sciendo

Exploring the Link between Sustainable Practices and Corporate Performance Across Industries

Iris Maria Velez Osorio
Faculty of Economics and Business Science, Pontificia Universidad Javeriana Cali, Colombia

Abstract

Background: The adoption of the Sustainable Development Goals (SDGs) has set a global standard for promoting sustainable practices. However, manufacturing companies need help in adopting these practices due to differences between industries, the need for research and development, and variations in corporate sizes. **Objectives:** This analysis aims to study sustainability practices and their impact on corporate performance across different industries. It seeks to identify whether there is a relationship between sustainability practices and corporate performance in manufacturing companies and if the type of industry affects this relationship. **Methods/Approach:** To achieve this goal, a multivariate analysis was conducted using hierarchical regression. **Results:** The research indicates a direct connection between sustainability practices and corporate performance. It highlights the importance of creating distinctive sustainability practices that cater to the specific needs and characteristics of each industry. **Conclusions:** Developing corporate strategies around sustainability is imperative. Additionally, public policies should be implemented to encourage the adoption of such practices, reinforcing the need for industry-specific approaches to enhance both sustainability and corporate performance.

Keywords: performance; sustainability; industry; manufacturing.

JEL classification: Q01, L6
Paper type: Research article.

Received: Mar 31, 2024
Accepted: May 11, 2024

Citation: Velez Osorio, I. M. (2024). Exploring the Link between Sustainable Practices and Corporate Performance Across Industries. Business Systems Research, 15(1), 158-177.
DOI: doi.org/10.2478/bsrj-2024-0008

Introduction

Manufacturing companies have adopted various approaches to achieve competitive advantage in recent years: downsizing, benchmarking, outsourcing, quality management, shared value, and outplacement, and although all function according to the organisational goal, none has promoted a fundamental factor for the corporate future, like the idea of sustainability. Each approach has solved difficulties in terms of costs, management, quality, and service. Still, a fundamental fact in the competitive environment began to draw severe attention: the environmental agony that the planet is experiencing, which is evident in climate change, arid soils, melting of the poles, prolonged droughts, and unprecedented atmospheric variations, among many others. Therefore, the concern to include sustainability practices in business activities has become not only an approach but a necessity that forces companies to develop competitive strategies that associate the value of environmental impact within their products.

Some organisations have worked in the short term (Haessler, 2020) with the replacement of plastic bags with cloth bags, recycling, better packaging design, and reduction of additives and preservatives; these solutions, however, are not enough, so organisations must redesign their production processes to modify the industrial habits that have positioned companies for decades. To achieve this, some companies have had to invest in research and development, technology, specialised human capital, and even share information with their competitors to improve certain processes to benefit competitive industries.

This concern requires industrial organisations to consider sustainability practices (Batista & Francisco, 2018) as a better way to achieve superior corporate performance and the possibility of combining these sustainability practices with their competitive strategy to reach long-term competitive advantages. Thus, in the present study, five industries have been grouped to recognise their sustainability practices and understand the impact of these practices on corporate performance, with the industries being a moderating variable that allows explaining whether this relationship is stronger or weaker according to the type of industry. The following industries have been selected for the study as they are the industries that offer the greatest contribution in economic terms to the industry: food and textile products, wood and paper, oil, pharmaceutical, chemical and rubber, metallurgy and electronics, machinery, and transport.

Some previous studies have established the importance of these practices and the organisations' ability to create value from the environmental axis (Tapaninaho & Heikkinen, 2022), while others have established that environmental activities are negatively affected by other factors (Miroshnychenko & De Massis, 2022; Disli et al., 2022); therefore, these diverse results must be investigated in a specific context like the Colombian one, where each industrial company presents specific behaviours associated with sustainability, according to the subsector in which it is located.

