Factor/items		Factor: Product innovation	Factor: Process innovation
Green product innovation			
INN41	Ecological packaging	0.922	–
INN42	Product recycling	0.766	–
INN43	Recycled materials	0.842	–
INN44	Recyclable materials	0.885	–
Green process innovation			
INN45	Use of resources	–	0.792
INN46	Green production system	–	0.932
INN47	Renewable technology	–	0.813
INN48	Environmental efficiency	–	0.901
INN49	Environmental guidelines	–	0.763

Note: $n = 325$

Table 2. Confirmatory factor loadings of green innovation questionnaire items

innovation on competitiveness (*H2*), and CSR on green innovation (*H3*), all three as a second-order construct, were supported by their significant standardized estimates of 0.512, 0.600 and 0.427 ($p < 0.001$). We found that the application of formal CSR tools, environment-, workplace- and marketplace-related CSR, along with green product and process innovation, increase the market and intangible assets performance of manufacturing organizations, verifying the causal relationships proposed in this study.

The total effects of the mediation, including the direct and the indirect effects, were measured and assessed (Baron and Kenny, 1986; James and Brett, 1984; Preacher and Hayes, 2004, 2008). The direct effect between CSR and competitiveness was 0.523 and, when adding the variable green innovation, the indirect effect was 0.238, both significant at 95% confidence level. Results show that there is a mediation of green innovation in the relationship between CSR and competitiveness. For this reason, the fourth hypothesis of mediation was accepted. However, this effect is less than the significant direct effect of both CSR and green innovation. Thus, both constructs explain, independently, much of competitiveness variability. The export capacity variable (*H5*) also presented a significant

Factor/Items		Factor: Market performance	Factor: Intangible performance
Market performance			
COMP30	Turnover	0.856	
COMP31	Demand traditional customer	0.913	
COMP32	Demand new customer	0.809	
COMP33	Business attraction	0.743	
Intangible performance			
COMP36	Personnel motivation		0.816
COMP37	Personnel productivity		0.760
COMP38	Reputation		0.930
COMP39	Stakeholders		0.885
COMP40	Relation with credit		0.794

Note: $n = 325$

Table 3. Confirmatory factor loadings of competitiveness questionnaire items

coefficient in the proposed structural model, while no statistical significance was found in the coefficients of the other control variables (*H6* and *H7*).

5. Discussion, implications and limitations

This study arguably contributes to multiple research areas related to CSR, with new evidence on the causal relationships between CSR, green innovation and competitiveness, in the context of the Ecuadorian manufacturing industry. The findings on the relationship between CSR and competitiveness (*H1*) are consistent with previous studies that reported the positive influence of CSR activities on organizational competitiveness (Boehe and Barin-Cruz, 2010; Lu *et al.*, 2016; Turyakira *et al.*, 2014), by reducing risks and cost structures over time. CSR focused on human talent seems to trigger an improvement in the relationship with employees, which in turn improves turnover rates and increases motivation and labor productivity. In addition, it has a positive impact on competitiveness variables such as image, reputation, productivity and innovation, when firms complement their activities with health and safety prevention initiatives for their employees. Regarding formal CSR tools, Castaldo *et al.* (2009) and Nicholls (2002), indicated that companies acquire various certifications to differentiate themselves from competitors, and encourage purchases from green customers, all supported by our findings, as certifications seem to enhance competitiveness.

Findings on the relationship between green innovation and competitiveness (*H2*), show a positive and significant coefficient, in line with previous studies which stated that most firms initially decide to be green to generate savings in short-term costs, and then, they would carry on these initiatives for strategic considerations (Albort-Morant *et al.*, 2017;

Table 4. Correlations among dimensions

			Estimate
Formal CSR tools	<->	Environment-related CSR	0.635
Formal CSR tools	<->	Workplace-related CSR	0.544
Formal CSR tools	<->	Marketplace-related CSR	0.539
Environment-related CSR	<->	Workplace-related CSR	0.377
Environment-related CSR	<->	Marketplace-related CSR	0.540
Workplace-related CSR	<->	Marketplace-related CSR	0.304
Product innovation	<->	Process innovation	0.611
Market performance	<->	Intangible performance	0.564

