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Influence of Environmental Innovation on Corporate Sustainability in Latin American Companies

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Abstract

The objective of this research is to analyze the influence of environmental innovation on corporate sustainability in the main capital markets in Latin America from the perspective of the Resource-Based View. To this end, with a sample of 202 Latin American companies, data from Thomson Reuters® were collected from 2012 to 2019. The dependent variable corporate sustainability was measured by the ESG score and the explanatory variable was represented by Environmental Innovation. The estimation was performed using robust random effects regression, with panel data. The results showed that environmental innovation explains corporate sustainability when measured by the overall score of the environmental, social and corporate governance (ESG) dimensions. Nevertheless, when analyzing each dimension individually, environmental innovation is only explained by corporate governance. A possible justification is the intrinsic characteristics of governance, since it is inserted in a context focused on transparency before the market, responsibility, resource allocation, corporate sustainability, strategic management, as well as the protection of stakeholder rights. In this aspect, the findings contribute to the academic debate on the relevance of environmental innovation for sustainable development, especially for the survival

of companies operating in highly competitive markets. Thus, the ability to innovate becomes an essential demand for public companies, and analyzing corporate sustainability standards and environmental innovation actions can provide valuable information about the performance of companies.

Keywords: environmental innovation; corporate sustainability; ESG

Introduction

Although there has been a development in sustainable and responsible investments in the last ten years (Escrig-Olmedo, Fernández-Izquierdo, Ferrero-Ferrero, Rivera-Lirio, & Muñoz-Torres, 2019), there are companies which are convinced that the more environmentally friendly they become, the more the effort will harm competitiveness, because this will increase their costs and will not bring financial benefits (Nidumolu, Prahalad & Rangaswami, 2009). According to these authors, companies, especially European and North American ones, consider such actions a disadvantage in relation to their rivals in developing countries, which do not face the same environmental pressures. Therefore, it is not surprising that the fight to save the planet has turned into a fierce battle among governments and companies, activist companies and consumers and sometimes activist consumers and governments (Nidumolu et al., 2009).

For example, despite the great economic achievements obtained in recent decades by China and India, the environmental impacts are evident, even causing the loss of resources. These are problems associated with increasingly critical energy consumption and environmental, air, soil and water pollution, desertification, resource depletion and environmental imbalance that affect human beings' health, as well as the sustainable development of society (Liao, 2018). Improving sustainability is a critical issue for senior management, as there are restrictive environmental regulations and consumer concern about the environmental behavior of companies that cause the aforementioned polluting activities (Berman & Bui, 2001; Bönnte & Dienes, 2013).

In addition, innovation has become the center of scientific debate and the agenda of environmental policymakers (Cainelli, De Marchi & Grandinetti, 2015), while environmental innovation is a concrete way for companies to follow environmental regulations and assume social responsibility (Liao, 2018; Rennings, 2000). Recent studies on environmental innovation have basically explored three perspectives: the determinants, the effect on reducing carbon emissions and the performance resulting from these environmental innovations (Zhang, Peng, Ma & Shen, 2017). This last determinant is used as a parameter in the present research, as it is an efficient way of reconciling economic growth, environmental protection and sustainable development.

When analyzing motivating factors for eco-innovation – innovation that translates into progress towards sustainable development – in companies in the industrial sector in Spain, Marzucchi and Montresor (2017) argued that resources are relevant to a company's environmental innovation strategy. Thus, political and managerial action must support the development of the company, within the scope of internal and external resources. To become eco-innovators, companies must encourage investments to get knowledge related to Research and Development (R&D), as well as other types of investments that do not necessarily refer to R&D. As an example, Kim (2015) argues that due to the heterogeneity of companies, it is necessary to take

into account the composition and level of competition in the market, analyzing the innovative activities applied, such as human, social, environmental, technical and economic investments.

Environmental innovation and corporate sustainability can be envisioned from a Resource-Based View (RBV) perspective. The literature argues that companies that engage in sustainable practices develop a set of unique resources, whether internal, such as R&D, human resources, routines and knowledge, or external, such as sources of knowledge arising from cooperation with suppliers or universities, among others (Barney, 1991; Cainelli et al., 2015; Chatterjee, Chaudhuri, & Vrontis, 2021; Sempere-Ripoll, Estelles-Miguel, Rojas-Alvarado, & Hervás-Oliver, 2020; Sharma, Bhattacharya, & Thukral, 2019; Wernerfelt, 1984).

In this context, the objective of this research is to analyze the influence of environmental innovation on corporate sustainability in the main capital markets in Latin America from the perspective of the Resource-Based View. The justification consists in the fact that analyzing corporate sustainability standards and environmental innovation actions can provide valuable information about the performance of companies. Empirical evidence such as that of Usman, Shaique, Khan, Shaikh and Baig (2017), Forcadell, Aracil and Úbeda (2019), Broadstock, Matousek, Meyer and Tzeremes (2019), and Sempere-Ripoll et al. (2020) reaffirm the role of environmental, social and governance criteria, known as ESG, in the context of sustainable development, that is, they emphasize the impact of several ESG components on company performance.

Innovation is a crucial factor that influences the company's long-term growth and survival (Kim, 2015). Therefore, promoting innovation is an important element of sustainable development policies, while there is a growing interest in identifying standards of corporate sustainability, given that companies are not only "judged" by their financial performance, but also by their ability to react to different environmental, social and corporate governance challenges, supported by how well they can assimilate different sustainability criteria into their daily business practices (Iamandi, Constantin, Munteanu, & Cernat-Gruici, 2019).

For Bíscoli, Silveira, Carvalho, Prates and Cunha (2016), governance is related to all and new organizational and institutional solutions applied to resolve conflicts over environmental resources in the public and private sectors, in order to stimulate, facilitate and disseminate the development and adoption of eco-innovations. Belloc (2012), Jitmaneeroj (2016) and Jia, Huang and Man Zhang (2019) mention that investor preservation and creditors' rights in innovative companies is a latent challenge for current organizations.

The ability to innovate has become an essential demand for companies and it is essential for their survival in the market. Besides this, the focus on Latin American countries is relevant because they present an additional motivation, which is the desire of the most successful companies to be able to grow beyond their national borders to compete in the world, since many are involved in some form of innovation, reinforcing entrepreneurial activities to sustain economic growth and development (Lederman, Messina, Pienknagura & Rigolini, 2014).

Literature Review

Before actually entering the discussion around innovation, it is necessary to understand it conceptually, since it has a plurality of definitions, going through the studies that lead to the concept explored in this research to only then identify, qualify it and later measure it.

For Baregheh, Rowley and Sambrook (2009), innovation represents a multi-step process in which organizations transform ideas into new/improved products, services or processes in order to successfully advance, compete and differentiate themselves in the market. Innovation can also be described as the intentional result of companies' ability to generate new knowledge and apply it in the development of new products, processes and combinations of entry into new markets (Tavassoli & Karlsson, 2015).

The concept of innovation aimed at sustainability has its roots in the notion of eco-innovation and in the debate that followed the publication of the Brundtland Report in 1987 (Jarmaj, 2020; Klewitz & Hansen, 2014). The Brundtland Report stated that "... the orientation of technology development must be changed to pay greater attention to environmental factors" (World Commission on Environment and Development, 1987, par. 65). In addition to it, this report highlighted the need for technologies that produce "social goods", such as improving air quality and increasing the useful life of products, or solving problems normally outside the cost calculation of companies, such as the external costs of pollution or waste disposal (World Commission on Environment and Development, 1987).