Theoretical Framework

Sustainability practices are all those actions carried out with the objective of reducing the environmental damage caused by business activities. In the early years of the environmental movement, many organisations considered recycling and reducing paper use as responsible environmental practices. However, as more research, information, and natural phenomena became evident, organisations found that water use, energy intensity, large amounts of waste, and the low environmental awareness of companies and consumers broadly affected nature—the unique source

of indispensable resources for corporate operation. Therefore, the environmental awakening, as it might be called, initiated a broader and faster movement, moving from simple sustainability practices to practices in the production processes that involved better inputs, reduction in the intensive use of some resources, or their shift to other alternative sources, as well as a change in the conception of consumption, the economic cycle, and therefore, what it means to be sustainable (Oriade et al., 2021). However, corporate performance (De Steur et al., 2020), derived from the sales of traditional and non-ecological industrial products, did not stop; on the contrary, companies increased their profitability indices with the same products and minor changes. Organisations have demanded more from managers in situations of great environmental uncertainty (He et al., 2021). Therefore, the concern for being sustainable did not modify the intention of the large corporations: to create more products, more consumption, and therefore higher levels of sales.

Manufacturing organisations have implemented various sustainability practices, but finding the practices suitable for the type of organisation and industry becomes a challenge for both resources and capabilities. To reach suitable sustainability practices, organisations should go through research processes that lead the company to develop innovations in their production processes, reducing the use of scarce resources and improving the use of resources that are less polluting to the environment. There are multiple contradictory studies regarding the effects of sustainability policy (Böttcher & Müller, 2016), some showing positive effects (Chuang & Huang, 2018; Naidoo & Gasparatos, 2018), others with negative effects (Dahlmann et al., 2019; Lin et al., 2007). Thus, sustainability and its effects on performance must be studied in this context, which clarifies whether corporate concern for sustainability, associated with appropriate practices, can impact performance (see Figure 1). Including, for example, defining new strategies for developing new products, entering new markets, proposing modifications to their processes, and achieving a sustainable competitive advantage. Therefore, the following hypothesis is proposed:

- *H1a. The sustainability practices of manufacturing companies positively affect their corporate performance.*

Manufacturing Industries

The manufacturing industry is as varied as the types of products offered; therefore, for the present research, it is important to recognise the moderating role of the different subsectors that make up the industry. Previous studies (Rahman et al., 2022; Malesios et al., 2018) have examined the manufacturing industry. However, only some studies have identified groups of industries and their interaction between sustainability practices and corporate performance.

Each economic industry is distinct and, therefore, should have sustainability practices in accordance with its specific characteristics; in the present study, the subsectors have been grouped into 5 main categories that will be studied subsequently. This will allow an understanding of whether the relationship between sustainability practices and corporate performance is moderated by the type of industry in which the organisation is located.

Food and Textile Products Industry

Sustainability in the food industry has been highly controversial over the last 15 years, especially because the industry is considered to be the creator of various environmental problems due to waste generation (Küberling-Jost, 2021; Yngfalk, 2019), indiscriminate disposal, and the intensive use of natural resources. Therefore, the

company's value chain matters significantly in establishing good sustainability practices.

On the other hand, quality activities and customer contact can be fundamental, according to previous studies by Rahmani et al. (2018), for successful sustainability management; other studies show that sustainability is not just an organisational matter but requires an intensive review of the value chain (Vu et al., 2017). However, an additional challenge for the food industry is to create a cooperation system for the company combining sustainability and innovation (Rabadán et al., 2019; León-Bravo et al., 2017); other authors add to this condition for the competitiveness of the industry and state that this cooperation must also be based on appropriate governmental regulations (Ben Amara & Chen, 2020; Guliyeva & Lis, 2020) that allow improving processes to build what is known as eco-innovation. Moreover, the food industry presents a condition in various studies, in entirely different contexts, it has been established that sustainability practices and specifically eco-innovation, which would be the result of these practices, can generate a significant performance improvement (Yurdakul & Kazan, 2020; Cucchiella et al., 2017; Maletič et al., 2016). Therefore, in this study, it is necessary to understand the dynamics of the Colombian food industry sustainability practices and verify if they are positive, as in other contexts.

Meanwhile, the Colombian textile industry is competitive internationally and widely recognised for its quality of fabrics. However, it faces a marked trend towards green fashion (Brewer, 2019), or the trend that seeks to recycle fashion to avoid excessive consumption of clothes and textiles that become pollutants. Some companies have opted to design garments that have multiple uses, or that can later be donated in an attempt to maintain sales but also to slowly implement sustainability policies (Feng & Ngai, 2020) and a culture of proper consumption for customers (Balconi et al., 2019).