Table 5. Dimensions' Cronbach's α coefficients and AVEs

Constructs	Cronbach's α	AVE	The square root of AVE
CSR Model	0.920	0.724	0.851
Formal CSR tools	0.908	0.735	0.857
Environment-related CSR	0.897	0.772	0.879
Workplace-related CSR	0.904	0.760	0.872
Marketplace CSR	0.882	0.667	0.817
Green Innovation	0.924	0.720	0.849
Product innovation	0.913	0.710	0.843
Process innovation	0.923	0.732	0.856
Competitiveness	0.913	0.700	0.837
Market performance	0.896	0.705	0.840
Intangible performance	0.919	0.693	0.832

Kam-Sing Wong, 2012). For this reason, companies invest in green innovation because "being greener" helps them develop new market opportunities, increase their productivity and competitive advantage (Chen *et al.*, 2006) and, complemented with CSR (*H3*), activate new forms of departmental interaction, innovate in products, services, processes and grant new job opportunities. As Ghisetti and Rennings (2014) stated, green process and product innovations could lead to a reduction in energy use and resources, increasing productivity and by extension, profitability. Hence, both theory and empirical evidence, suggest that green innovation helps companies achieve greater efficiency, to establish and strengthen their skills, improve their image, and all of them combined, contribute to profitability. It would also allow them to evolve as an organization and ensure a more sustainable future for next generations.

Our results revealed a partial mediation of green innovation (*H4*). However, this effect is less than the significant direct effect; in other words, both constructs explain, independently, much of competitiveness variability. Therefore, CSR and green innovation practices would be important for the generation of competitiveness. Our research joins other studies which have indicated that CSR contributes to shape an innovation culture that, through the use of social, environmental or sustainability controllers, can create new business models, products, services or processes (Battaglia *et al.*, 2014) and the possibility of reassigning this innovation to other organizations through the supply chain (Porter and Miles, 2013). Innovation performance can be a direct and effective competitive implication that complements CSR initiatives, owing to the accumulation of know-how and increased technical capabilities (Albort-Morant *et al.*, 2017; Boehe and Barin-Cruz, 2010; Humphrey *et al.*, 2015; Lu *et al.*, 2016; Tomšič *et al.*, 2015). We may conclude that our findings are consistent with the literature that claims that CSR and green innovation are important drivers for achieving competitiveness in the manufacturing industry, in a developing market setting, such as Ecuador. Our empirical results suggest that export capacity (*H5*) could play an important role in inducing companies to embrace both the green process strategy and the innovation of organic products, as operating successfully in the global market requires the adoption of competitive advantages (Alarcón and Sánchez, 2016).

Our review of the literature suggests an incomplete understanding of how CSR and green innovation impact on competitiveness across different industries, notably so in manufacturing companies. We found that green practices contribute to improved financial results and competitiveness in international markets, as consumers increasingly screen for and reward green processes behind the products they acquire and the services they receive, even over perceived quality and price. Such evidence has been reported in multiple studies across industries in both developed and developing economies (Antonietti and Marzucchi, 2014;

Path from	Path to	*H*	Result	Standardized estimation	*p-value*
Corporate social responsibility	Competitiveness	H_1	Supported	0.523	***
Green innovation	Competitiveness	H_2	Supported	0.545	***
Corporate social responsibility	Green innovation	H_3	Supported	0.437	***
CSR – green innovation	Competitiveness	H_4	Supported	0.238	***
Export capacity	Competitiveness	H_5	Supported	0.137	***
Firm age	Competitiveness	H_6	Not supported	−0.041	
Administrative management	Competitiveness	H_7	Not supported	0.040	

Note: *$p < 0.001$

Table 6. Structural path estimations

Battaglia *et al.*, 2014; Carrillo-Hermosilla *et al.*, 2010; Charmondusit *et al.*, 2016; Chen, 2008; Ghisetti and Rennings, 2014; Lu *et al.*, 2016; Tomšič *et al.*, 2015; Turyakira *et al.*, 2014). Thus, this research arguably contributes to narrowing the existing knowledge gap, showing that CSR and green innovation positively and significantly impact on manufacturing competitiveness in a developing market setting, shedding light on the relevance of stakeholder theory as grounded in the statistical analysis of our structural equation model.