The discussions about the inclusion of social criteria, in addition to environmental ones, were carried forward under the terms "sustainable innovation", "sustainability-related innovation" and "sustainability-based innovation" (Klewitz & Hansen, 2014), which are sustained in the vision of the "deliberate management of economic, social and ecological aspects" in innovation. The concept above corroborates Porter and Van der Linde's idea (1995), that a more rational use of production factors, through innovations of an environmental nature, while respecting principles of ecological sustainability, increases productivity and makes the company competitive by reducing costs and/or improving products.

Cainelli et al. (2015) mention, in a broader view, that environmental innovation consists of the production, application or exploitation of a good, service, production process, organizational structure or business management method, which is new to the company and/or user and that results, throughout its life cycle, in a reduction of environmental risk, pollution and negative impacts of the resource use compared to relevant alternatives. It is a comprehensive definition that meets sustainability goals, such as waste management, eco-efficiency, emission reduction, recycling and ecological design (Markusson, 2011; Rennings, 2000).

Recalling, for this study, innovation is explored as a potential source of corporate sustainability. After all, companies are increasingly challenged to include environmental concerns in their business activities. While in the past companies were considered the main source of the pollution problem, currently, they have come to be seen as a possible solution, largely thanks to their innovative activity (Cainelli et al., 2015). Finally, environmental innovation is considered a strategy, because from its definition, the organization needs to turn to the search for specific resources, capable of providing differentiation in the market and, consequently, maximizing its performance. This can be achieved, according to Lin, Tan and Geng (2013) and Ramadani et al. (2019), with product/service innovations that consider aspects such as raw material optimization, material use that allow recycling and components with less environmental impact.

Environmental Innovation and Corporate Sustainability: A Resource-Based Perspective

The research is based on the Resource Based View (RBV)- known as RBV (Resource Based View). Theorists explored RBV to understand internal resources and competencies, such as R&D, human resources, routines and knowledge (Barney, 1991; Wernerfelt, 1984); starting from the premise that the unique conditions of each company in the development and exploitation of its resources and capabilities can generate sources of competitive advantage and, if exploited by the organization, can lead to sustainable competitive advantage (performance superior to competitors). Therefore, the resources and capabilities that the company controls must be valuable, that is, they must provide the company with conditions to explore opportunities and/or reduce/neutralize threats; rare, that is, scarce among current and potential competitors; have a high cost of imitation or be inimitable; and irreplaceable or that there are no close strategic substitutes (Barney, 1991; Wernerfelt, 1984).

Over the years, researchers have also pointed to the importance of external resources (sources of knowledge from the acquisition of incorporated knowledge, cooperation with suppliers or universities, among others), taking advantage of the awareness that it is not convenient, although possible, for companies internally develop all the necessary resources to compete, innovate and grow in their competitive environment (Cainelli et al., 2015; Sempere-Ripoll et al., 2020). This is particularly evident when it comes to innovation, as Pittaway, Robertson, Munir, Denyer and Neely (2004) show in their systematic review of research linking firms' network behavior with their innovative capacity. Even companies that have strong R&D activities and invest significantly in training human resources for innovation often rely on cooperation to diversify risks or gain access to competencies that would be too expensive or time-consuming to develop in-house (Cainelli et al., 2015; Pittaway et al., 2004).

Likewise, the literature on sustainability-oriented innovation points out that companies' innovation capabilities influence sustainability (Chesbrough, 2003; Kemp, Olsthoorn & Oosterhuis, 1992). From this perspective, Hart (1995) suggests a reinterpretation of the RBV considering the organization's social and environmental responsibility as a means of building sustainable competitive advantages. For the author, strategy and competitive advantage would be guided by the ease of making economic activity compatible with the external natural environment (this includes the environmental and social spheres).

Halkos and Skouloudis (2018) argue that innovation seeks the development and implementation of new combinations of resources that produce added value for the entity that adopts it and increase the well-being of its stakeholders. Likewise, eco-efficiency ideas and technologies, which meet the conditions of mutual gain in terms of commercial revenue and reduction of environmental problems, belong to an important aspect of the business that emphasizes ecologically oriented innovation towards sustainable change (Halme & Laurila, 2008); Hockerts & Wüstenhagen, 2010). In this context, environmentally responsible companies are driven by process and/or product innovations, in an attempt to reduce their ecological impact through energy efficiency, waste management and "greener" products.

However, Barbieri, Vasconcelos, Andreassi and Vasconcelos (2010) warn that innovations must generate positive economic, social and environmental results, at the same time, which is not easy to do, given the uncertainties that innovations bring, especially when are radical or with a

high degree of novelty. The authors also point out that, unlike the economic effects, the social and environmental effects are more difficult to be evaluated in advance, as they involve many more variables, uncertainties and interactions.

Although there is some difficulty in measuring corporate sustainability, there are institutions that classify companies according to their ESG performance (environmental, social and governance dimensions), in order to help several stakeholders make the most efficient business decisions well-informed, regardless of whether they are investors, customers, employees or broader communities (Iamandi et al., 2019). For example, Refinitiv provides detailed, aggregated ESG performance and dispute-related data to customize sustainable investment strategies, based on Thomson Reuters ESG scores for companies, which are calculated annually from company-reported data (Refinitiv, 2019). In this study, the determination of corporate sustainability used this basis.

Empirical Evidence and Formulation of Research Hypotheses

From an organizational perspective, the sustainability of companies is connected to teams and product quality that meet economic, social and governmental dimensions (Bansal & Song, 2017). In a broader overview, it is also linked to the effects that companies can provide to society when they play a state role and replace the functions of governments (Forcadell et al., 2019; Frynas & Yamahaki, 2016; Jackson & Apostolakou, 2010). For the purposes of this article, an organizational perspective was constructed to analyze the influence of environmental innovation on ESG dimensions, under an instrumental view of corporate sustainability, since innovation plays a fundamental role in the survival and growth of companies (Hauser, Tellis & Griffin, 2006), in a micro sense; and in the economic and social development of countries, in a macro perspective (Arond, Rodríguez, Arza, Herrera, & Sanchez, 2011).

Complementing, Forcadell et al. (2019) explain that both innovation and corporate sustainability share some characteristics, in terms of their consequences for the company. In particular, the results of corporate sustainability, covered by decades of studies, highlight its connection with corporate performance (Raza, Ilyas, Rauf & Qamar, 2012), differentiation strategies (Lii & Lee, 2012) and the creation of other advantages competitive through intangible strategic resources, such as reputation (Branco & Rodrigues, 2006; Fombrun & Shanley, 1990). Other studies that explored innovation in the corporate context are presented in Table 1:

Table 1
Empirical Evidence on Innovation

Author/Date	Description
Brito, Brito e Morganti (2009)	The objective of this study is to analyze the relationship between innovation and the performance of companies in Brazil based on data from Pintec (2000). The base years were 1999-2001, with data from 62 companies in the chemical and petrochemical sectors. No significant correlation was found between innovation and profitability, but a positive correlation between innovation and revenue was observed. Innovation can have an effect on growth, but not an immediate effect on profits. The indicators were extracted from Pintec (R&D, sales and personnel expenses).
Santos, Basso, Kimura e Kayo (2014)	Santos, Basso, Kimura and Kayo (2014) The objective of this study is to analyze the relationship between innovation and performance of Brazilian companies using a comprehensive database that cross-references information on innovation by PINTEC (Pesquisa Tecnológica em Inovação) of the IBGE (Instituto Brasileiro de Geografia e Estatística) and financial information from Serasa and Gazeta Mercantil. The results of structural equation modeling suggest that variables associated with investments in innovation, linked to a company's innovative effort, do not significantly explain financial performance.
Forcadell <i>et al.</i> (2019)	The aim of this study is to explore whether there is a link between innovation and sustainability in a large number of world banks during the period 2003–2016. The results suggest that service innovation performance improves the corporate sustainability of the banking sector.
Broadstock <i>et al.</i> (2019)	The purpose of this study is to investigate the impact of companies' involvement in environmental, social and governance (ESG) policies on their levels of innovation capacity. A non-parametric boundary analysis framework was applied to a sample of 320 Japanese companies in the period from 2008 to 2016. The results are consistent with an "indirect value creation" process, whereby the adoption of Corporate Social Responsibility policies and ESG of companies initially enhances their ability to pursue innovation activities and eventually positively affects their value creation and financial/operational performance.
Sempere-Ripoll <i>et al.</i> (2020)	The objective of this study is to determine whether there is a relationship between innovation and corporate sustainability in the financial sector. Using data from the Community Innovation Survey (CIS) from 2012-2014, this study empirically analyzes a sample of 1574 companies from eleven countries. The results suggest that innovation is positively linked to corporate sustainability, pointing out that innovation capabilities are positively related to sustainability.