It has also been shown that sustainability can improve an organisation's performance (Pedersen et al., 2018). Therefore, sustainability practices can help organisations in the industry develop valuable assets such as reputation and even improve their value chains.

In the food industry, some Colombian companies have a sustainability policy. Companies like Frisby, dedicated to producing chicken products and fast food offered at sales points, have created a sustainability policy emphasising the use of ecological inks, recyclable packaging, and zero use of bleachers (Frisby, 2019). Organisations in these industries should have a greater relationship between sustainability practices and performance. Therefore, the aim is to explain whether:

- *H1b. The food and textile products industry moderates the relationship between sustainability practices and the performance of Colombian manufacturing organisations.*

Wood and Paper Industry

Wood and paper are possibly the industries that have developed the most social responsibility since the Millennium Goals. Its dependence on natural resources has consistently led it to create procedures to restore soils used for the industry and ensure sufficient long-term inputs. This has led to the creation of plastic woods with finishes similar to more expensive and hard-to-obtain woods in the short and medium term.

Some government policies have helped the industry generally establish certain standards (Scordato et al., 2018), although one of the major concerns is the utilisation of waste within the production process (Molina-Sánchez et al., 2018); the application of new technologies (Jiang et al., 2018) to facilitate sustainability practices has also become a concern due to the scope and benefits for a few competitors with enough resources to include them in the entire value chain. However, finding a fair balance

between nature and performance has become the central focus of companies in the industry; some studies (Hurditch, 2018) show that sustainability can help the industry create better practices and continue to be successful.

The wood and paper industry in Colombia is making great efforts to diversify paper production from other resources such as sugarcane bagasse. In Colombia, Grupo Carvajal, especially its company Propal, has developed innovations that, using waste, have managed to position itself in the market as an ecological paper derived from sugarcane crops (Propal, 2019). The company has managed to expand to more than 15 countries and diversify into packaging from the same input, allowing the industry to be widely recognised as highly profitable. Therefore, this study seeks to establish whether:

- *H1c. The wood and paper industry moderates the relationship between sustainability practices and the performance of Colombian manufacturing organisations.*

Oil, Pharmaceutical, Chemical, and Rubber Industry

The Colombian pharmaceutical and chemical industry is very competitive internationally, exports important inputs to different countries, and has consolidated its quality and good practices. However, it faces large competitors with greater research and development capabilities. In sustainability practices, the international pharmaceutical industry works on sustainable packaging (Chaturvedi et al., 2017; Raju et al., 2016), reduction in the use of some raw materials, and especially by generating a sustainability culture that improves its reputation and helps it perform better.

On the other hand, the oil and rubber industry, following the crisis generated by the COVID-19 pandemic, has been seriously affected; according to Dinero (2020), there is currently a demand shortage, generating a possible short-term production drop. However, other oil substitutes in Colombia, such as bioethanol and palm biodiesel, which are developed by mills like Manuelita (Manuelita, 2020), have established themselves as more ecological alternatives with significant results in the industry. The so-called biofuels (Bibi et al., 2017) have become an alternative for fuel production with a lower impact on the ecological environment, which can also be profitable and, in the long term, displace the demand for traditional fuels derived exclusively from oil.

The pharmaceutical, chemical, oil, and rubber industries are highly specialised and competitive and require large investments. These industries have developed essential skills that position them as highly profitable creators of a large number of jobs and significant economic mobilisers. Their value cycle, accompanied by appropriate sustainability practices, can improve firm performance (Hasheminasab et al., 2018), followed by social practices such as improvement in work safety (Huurdeman & Rozhkova, 2019) for the thousands of employees, would constitute a significant advancement that would improve the industry reputation and therefore its long-term performance. Consequently, it is necessary to establish whether this industry presents better sustainability practices than other industries, establishing the following hypothesis:

- *H1d. The oil, pharmaceutical, chemical, and rubber industries moderate the relationship between sustainability practices and the performance of Colombian manufacturing organisations.*

Metallurgy and Electronics Industry

The electronics industry in Colombia has a particular dynamic, especially dedicated to the assembly of automobile parts. It has been extensively linked to large

multinationals investing in the industry, with Colombian companies becoming their specialised suppliers. This industry globally has had to face radical changes in the consumption and recycling of various types of products, as well as the search for cooperation to make the business more competitive and sustainable (Flygansvær et al., 2018) while seeking a reduction in the use of raw materials (Ho et al., 2019).