Several implications are derived from our findings. From a business perspective, prioritizing the introduction of socially responsible practices and ecologically innovative initiatives, are efforts that should be widely considered as part of the long-term planning to achieve and sustain competitiveness in the manufacturing sector. Organizations should also revisit the misconception around these practices being an expense, when they are an investment that ensures the continuity and sustainability of the firm. Green practices contribute to ethical and responsible organizational behavior, which does not contradict the maximization of wealth, yet for stakeholders at large. As for the public sector, decision-makers could provide incentives and develop policies for firms to adopt sustainable practices and green innovations likely to improve their competitiveness and unleash a ripple effect through the supply chain, aggregating up to the regional and national levels.

Additionally, our research contributes to shed light on the impact of green process and product innovations on social and environmental performance, providing evidence on a more efficient use of energy and natural resources, increasing productivity and by extension, profitability. CSR shapes an innovation culture that, through the use of social, environmental and sustainability controllers, can create new business models, products, services or processes that boost both firm-level and supply chain productivity, benefits that eventually spill over to the host community.

Limitations to this study should be highlighted. The scope of the survey was Ecuadorian manufacturing firms, purposely so, hence results cannot be generalized to the entire Latin American context nor to developing countries as a whole. Conversely, this would open up the opportunity to extend or replicate this research in other markets. On a related note, our study was bound to specifically assess green innovation as mediator, rather than following a generic innovation approach for the mediating effect. Hence, extending the mediator role between CSR and competitiveness to a broader definition of innovation, even if already explored in developed economies, could account for a relevant opportunity for future research in an emerging market context.

Another relevant limitation was the nature of our quantitative approach. In the future, similar studies could be conducted, or added, so as to achieve a better understanding of the patterns and dynamics between constructs over time. Future research could consider other variables that may drive competitiveness, such as business environment, green leadership, environmental culture and environmental capacity at firm level. Another construct that could be included is green supply chain management, relating to corporate practices geared toward optimizing the transactional and cooperative interface with suppliers and clients, as CSR and green innovation are likely to deliver impact and sustainable competitiveness when carried along the (entire) supply chain. These actions involve supplier selection, aiming at a more reliable environmental performance and the development of shared improvement projects.

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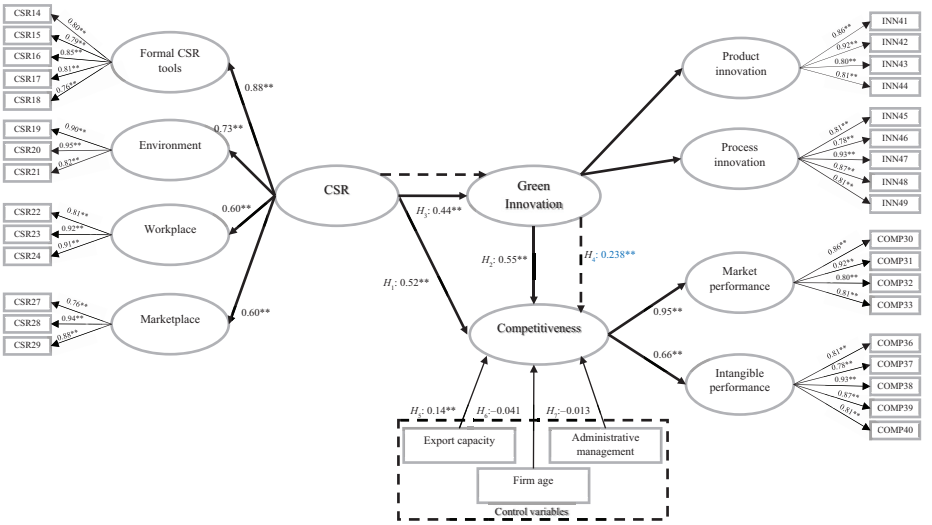
Appendix. Results of the structural model



Notes: *$p < 0.05$; **$p < 0.01$

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