Sources: elaborated by the authors.

It is possible to admit that the innovation process is based on a combination of internal and external sources of knowledge that allow the formation and development of capabilities and the creation of positive synergies (Cassiman & Veugelers, 2006), with the aim of building a company capable of innovate. And yet, innovation can drive corporate sustainability, promoting business models for social, environmental and economic goals, in particular in specific market segments, driving sustainable solutions (Forcadell *et al.*, 2019). Therefore, based on the assumption that environmental innovation influences corporate sustainability, the main research hypothesis stands out:

H1: There is a positive relationship between environmental innovation and corporate sustainability (ESG) of companies in the main capital markets in Latin America.

About the dimensions (social, corporate and environmental governance) of corporate sustainability, the following secondary hypotheses were established:

H1a: There is a positive relationship between environmental innovation and corporate sustainability (Social Dimension) of companies in the main Latin American capital markets.

H1b: There is a positive relationship between environmental innovation and corporate sustainability (Corporate Governance Dimension) of companies in the main capital markets in Latin America.

H1c: There is a positive relationship between environmental innovation and corporate sustainability (Environmental Dimension) of companies in the main Latin American capital markets.

Science and innovation are relevant elements for social and economic development and, therefore, have been the focus of public policies since the beginning of the 20th century (Arond et al., 2011), as it encompasses the development and implementation of new technologies. combinations of resources (that is, factors of production), producing added value for the entity that adopts them and increasing the benefits distributed among its stakeholders. That is, such policies should focus on the contribution that innovation in science and technology (and other forms of knowledge) can make to development and sustainability goals, as this perspective endorses the possibilities of transforming social problems into new business opportunities, benefits economics, productive capabilities, human competences and, finally, wealth (Arond et al., 2011; Baldwin & Curley, 2007).

Methodology

In order to analyze the influence of environmental innovation on the corporate sustainability of traded companies in the main capital markets in Latin America from the Resource-Based View perspective, the study relied on information collected from the Thomson Reuters® database, from 2012 to 2019. The period choice, from the year 2012, was because Brasil, Bolsa, Balcão (B3) started to recommend, to listed companies, that they include, in its annual reports, the “Report or Explain for Sustainability or Integrated Report”. This initiative was partnered the Global Reporting Initiative (GRI) in support of the International Integrated Reporting Council (IIRC), whose benefit was to facilitate the disclosure of socio-environmental information to users of the information.

The population is of traded non-financial companies from Argentina, Brazil, Chile and Mexico, whose data were available in the aforementioned database. For the sample, companies that traded their shares - classified as active stock exchange - in 2019 were selected. After this filter, companies that did not present sufficient data to construct the necessary variables in the research (unbalanced panel) were excluded, registering a final sample of 202 companies, which are distributed as follows:

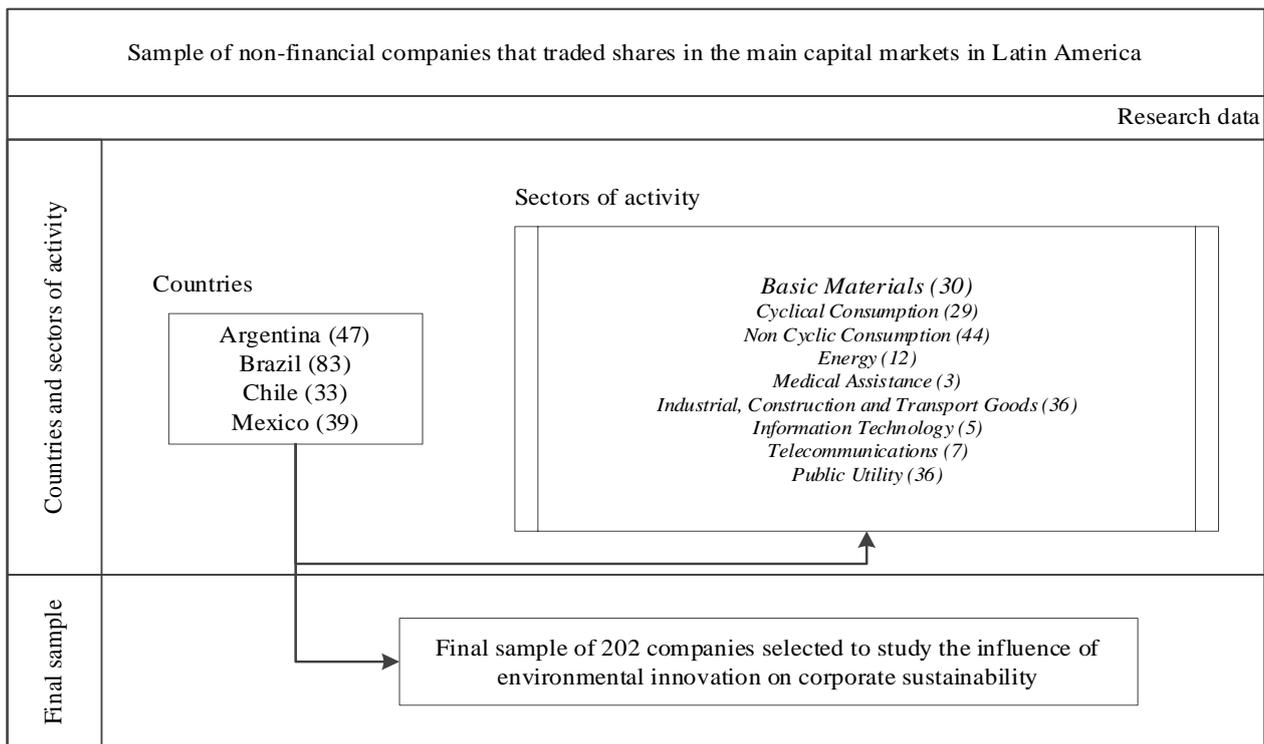


Figure 1. Final sample of the research analysis

Source: research data.

From data in Figure 1, it is important to highlight that intrinsic characteristic of the sector in which each company operates, can influence the results of the study due to regulatory issues, type of activity, market pressure, as well as maturation of sustainable corporate behavior. For the sectoral classification of companies, the Global Industry Classification Standard (GICS), available in the Thomson Reuters Eikon® database, was taken as reference. In all, there are ten sectors, however, the financial sector was disregarded, leaving only nine. They are: Basic Materials; Cyclical Consumption; Non Cyclic Consumption; Energy; Health care; Industrial, Construction and Transport Goods; Information Technology; Telecommunications; and Public Utility.

Presentation and Description of Variables

In Table 2 shows the variables that were collected and analyzed in the study. The dependent variable corporate sustainability (SC_ESG) was measured from the ESG score, made available by the Thomson Reuters® database, which ranges from 0 to 100. According to lamandi et al. (2019), ESG scores are used in several studies to quantify corporate sustainability or responsible behavior, so it is estimated that it is a viable resource to be applied in the present research. Furthermore, corroborating the studies by Frame (2004), Dahlsrud (2008) and Forcadell et al. (2019) clarify that this measure presents the sustainability of companies in a multidimensional construct that involves environmental, social and economic factors, providing a continuous measure, in contrast to other available economic indicators. To complement, the dimensions

(social, corporate and environmental governance) were analyzed individually, that use the same collection system, now the scores are obtained in a segregated way.