Within the metallurgical industry, the constant concern to improve extraction and subsequent processing methods has created advanced production, distribution, and export policies. This industry is considered a supplier to others in the manufacturing industry and requires intensive study in terms of more responsible practices both environmentally and towards employees. Some authors have made various proposals so that each subsector within metallurgy can improve its ecological impact (Rankin, 2017), especially because it is well-known that the practices of some companies globally are not the most appropriate (Goode, 2018; Lamm & Lips-Wiersma, 2018).

Within the metallurgical industry in Colombia, one of the most representative industries is the steel industry. In Colombia, Acerías Paz del Río, originally Colombian, consolidated as the second most important in the country, although in 2007, it was acquired by a Brazilian company. It has stood out for having a policy on society and the environment, covering the management of water, air, and waste (Paz del Río, 2020). It is important to recognise that while this industry has developed some environmental practices, it still has a long way to go, especially because all decisions organisations make regarding extraction and processing directly affect employees. Additionally, establishing sustainability practices can help the organisation improve its productivity (Sun et al., 2017), which can lead to improvements in its performance. In the Colombian case, sustainability practices in the metallurgy and electronics industry are expected to be broader than in other industries. Therefore, this study seeks to establish whether:

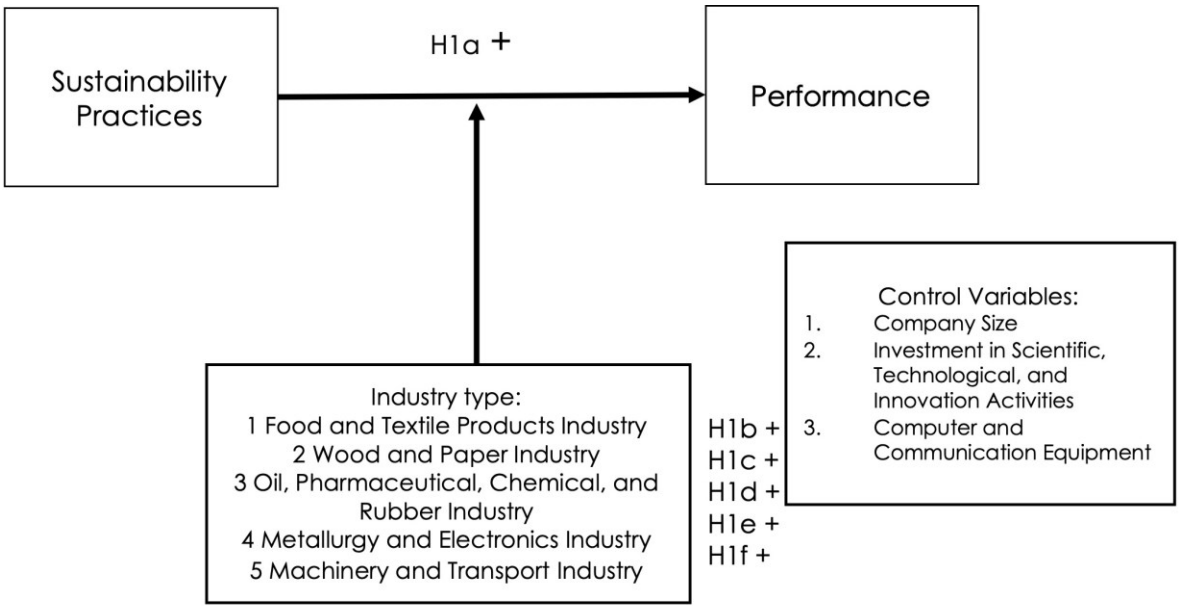
- *H1e. The metallurgy and electronics industry moderate the relationship between sustainability practices and the performance of Colombian manufacturing organisations.*