To measure the independent variable environmental innovation, the variable Environment Innovation (EI) was observed, which is an indicator developed and made available by the Thomson Reuters® database, in order to represent the degree of innovation of companies from a scale of 0-100. This indicator reflects the companies' ability to reduce costs and create new market opportunities through new technologies. The selection of this variable has as a parameter the research of Berman and Bui (2001), Nidumolu et al. (2009) and Bönnte and Dienes (2013), this is because, for the aforementioned authors, environmental innovation is seen as a factor that enables the company to evolve an environmental management, that is, providing a cause and effect relationship.

Table 2
Variables for analyzing the influence of environmental innovation on corporate sustainability

Type	Variables	Acronyms	Definitions	Expected Ratio	Reference
Dependent (Corporate Sustainability- CS)	ESG	SC_ESG	Overall score for the environmental, social and governance dimensions as classified by Thomson Reuters (score from 0 to 100)	NA	Forcadell <i>et al.</i> (2019)
	Social Dimension	SC_Social	Score on the social area (workforce, human rights, community and product responsibility) as ranked by Thomson Reuters (score from 0 to 100)	NA	
	Corporate Governance Dimension	SC_Governance	Governance Score (Management, Shareholders and CSR Strategy), as ranked by Thomson Reuters (score from 0 to 100)	NA	
	Environmental Dimension	SC_Environmental	Environmental score (resource use, emissions and innovation), as ranked by Thomson Reuters (score from 0 to 100)	NA	
Independent (Environment)	Environment Innovation	EI _{it-1}	Represents the degree of Innovation (lagged) as ranked by Thomson Reuters (score from 0 to 100)	(+)	Berman and Bui (2001); Bönnte and Dienes (2013)
Control	Rentability	ROA _{it-1}	Proportion of Operating Profit by Total Assets (lagged)	(+)	Ziegler e Schröder (2010); Ermenc, Klemenčič e Buhovac (2017)
	Indebtedness	ENDIV _{it-1}	Proportion of Liabilities Due to Total Assets (lagged)	(-)	Ermenc <i>et al.</i> (2017)
	Company size	SIZE	Total Asset Log	(+)	
	Sector	SECTOR	Sector in which the company operates, represented by a dummy variable.	NA	Forcadell <i>et al.</i> (2019)
	Country	COUNTRY	Country where the company is, represented by a dummy variable	NA	

Sources: elaborated by the authors.

As for the control variables, in addition to the inclusion of sectors and countries, the study takes into account that corporate sustainability has a positive relationship with accounting performance, as measured by profitability (ROA), according to Ziegler and Schröder (2006) and Ermenc et al. (2017). It is assumed that the greater the indebtedness of the company, the less the administration will invest in sustainability, because if a particular company is largely indebted, investments in sustainability can be perceived as a negative factor for stakeholders (Ermenc et al., 2017), so the indebtedness variable (ENDIV) becomes relevant in the study. The size of the company (SIZE) was incorporated in the analysis, considering that size has a statistically significant and positive effect on corporate sustainability, while the larger the company, the greater the set of resources it has available to invest in sustainability (Ermenc et al., 2017; Forcadell et al., 2019).

Estimation of the econometric model

To estimate the influence of environmental innovation on the corporate sustainability of Latin American companies, the generalized least squares (GLS) regression model was used, with panel data, because it accommodates the possible biases of heterogeneity, collinearity and behavior among companies, sectors and countries, combining time series features and cross-sectional data. In an attempt to explain endogeneity, the lag of independent variables in period t-1 was used in the estimate. To establish which panel is most suitable for data analysis, some econometric tests were performed (Chow, Breusch Pagan and Hausman), whose results indicated that the panel with random effects is the most suitable. In addition, there were autocorrelation and heteroscedasticity problems, which were corrected using the robust GLS regression model.

Thus, Equation 1 presents the model used to be estimated:

$$SC_ESG_{it} = \alpha + \beta_1 EI_{it-1} + \beta_2 ROA_{it-1} + \beta_3 ENDIV_{it-1} + \beta_4 SIZE_{it} + \beta_5 SETOR_i + \beta_6 PAÍS_i + \varepsilon_{it} \quad (1)$$

On what:

SC_ESG_{it} represents the Corporate Sustainability of company i at time t, according to ESG classification;

EI_{it-1} represents the Environmental Innovation of company i at time t-1;

ROA_{it-1} represents the Return on Assets of company i at time t-1;

$ENDIV_{it-1}$ represents the indebtedness of company i at time t-1;

$SIZE_{it}$ represents the Size of company i at time t;

$SECTOR_i$ represents the Sector in which company i operates;

$Country_i$ represents the country where company i resides;

ε_{it} represents the random error.

Then, the ESG dimensions – social, corporate and environmental governance – were analyzed individually, based on equations 2, 3 and 4, respectively.

$$SC_Social_{it} = \alpha + \beta_1 EI_{it-1} + \beta_2 ROA_{it-1} + \beta_3 ENDIV_{it-1} + \beta_4 SIZE_{it} + \beta_5 SETOR_i + \beta_6 PAÍS_i + \varepsilon_{it} \quad (2)$$

$$SC_Governance_{it} = \alpha + \beta_1 EI_{it-1} + \beta_2 ROA_{it-1} + \beta_3 ENDIV_{it-1} + \beta_4 SIZE_{it} + \beta_5 SETOR_i + \beta_6 PAÍS_i + \varepsilon_{it} \quad (3)$$

$$SC_Environmental_{it} = \alpha + \beta_1 EI_{it-1} + \beta_2 ROA_{it-1} + \beta_3 ENDIV_{it-1} + \beta_4 SIZE_{it} + \beta_5 SETOR_i + \beta_6 PAÍS_i + \varepsilon_{it} \quad (4)$$

On what:

SC_Social_{it} represents the Corporate Sustainability of company i at time t, from the Social pillar;

$SC_Governance_{it}$ represents the Corporate Sustainability of company i at time t, based on the Corporate Governance pillar;

$SC_Environmental_{it}$ represents the Corporate Sustainability of company i at time t, from the environmental pillar.

Results

Descriptive analysis of results

Table 3 shows the descriptive statistics. It is possible to observe that SC_ESG variable – general score of the environmental, social and governance dimensions – presented an average score of 44.1205. When analyzing the dimensions individually, ESG governance (SC Governance) was the most representative (48.3809). As a result, this score implies how the companies selected for the sample have a governance committed to corporate social responsibility, that is, they are aware of the importance of sustainability and the need to minimize the impact of the company's activities on the environment. It refers to the systems and rules that companies define as guidelines on how the company should be managed and directed. For ESG, it includes factors such as strategy, corruption, tax strategy and wages (Dahlberg & Wiklund, 2018).

The second most representative dimension is the social ESG (SC Social), whose average score is 45.6221, and consists of identifying and managing the impact that companies have on people around the world, as well as in its composition themes are analyzed, diverse, such as the workforce, human rights, community and corporate responsibility regarding the product made available to the market. The environmental dimension (SC Environmental), has an average score of 38.4305, and whose standard deviation (27.8727) is the most representative among all the study variables. This factor is often the first that comes to mind when thinking about sustainability, as it highlights the use of resources, emissions and innovation by companies (Forcadell et al., 2019). Also, it is important to clarify that this is the dimension that has a zero score for certain companies (a total of 43 companies) in all sectors and countries analyzed.

Regarding lagged environmental innovation (EIt-1) the average is only 14.0719, representing the degree of innovation according to the Thomson Reuters classification. A possible justification for this low environmental innovation score for publicly traded companies in the main Latin American capital markets is that it is a differentiated innovation, whose development is more

complex, as there is no regulation for the use of specific technologies, which causes delays in investments, technologies to reduce pollution due to the uncertainty associated with the costs and effectiveness of such technologies (Berman & Bui, 2001; Bönnte & Dienes, 2013).

Regarding the control variables, from 2012 to 2019, the log of total assets had the highest average (19.5590), followed by lagged indebtedness (0.6346) and lagged profitability (0.0495). Besides this, it is worth noting that the log of total assets, whose median (19.9973) and standard deviation (2.2590) are the most representative among the control variables, reflects the company's ability to transform assets into profit, showing how successful the company is in using its assets to generate profit (Ermenc et al., 2017).

Table 3
Descriptive statistics of environmental innovation and corporate sustainability (2012 to 2019)

Variable	Observation	Average	Median	Standard Deviation	Minimum	Maximum
SC_ESG	975	44,1205	45,8680	23,0160	0,1077	91,1486
SC_Social	975	45,6221	48,6789	27,1168	0,1729	96,3064
SC_Governance	975	48,3809	49,8388	23,0917	0,1135	96,0687
SC_Environmental	975	38,4305	40,7866	27,8727	0,0000	96,8905
El _{t-1}	921	14,0719	0,0000	27,1827	0,0000	99,3507
ROA _{t-1}	975	0,0495	0,0477	0,1107	-1,3287	1,3957
ENDIV _{t-1}	915	0,6346	0,5431	0,9817	0,0037	22,5441
SIZE	920	19,559	19,9973	2,2590	9,3484	24,4224

Source: research data.

Table 4 emphasizes Pearson's Correlation for the analysis of innovation and corporate sustainability, from 2012 to 2019. That said, from the survey results it is possible to infer that, at a significance level of 10%, the score (score) Overall, the environmental, social and governance dimensions are positively correlated with each dimension individually, that is, environmental, social and corporate governance are interconnected.

This result is consistent with the study by lamandi et al. (2019), since the behavior of companies dedicated to ESG implies an environmental conscience, due to the preservation of the natural environment and biodiversity, in addition to a social conscience, for improving relations with employees and preserve the well-being of society, as well as corporate governance practices, which aim, through its principles, to seek responsibility, transparency and protection of the rights of stakeholders.

With regard to environmental innovation, it is possible to confirm that there is a positive correlation with corporate sustainability, when considering the SC_ESG variable, also when analyzing each dimension individually – SC_Social, SC_Governance, SC Environmental. This result confirms previous studies with the same theme, such as Berman and Bui (2001), Nidumolu et al.

(2009), Arond et al. (2011), Bönnte and Dienes (2013) and Forcadell et al. (2019). It also reveals that they must go beyond the simple remediation of market failures in the production of knowledge based on R&D. To become innovators, companies must be helped to overcome systemic failures – for example, the lack of adequate interfaces – that hinder their fruitful interactions with research and, above all, with business partners. In short, the set of levers through which companies can be supported in their innovative activities is actually quite broad (Marzucchi & Montresor, 2017).

This is in line with VBR, whose central idea is that a company that has the ability to use appropriate resources to improve its performance will achieve a better competitive advantage. Appropriate resources are those considered valuable, inimitable, rare and non-replaceable (Chatterjee et al., 2021). In particular, Nidumolu et al. (2009) found in their research that sustainability is a lode of organizational and technological innovations that produce both revenue and profits (bottom line), because costs are reduced by reducing the inputs used. Still, the process generates additional revenue with better products, which allows the creation of new businesses, that is, smart companies must treat sustainability as the new frontier of innovation.

Table 4

Pearson's Correlation of Environmental Innovation and Corporate Sustainability (2012 to 2019)

Variables	SC_ESG	SC Social	SC_Governance	SC_Environmental	El _{t-1}	ROA _{t-1}	ENDIV _{t-1}	SIZE
SC_ESG	1000							
SC_Social	0,9468*	1000						
SC_Governance	0,6788*	0,5100*	1000					
SC_Environmental	0,5100*	0,8436*	0,4193*	1000				
El _{t-1}	0,1216*	0,1116*	0,0691*	0,1266*	1000			
ROA _{t-1}	0,0349	0,051	0,0211	-0,0001	-0,0334	1000		
ENDIV _{t-1}	-0,0513	-0,0563	-0,0411	-0,0309	-0,0208	-0,0178	1000	
SIZE	0,0382	0,0278	0,0741*	0,0058	-0,0339	0,0402	-0,1392*	1000

Note: * statistical significance at 10%.

Source: research data.

Regarding the control variables, the size of the company (SIZE) was positively correlated, at the level of 10%, with the ESG of corporate governance (SC_Governance). This result was expected, since, due to the choice of the sample to include companies that trade in the open market, large companies, size has a statistically significant and positive effect on sustainability due to the greater number of resources to make investments in this area. In addition to it, sustainable companies are gaining more and more prominence in a market represented by the great competition among competitors and therefore the sustainable actions applied in these larger companies become increasingly common in the market (Ermenc et al., 2017; Forcadell et al., 2019).

The size of the company is correlated with the indebtedness, however with a negative effect. This result may have as a possible justification, the downgrade of rating agencies' ratings, such as Moody's, because the downgrade of risk ratings has as a consequence on large companies difficulties in acquiring financing. Regarding the other variables of the study, it is not possible to make any inference, given the lack of statistical significance.

Econometric Analysis

Table 5 presents the results of the econometric analysis of the four equations arranged in the methodology. Each equation corresponds to a way of capturing the dependent variable corporate sustainability, the first equation encompassing the social, governance and environmental pillars (SC_ESG). The others (equations 2, 3 and 4) analyze these pillars individually (SC Social, SC Governance, SC Environmental). The Adjusted R² identified in the regressions vary from 0.0881 and 0.2637.

From the results observed in the table above, it is noted that, although investments in environmental innovation (Elit-1) are directly related to corporate sustainability, only when this variable was measured with the pillars together (SC_ESG) or when only the pillar of governance (SC Governance) was statistically significant. At the 10% level, the variable Elit-1 showed a correlation of 0.0352 with the dependent variable SC_ESG and a correlation of 0.0336 with the dependent variable (SC Governance). Therefore, equations 1 and 3 do not reject the hypothesis of a positive relationship between environmental innovation and corporate sustainability of companies in the main capital markets in Latin America, represented by H1 and H1b. On the other hand, in equations 2 and 4, environmental innovation did not show explanatory power (both with p-value > 0.10) to corporate sustainability, when specifically measured the social (SC_Social) and environmental (SC Environmental) pillars, so both reject H1a and H1c.