Machinery and Transport Industry

The Colombian industry includes various groups that trade and assemble machinery and transport vehicles with foreign and national capital. Most of these organisations present sustainability policies derived from the country of origin of these inputs or the consumer's use of the final product. One of the most recognised companies in the industry is Sofasa (Renault, 2020). Although there are few companies in this market niche, it turns out to be an industry that energises the economy thanks to the productive chain behind these types of companies. Sustainability practices for these companies have become a challenge in their production process, especially due to highly polluting inputs, high energy consumption, and little study regarding this industry and its environmental effects (Li et al., 2017). It is important to recognise that companies in the transport industry have different performances in terms of sustainability (Kumar & Anbanandam, 2019) and implement various practices according to their type of business and context (Banerjee & Punekar, 2020). Therefore, this study seeks to establish whether:

- *H1f. The machinery and transport industry moderates the relationship between sustainability practices and the performance of Colombian manufacturing organisations.*

Figure 1
Research model



Source: Author's illustration

The model of this research tries to explain the positive relationship between the variables sustainability practices and performance in the manufacturing industry; the "+" sign indicates that an increase in one variable is expected to cause a corresponding increase in another variable. According to the model, the connection between sustainability practices and performance is influenced by the industry type. This means that the impact of sustainability practices on performance may vary across different industries depending on their unique characteristics and external pressures. Each industry may respond differently to sustainability practices, and as a result, the strength or direction of the influence may differ. However, all the hypotheses suggest that sustainability practices positively impact performance within particular industries.

Methodology

A sample of 1570 Colombian manufacturing companies from the Survey of Technological Development and Innovation (EDIT) with data from 2017 - 2018 created by the National Administrative Department of Statistics (DANE) was taken (Velez, 2023). For the analysis, a hierarchical regression analysis was performed, which allows the introduction of variables, noting the impact and interaction between variables in each model. The independent variable corresponds to sustainable practices (Pham et al., 2021; Pereira et al., 2021; Zhu et al., 2016), which takes the arithmetic mean of three variables: reduction in energy consumption (Hepburn et al., 2018; Tang & Tan, 2014), waste utilisation (Gupta et al., 2019; Ajemigbitse et al., 2019; Qi et al., 2018), and reduction in the use of raw materials (Lenzo et al., 2018; Sameer & Bringezu, 2019; Sicoli et al., 2019).

The control variable used was company size (Forés & Camisón, 2016), followed by investment in scientific, technological, and innovation activities in millions of pesos, according to the survey (Velez, 2023, Kihombo et al., 2021; Liu et al., 2019; Biswas et al., 2018; Saidani et al., 2017) adopted from previous studies on innovation. The third

control variable corresponds to investment in machinery and communication equipment in millions of pesos (Liang et al., 2022; Wu et al., 2015; Gawer & Cusumano, 2014). Natural logarithm was applied to both variables: investment in scientific, technological, and innovation activities and investment in machinery and communication equipment.

The dependent variable, a robust measure of performance that adds national and international sales, has been widely adopted in the literature of previous studies (Jha et al., 2017; Tan et al., 2017; Chandran & Rasiah, 2013), giving confidence in its validity and applicability.

The moderating variable used is the type of industry, recognising if differences between industry subsectors can influence performance (Hasan et al., 2022; Fok et al., 2021; Lützner et al., 2016; Betts et al., 2015; Wu, and Chiu, 2015).

Results

The assumptions of multiple regression analysis were taken care of for the analysis, and the maximum value of the variance inflation factor was 3.6. Table 1 presents the descriptive statistics, and Table 2 the correlation matrix.