Table 5
Statistical Result of the Influence of Innovation on Corporate Sustainability of Latin American Companies (Argentina, Brazil, Chile and Mexico) from 2012 to 2019

Variables	Robust Random Effects Regression			
	Equation 1 <i>DV = SC_ESG</i>	Equation 2 <i>DV = SC_Social</i>	Equation 3 <i>DV = SC_Governance</i>	Equation 4 <i>DV = SC_Environmental</i>
El_{it-1}	0,0352* (0,060)	0,0343 (0,137)	0,0336* (0,089)	0,0324 (0,123)
ROA_{it-1}	5,6278 (0,208)	6,3008 (0,220)	8,7773 (0,104)	2,4256 (0,610)
ENDIV_{it-1}	-0,5910 (0,490)	-0,3654 (0,750)	-1,2391*** (0,002)	-0,3859 (0,736)
SIZE	-0,0470 (0,934)	-0,1486 (0,839)	0,3198 (0,575)	-0,1755 (0,783)
SECTOR	YES	YES	YES	YES
COUNTRY	YES	YES	YES	YES
Constant	51,0299*** (0,000)	56,6705*** (0,000)	41,8015*** (0,001)	51.8798*** (0,000)
Observation:	855	855	855	855
R ² (Within)	0,0102	0,0047	0,0144	0,0046
R ² (Between)	0,2348	0,2637	0,0881	0,2329
R ² (Overall)	0,1669	0,1752	0,0544	0,1840
F Test:	0,0000	0,0000	0,0003	0,0000

Equation 1: $SC_ESG_{it} = \alpha + \beta_1 El_{it-1} + \beta_2 ROA_{it-1} + \beta_3 ENDIV_{it-1} + \beta_4 SIZE_{it} + \beta_5 SETOR_i + \beta_6 PAÍS_i + \epsilon_{it}$

Equation 2: $SC_Social_{it} = \alpha + \beta_1 El_{it-1} + \beta_2 ROA_{it-1} + \beta_3 ENDIV_{it-1} + \beta_4 SIZE_{it} + \beta_5 SETOR_i + \beta_6 PAÍS_i + \epsilon_{it}$

Equation 3: $SC_Governance_{it} = \alpha + \beta_1 El_{it-1} + \beta_2 ROA_{it-1} + \beta_3 ENDIV_{it-1} + \beta_4 SIZE_{it} + \beta_5 SETOR_i + \beta_6 PAÍS_i + \epsilon_{it}$

Equation 4: $SC_Environmental_{it} = \alpha + \beta_1 El_{it-1} + \beta_2 ROA_{it-1} + \beta_3 ENDIV_{it-1} + \beta_4 SIZE_{it} + \beta_5 SETOR_i + \beta_6 PAÍS_i + \epsilon_{it}$

Note: i) Subtitle: DV= Dependent Variable; SC_ESG = Corporate Sustainability based on the overall score of the social, governance and environmental pillars; SC_Social= Corporate Sustainability based on the social pillar score; SC_Governance= Corporate Sustainability based on the corporate governance pillar score; SC_Environmental= Corporate Sustainability based on the environmental pillar score; EI = Environmental Innovation; ROA= Return on Assets; ENDIV = Indebtedness; SIZE= company size; ii) *, ** and *** statistical significance at 10%, 5% and 1%, respectively.

Source: research data.

Empirical evidence shows that innovation improves corporate sustainability when measured by ESG (SC_ESG). In other words, companies that develop innovation are able to create superior value for their customers and achieve corporate sustainability. Although financial companies were not considered in this research, the results are consistent with Forcadell et al. (2019), who, when studying the influence of innovation on corporate sustainability in the

international scope of the banking industry, identified a strong intersection between the performance of service innovation and corporate sustainability, suggesting an alignment among corporate objectives and values. In the same direction, Sempere-Ripoll et al. (2020), using data from 1.574 financial companies in eleven countries, extracted from the 2012-2014 Community Innovation Survey (CIS), found that innovation capabilities are positively linked to sustainability.

From RBV's point of view, investing in environmental initiatives creates valuable intangible resources in terms of reputation, brand equity and goodwill, which, although they may initially result in increased cost, can also be strategically converted into economic benefit (Sharma et al., 2019). From the results of the present study, it is possible to infer the relevance of the relationship between corporate sustainability (measured by the ESG dimension) and innovation. By showing that environmental innovation drives corporate sustainability, this research provides new empirical evidence with which ESG managers and practitioners can support the argument that spending in this area can be viewed more as capital investments than operating costs. Managers must be motivated to purposefully develop environmental innovation policies as a driver of corporate sustainability, and to find ways to channel external knowledge, thereby meeting the expectations of company stakeholders.

Regarding the governance pillar (SC_Governance), a positive influence of environmental innovation on its performance was highlighted. Although, the present study did not identify the exposed relationship in the literature, since some of the studies observed have analyzed the inverse relationship - the impact of corporate governance on the innovation process - (Jia et al., 2019; Jitmaneroj, 2016), it is assumed that reducing asymmetries in the innovation process, guaranteeing transparency to those involved and preserving the rights of investors and creditors in innovative companies is a latent challenge for current organizations (Belloc, 2012). Thus, corporate sustainability is ensured, as the governance dimension is related to the development and adoption of innovation practices (Bíscoli et al., 2016).

Analyzing corporate sustainability based on the social (SC_Social) and environmental (SC_Environmental) pillars, it was found that these are not significantly influenced by environmental innovation. This finding contrasts with much of the literature that mentions innovation as a path to the country's social and economic development (Arond et al., 2011), meeting market needs, increasing profitability and the long-term survival of any company (Hauser, 2011). Tellis & Griffin, 2006). It is also in agreement with the studies by Lin et al. (2013) and Ramadani et al. (2019), these authors attest that innovations in products/services that consider aspects such as optimization of raw materials, and use of materials that allow recycling and components with less environmental impact tend to have a positive impact on economic and environmental results, as in addition to In order to reduce the environmental impact, costs tend to decrease through the efficient use of resources.

Thus, the study alerts to the need for new individual investigations of environmental and social variables, to identify the cause of the lack of statistical significance. At first, one can reflect the arguments of Barbieri et al. (2010), who warn about the difficulty of generating positive results in all dimensions (economic, environmental and social) at the same time, especially with regard to social and environmental effects, as they involve many more variables, uncertainties and interactions.

Considering the control variables profitability (ROAit-1), company size (SIZE) and indebtedness (ENDIVit-1), only the latter presented statistical significance, at the level of 1%, with the dependent variable SC_Governance (equation 3). The coefficient of this relationship was negative (-1.2391), suggesting that companies with higher indebtedness have lower corporate sustainability in the governance dimension. The other variables do not have explanatory power for corporate sustainability. Such evidence is similar to that verified by Forcadell et al. (2019) and Ziegler and Schröder (2010), when observing, respectively, the ROA and the ENDIV; and contrary to the research by Ermenc et al. (2017), when considering the SIZE variable. However, it should be noted that these previous studies presented different parameters for capturing the variable to be explained (dependent variable), a fact that may also have caused the divergence in the significance of the relationship between the variables observed in comparison to the literature explored.

It is noteworthy that the result of profitability not having presented explanatory power of corporate sustainability may have been caused because that financial development and innovation are factors causing economic growth in the long term, so, the lag of only one year of the ROA variable, possibly it was not enough to identify the possible benefits imposed by the implementation of innovative practices. After all, undeniably, innovation has become something vital for the survival of the modern organization, being attributed to it organizational success, driving economic development and growth (Santos et al., 2014). Therefore, it is believed that the activity of innovating can contribute to the economic, environmental and social fields, which demonstrates its affinity with sustainability.

Final Considerations

This research aimed to analyze the influence of environmental innovation on corporate sustainability in the main capital markets in Latin America from the perspective of the Resource-Based View. The empirical results, for a sample of 202 companies, from 2012 to 2019, show how the performance of environmental innovation can result in a greater contribution to corporate sustainability. In particular, corporate sustainability was addressed as a multidimensional construct based on environmental, social and governance guidelines, measured through the ESG score. The findings contribute to the recent academic debate about the relevance of innovation for the well-being of society and sustainable development, in particular, for the survival of companies operating in highly competitive markets.

Considering the data obtained from Pearson's correlation and robust random effects regression, it was possible to infer that the research hypothesis was not rejected. In this context, there is a positive relationship between environmental innovation and corporate sustainability of companies in the main capital markets in Latin America. This is because, at a significance level of 10%, environmental innovation positively influences corporate sustainability, when measured by the environmental, social and corporate governance pillars (SC_ESG). In other words, environmental innovation explains corporate sustainability when measured by the overall score of the dimensions, which imply environmental awareness, social awareness and the use of corporate governance practices.

It is important to notice that when analyzing the influence of environmental innovation on each pillar of corporate sustainability, according to Pearson's correlation, there is a positive and

significant correlation at the level of 10% among environmental innovation and each score of the environmental, social and governance dimensions. However, through the regression of robust random effects, only the pillar of corporate governance presents significance and positive – at the level of 10% – with environmental innovation. This implies that environmental innovation – measured by the ability to reduce costs and create new market opportunities through new technologies – has a greater weight on the corporate governance pillar, to the detriment of the environmental and social pillars. A possible justification for this result is the fact that corporate governance is inserted in a context focused on transparency before the market, responsibility, resource allocation, corporate sustainability, strategic management, as well as the protection of stakeholder rights.

The research effectively used the concepts of RBV theory, in particular with regard to the innovation process and its proper relationship with corporate sustainability. Thus, the results have some managerial implications for publicly traded companies located in Latin American countries (Argentina, Brazil, Chile and Mexico). First, considering the complex, dynamic and hostile scenario of emerging countries, these companies can understand the importance of improving their innovation performance and how this can help strengthen their corporate sustainability, especially in the corporate governance dimension. Second, the analysis illustrates a combination of innovation performance initiatives, which can lead to stakeholder well-being and, at the same time, competitive advantage. Finally, the findings can strengthen the initiative to combine innovation and corporate sustainability, giving special attention to innovation practices directed to the social and environmental dimensions, as these have not been shown to be satisfactory in relation to environmental innovation.

Although the research contributions have been emphasized, they should not be generalized, as the study presented limitations, namely: limited data on innovation provided by the investigated companies, and it is possible that more refined details may allow a deeper understanding of how technology investments impact corporate sustainability; disregarded the normative aspects and legislation imposed on the companies, due to their operational activities; when lagging the independent variable, several companies presented “missing” data, since some were not made available in all years; and the fact of using a score as a criterion for measuring corporate sustainability. Thus, as a suggestion for future research, it is suggested to observe and try to mitigate such limitations, opting, if necessary, by exploring in depth only one sector of activity; or, still, make a comparative analysis with companies located in developed countries.

References

- Arond, E., Rodríguez, I., Arza, V., Herrera, F., & Sanchez, M. (2011). *Innovation, sustainability, development and social inclusion: lessons from Latin America*. Brighton: STEPS Centre.
- Baldwin, E., & Curley, M. (2007). *Managing IT innovation for business value: practical strategies for IT and business managers*. Santa Clara: Intel Press.
- Bansal, P., & Song, H. C. (2017). Similar but not the same: differentiating corporate sustainability from corporate responsibility. *Academy of Management Annals*, 11(1), 105-149. doi:10.5465/annals.2015.0095

- Barbieri, J. C., Vasconcelos, I. F. G., Andreassi, T., & Vasconcelos, F. C. (2010). Inovação e sustentabilidade: novos modelos e proposições. *Revista de Administração de Empresas*, 50(2), 146-154. doi:10.1590/S0034-75902010000200002
- Baregheh, A., Rowley, J., & Sambrook, S. (2009). Towards a multidisciplinary definition of innovation. *Management Decision*, 47(8), 1323-1339. doi:10.1108/00251740910984578
- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120. doi:10.1177/014920639101700108
- Belloc, F. (2012). Corporate governance and innovation: a survey. *Journal of Economic Surveys*, 26(5), 835-864. doi:10.1111/j.1467-6419.2011.00681.x
- Berman, E., & Bui, L. T. M. (2001). Environmental regulation and productivity: evidence from oil refineries. *The Review of Economics and Statistics*, 83(3), 498-510. doi:10.3386/w6776
- Bíscoli, F. R. V., Silveira, A. D., Carvalho, A. P., Prates, R., & Cunha, S. K. (2016). Dimensões daecoinovação em empresas instaladas nos parques tecnológicos do estado do Paraná. *Revista Competitividade e Sustentabilidade*, 3(1), 72-99. doi:10.48075/comsus.v3i1.13704
- Bönte, W., & Dienes, C. (2013). Environmental innovations and strategies for the development of new production technologies: empirical evidence from Europe. *Business Strategy and the Environment*, 22(8), 501-516. doi:10.1002/bse.1753
- Branco, M. C., & Rodrigues, L. L. (2006). Corporate social responsibility and resource-based perspectives. *Journal of Business Ethics*, 69(2), 111-132. doi:10.1007/s10551-006-9071-z
- Brito, E. P. Z., Brito, L. A. L., & Morganti, F. (2009). Inovação e o desempenho empresarial: lucro ou crescimento? *Revista de Administração de Empresas*, 8(1), Art.6. doi:10.1590/S1676-56482009000100007
- Broadstock, D. C., Matousek, R., Meyer, M., & Tzeremes, N. G. (2019). Does corporate social responsibility impact firms' innovation capacity? The indirect link between environmental & social governance implementation and innovation performance. *Journal of Business Research*, 119, 99-110. doi:10.1016/j.jbusres.2019.07.014
- Cainelli, G., De Marchi, V., & Grandinetti, R. (2015). Does the development of environmental innovation require different resources? Evidence from Spanish manufacturing firms. *Journal of Cleaner Production*, 94, 211-220. doi:10.1016/j.jclepro.2015.02.008
- Cassiman, B., & Veugelers, R. (2006). In search of complementarity in innovation strategy: internal R&D and external knowledge acquisition. *Management science*, 52(1), 68-82. doi:10.1287/mnsc.1050.0470
- Chatterjee, S.; Chaudhuri, R. & Vrontis, D. (2021). Does data-driven culture impact innovation and performance of a firm? an empirical examination. *Annals of Operations Research*. doi:10.1007/s10479-020-03887-z
- Chesbrough, H. W. (2003). *Open innovation: the new imperative for creating and profiting from technology*. Boston: Harvard Business Press.
- Dahlberg, L., & Wiklund, F. (2018). *ESG investing in nordic countries: an analysis of the shareholder view of creating value* (Trabalho de conclusão de curso). Umea University, Umea.

- Dahlsrud, A. (2008). How corporate social responsibility is defined: an analysis of 37 definitions. *Corporate social responsibility and environmental management*, 15(1), 1-13. doi:10.1002/csr.132
- Ermenc, A., Klemenčič, M., & Buhovac, A. R. (2017). Sustainability reporting in Slovenia: does sustainability reporting impact financial performance? In P. Horváth, & J. M. Pütter (Eds.), *Sustainability reporting in central and eastern European companies* (pp. 181-197). Cham: Springer. doi:10.1007/978-3-319-52578-5_12
- Escrig-Olmedo, E., Fernández-Izquierdo, M. Á., Ferrero-Ferrero, I., Rivera-Lirio, J. M., & Muñoz-Torres, M. J. (2019). Rating the raters: evaluating how ESG rating agencies integrate sustainability principles. *Sustainability*, 11(3), 1-16. doi:10.3390/su11030915
- Fombrun, C., & Shanley, M. (1990). What's in a name? Reputation building and corporate strategy. *Academy of Management Journal*, 33(2), 233-258. doi:10.2307/256324
- Forcadell, F. J., Aracil, E., & Úbeda, F. (2019). The influence of innovation on corporate sustainability in the international banking industry. *Sustainability*, 11(11), 3210. doi:10.3390/su11113210
- Frame, W. S., & White, L. J. (2004). Empirical studies of financial innovation: lots of talk, little action? *Journal of economic literature*, 42(1), 116-144. doi:10.2139/ssrn.325800
- Frynas, J. G., & Yamahaki, C. (2016). Corporate social responsibility: review and roadmap of theoretical perspectives. *Business Ethics: A European Review*, 25(3), 258-285. doi:10.1111/beer.12115
- Halkos, G., & Skouloudis, A. (2018). Corporate social responsibility and innovative capacity: intersection in a macro-level perspective. *Journal of Cleaner Production*, 182, 291-300. doi:10.1016/j.jclepro.2018.02.022
- Halme, M., & Laurila, J. (2008). Philanthropy, integration or innovation? exploring the financial and societal outcomes of different corporate responsibility. *Journal of Business Ethics*, 84(3), 325-339. doi:10.1007/s10551-008-9712-5
- Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review*, 20(4), 986-1014. doi:10.2307/258963
- Hauser, J., Tellis, G. J., & Griffin, A. (2006). Research on innovation: a review and agenda for marketing science. *Marketing Science*, 25(6), 687-717. doi:10.1287/mksc.1050.0144
- Hockerts, K., & Wüstenhagen, R. (2010). Greening Goliaths versus emerging Davids – theorizing about the role of incumbents and new entrants in sustainable entrepreneurship. *Journal of Business Venturing*, 25(5), 481-492. doi:10.1016/j.jbusvent.2009.07.005
- Iamandi, I. E., Constantin, L. G., Munteanu, S. M., & Cernat-Gruici, B. (2019). Mapping the ESG behavior of European companies: a holistic Kohonen approach. *Sustainability*, 11(12), 3276. doi:10.3390/su11123276
- Jackson, G., & Apostolakou, A. (2010). Corporate social responsibility in Western Europe: an institutional mirror or substitute? *Journal of Business Ethics*, 94(3), 371-394. doi:10.1007/s10551-009-0269-8