Table 1
Descriptive statistics

Research variables	Code	Mean	SD
Log Performance	(1)	7,14	0,85
Control Variable Company Size	(2)	251,56	421,59
Log Investment in Scientific, Technological, and Innovation Activities	(3)	1,79	2,41
Log Computer and Communication Equipment	(4)	2,88	2,65
Sustainability Practices	(5)	1,7	0,57
Industry1 - Food and Textile Products	(6)	0,37	0,48
Industry2 - Wood and Paper	(7)	0,07	0,25
Industry3 - Oil, Pharmaceutical, Chemical, and Rubber	(8)	0,26	0,44
Industry4 - Metallurgy and Electronics	(9)	0,16	0,36
Industry5 - Machinery and Transport	(10)	0,15	0,36

Source: Author's work

Table 2
Correlation analysis

Code	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	1								
(2)	0,668**	1							
(3)	0,495**	0,461**	1						
(4)	0,446**	0,349**	0,380**	1					
(5)	0,140**	0,084**	0,098**	0,153**	1				
(6)	0,051*	0,128**	-0,125	-0,003	-0,077**	1			
(7)	-0,078**	-0,059*	-0,033	0,013	-0,025	-0,207**	1		
(8)	0,052*	-0,063*	0,072**	-0,017	0,047	-0,447**	-0,159**	1	
(9)	-0,035	-0,049	0,066**	0,021	0,047	-0,328**	-0,117**	-0,252**	1
(10)	-0,042	-0,004	0,036	-0,005	0,014	-0,323**	-0,115**	-0,248**	-0,182**

Source: Author's work
Note: ** statistically significant at 1%; *5%

Table 3 presents the regressions for the dependent variable corporate performance and the moderating effects of industry types. Control variables are introduced in

model 1; in this first model, it is explained 52.1% of the variance of corporate performance; the company size variable is positive and significant, indicating that a change in the size of the organisation can affect its corporate performance, especially if it has sustainability practices. The investment variable in research and development activities (R&D) is positive and significant, which is of interest to manufacturing companies; in this second model, research and development prove to be useful for improving the organisation's overall performance in its industry. On the other hand, investment in machinery and equipment is positive and significant; in the first model, it also had the same effect, which can help organisations consider investment in machinery and equipment as a necessity to improve their performance in the long term, and not as an inefficient expense.

Table 2
Hierarchical regression analysis

	Model 1	Model 2	Model 3	Model 4
Control Variable Company Size	0,001*** (0,000)	0,001*** (0,000)	0,001*** (0,000)	0,001*** (0,000)
Log Investment in Scientific, Technological, and Innovation Activities	0,064*** (0,007)	0,063*** (0,007)	0,063*** (0,007)	0,063*** (0,007)
Log Computer and Communication Equipment	0,063*** (0,006)	0,061*** (0,006)	0,062*** (0,006)	0,062*** (0,006)
Sustainability Practices		0,075*** (0,026)	0,073*** (0,026)	0,016 (0,049)
Industry1 Food and Textile Products			.	.
Industry2 Wood and Paper			-0,149** (0,061)	-0,171 (0,187)
Industry3 Oil, Pharmaceutical, Chemical, and Rubber			0,091** (0,039)	0,209* (0,117)
Industry4 Metallurgy and Electronics			-0,069 (0,045)	-0,058 (0,147)
Industry5 Machinery and Transport			-0,106** (0,045)	-0,198 (0,143)
Interaction Industry1_ Sustainability Practices				0,068 (0,065)
Interaction Industry2_ Sustainability Practices				0,081 (0,110)
Interaction Industry3_ Sustainability Practices				.
Interaction Industry4_ Sustainability Practices				0,061 (0,084)
Interaction Industry5_ Sustainability Practices				0,121 (0,084)
Constant	6,582*** (0,023)	6,462*** (0,047)	6,479*** (0,050)	6,460*** (0,075)
R^2	0,521	0,523	0,530	0,530
R^2 Change		0,002	0,007	0,000

Notes: Dependent Variable Log Performance; *p < 0.10, **p<0.05, ***p<0.01; Standard error in parentheses.
Source: Author's work

In model 2, the independent variable of sustainability practices is included, being significant and positive, confirming hypothesis H1a. Thus, companies with practices associated with the reduction of energy use, reduction of raw materials, and waste utilisation have better corporate performance in the market.