- Jarmai, K. (2020). Introduction. In K. Jarmai (Ed.), *Responsible innovation: business opportunities and strategies for implementation* (pp. 1-5). New York: Springer Nature. doi:10.1007/978-94-024-1720-3_1
- Jia, N., Huang, K. G., & Man Zhang, C. (2019). Public governance, corporate governance, and firm innovation: an examination of state-owned enterprises. *Academy of Management Journal*, 62(1), 220-247. doi:10.5465/amj.2016.0543
- Jitmaneroj, B. (2016). Reform priorities for corporate sustainability: environmental, social, governance, or economic performance? *Management Decision*, 54(6), 1497-1521. doi:10.1108/MD-11-2015-0505
- Kemp, R., Olsthoorn, X., Oosterhuis, F., & Verbruggen, H. (1992). Supply and demand factors of cleaner technologies: some empirical evidence. *Environmental and Resource Economics*, 2(6), 615-634. doi:10.1007/BF00330287
- Kim, Y. (2015). Environmental, sustainable behaviors and innovation of firms during the financial crisis. *Business Strategy and the Environment*, 24(1), 58-72. doi:10.1002/bse.1811
- Klewitz, J., & Hansen, E. G. (2014). Sustainability-oriented innovation of SMEs: a systematic review. *Journal of Cleaner Production*, 65, 57-75. doi:10.1016/j.jclepro.2013.07.017
- Lederman, D., Messina, J., Pienknagura, S., & Rigolini, J. (2014). *Latin American entrepreneurs: many firms but little innovation*. Washington, DC: The World Bank.
- Liao, Z. (2018). Environmental policy instruments, environmental innovation and the reputation of enterprises. *Journal of Cleaner Production*, 171, 1111-1117. doi:10.1016/j.jclepro.2017.10.126
- Lii, Y. S., & Lee, M. (2012). Doing right leads to doing well: when the type of CSR and reputation interact to affect consumer evaluations of the firm. *Journal of Business Ethics*, 105(1), 69-81. doi:10.1007/s10551-011-0948-0
- Lin, R. J., Tan, K. H., & Geng, Y. (2013). Market demand, green product innovation, and firm performance: evidence from Vietnam motorcycle industry. *Journal of Cleaner Production*, 40, 101-107. doi:10.1016/j.jclepro.2012.01.001
- Markusson, N. (2011). Unpacking the black box of cleaner technology. *Journal of Cleaner Production*, 19(4), 294-302. doi:10.1016/j.jclepro.2010.10.007
- Marzucchi, A., & Montresor, S. (2017). Forms of knowledge and eco-innovation modes: evidence from Spanish manufacturing firms. *Ecological Economics*, 131(C), 208-221. doi:10.1016/j.ecolecon.2016.08.032
- Nidumolu, R., Prahalad, C. K., & Rangaswami, M. R. (2009). Why sustainability is now the key driver of innovation. *Harvard business review*, 87(9), 56-64.
- Pittaway, L., Robertson, M., Munir, K., Denyer, D., & Neely, A. (2004). Networking and innovation: a systematic review of the evidence. *International Journal of Management Reviews*, 5-6(3-4), 137-168. doi:10.1111/j.1460-8545.2004.00101.x
- Porter, M. E., & Van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, 9(4), 97-118.

- Ramadani, V., Hisrich, R. D., Abazi-Alili, H., Dana, L. P., Panthi, L., & Abazi-Bexheti, L. (2019). Product innovation and firm performance in transition economies: a multi-stage estimation approach. *Technological Forecasting and Social Change*, 140, 271-280. doi:10.1016/j.techfore.2018.12.010
- Raza, A., Ilyas, M. I., Rauf, R., & Qamar, R. (2012). Relationship between corporate social responsibility (CSR) and corporate financial performance (CFP): literature review approach. *Elixir Financial Management*, 46, 8404-8409.
- Refinitiv. (2021). Environmental, social and governance scores from refinitiv. Recuperado de <https://refini.tv/3tKaDMY>
- Rennings, K. (2000). Redefining innovation – eco-innovation research and the contribution from ecological economics. *Ecological Economics*, 32(2), 319-332. doi:10.1016/S0921-8009(99)00112-3
- Santos, D. F. L., Basso, L. F. C., Kimura, H., & Kayo, E. K. (2014). Innovation efforts and performances of Brazilian firms. *Journal of Business Research*, 67(4), 527-535. doi:10.1016/j.jbusres.2013.11.009
- Sempere-Ripoll, F., Estelles-Miguel, S., Rojas-Alvarado, R., & Hervás-Oliver, J. L. (2020). Does technological innovation drive corporate sustainability? Empirical evidence for the European financial industry in catching-up and central and eastern Europe countries. *Sustainability*, 12(6), 1-19. doi:10.3390/su12062261
- Sharma, D., Bhattacharya, S., & Thukral, S. (2019). Resource-based view on corporate sustainable financial reporting and firm performance: evidences from emerging Indian economy. *International Journal of Business Governance and Ethics*, 13(4), 323-344. doi:10.1504/IJBGE.2019.10021060
- Tavassoli, S., & Karlsson, C. (2015). Persistence of various types of innovation analyzed and explained. *Research Policy*, 44(10), 1887-1901. doi:10.1016/j.respol.2015.06.001
- Usman, M., Shaique, M., Khan, S., Shaikh, R., & Baig, N. (2017). Impact of R&D investment on firm performance and firm value: evidence from developed nations (G-7). *Revista de Gestão, Finanças e Contabilidade*, 7(2), 302-321. doi:10.18028/2238-5320/rgfc.v7n2p302-321
- Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171-180.
- World Commission on Environment and Development. (1987). *Report of the world commission on environment and development: our common future*. New York: Autor.
- Zhang, Y. J., Peng, Y. L., Ma, C. Q., & Shen, B. (2017). Can environmental innovation facilitate carbon emissions reduction? Evidence from China. *Energy Policy*, 100, 18-28. doi:10.1016/j.enpol.2016.10.005
- Ziegler, A., & Schröder, M. (2010). What determines the inclusion in a sustainability stock index? A panel data analysis for European firms. *Ecological Economics*, 69(4), 848-856. doi:10.1016/j.ecolecon.2009.10.009

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