Model 3 consists of all the main effects, and model 4 introduces the moderating effects between sustainability practices and industry types. Model 4 explains 53.0% of the variance in corporate performance. Industry 1, food and textile products (H1b) does not contribute to the model. The interactions with the industries, such as Industry 2, wood, and paper (H1c), were not significant. Also, the coefficient for the wood and paper industry itself was negative and significant, suggesting a negative impact; Industry 3, oil, pharmaceutical, chemical, and rubber (H1d), was not significant. However, the industry had a positive coefficient, indicating some direct positive impact; Industry 4, metallurgy, and electronics (H1e), was not significant, and the coefficients for the industry were negative and not significant; and Industry 5, machinery and transport (H1f), was not significant. Also, the coefficients for this industry were negative. Therefore, the effect of sustainability practices is direct and does not depend on the industry exclusively but on the company's intention to carry out sustainable practices. These practices, in turn, help it to have better corporate performance.

The industry types as a moderating variable help recognise two fundamental aspects of implementing sustainability practices. The first is that an organisation intending to carry out sustainable practices can do so regardless of its competitive industry and will, in return, achieve better corporate performance. However, the second element is that some industries may benefit more from these practices if their organisation is in an industry that can sacrifice the lesser use of natural resources and replace them with other materials or resources that have less impact on the environment.

Discussion

In the analysis of sustainability practices, multiple factors have been studied regarding causes that allow for better practices and the effects of such practices that help the organisation establish a competitive advantage (Braccini & Margherita, 2018). However, recent studies present a fundamental limitation; they need to include the economic industries to which organisations belong as a variable of analysis. This study advances in this direction, recognising the permanent effects of sustainability practices in different industries and describing a fundamental situation, the significant differences in investment, and the intention of industries to develop sustainable practices, explaining that each industry carries out sustainability practices that affect performance. However, the industry under analysis does not necessarily imply a modification in this relationship. In other words, the diversity of industries does not affect the relationship between sustainability practices and performance. Rather, it is the practices themselves and the intention to develop these practices that allow the organisation to achieve superior market performance.

From the resource and capabilities theory perspective, sustainability can be considered as a capability stemming from the good use of human and technological resources that allows for the development of practices to reduce specific resources (water, electricity, lands for farming and livestock, among others), creating a virtuous circle in the development of sustainable practices. Recent studies show that the development of capabilities can become a complete management system (Yoshikuni et al., 2021), requiring mostly intangible resources for creating value from ecological sustainability.

Moreover, recent studies implied that the organisation had to be sustainable in ecological terms (Angelakoglou & Gaidajis, 2015) but did not necessarily have investment levels in research, technology, and development, investment in machinery and equipment as a determining factor for advancement in sustainability practices and therefore in corporate performance. This analysis advances in this direction, showing how organisations that have sustainability practices and also appropriate investments in research and development, technology, machinery, and equipment can achieve this superior performance, breaking the paradigm of sacrificing sustainability for technology and recognising the need to have both perspectives (Oláh et al., 2020) to achieve organisational success.

Sustainability has gradually become the substantial axis of corporate social responsibility, not only as a determinant in the acquisition and maintenance of natural resources, the unique source of creating products and services but also because of its immediate effect on consumers' and employees' quality of life. In other words, sustainability becomes the goal of value creation for any organisation seeking to preserve a growth cycle that not only generates economic value but also social value for the communities it serves.

Therefore, returning to corporate social responsibility is fundamental to understanding the concept of sustainability and its implications on firm performance (Choongo, 2017). It is important to remember that the source of what we know as sustainability derives from a principle of responsibility of business activity, where organisations, once they carry out activities of resource exploitation, develop goods that different consumers purchase, and in each of the economic industries in which the companies of this study are located, the creation scheme is the same, the problem for all has been the scarcity of resources, which offers us the resource-based view. This theory establishes that organisations must face and deal with uncertainty (Ren, 2018) and the growing scarcity of natural resources, particularly created resources, in general. This concern looms over companies in both the production process and at the point of sale, which must ensure two fundamental factors: first, that the organisation, with the economic resources it obtains, can recreate these resources or at least invest in recovering the exploited resource, and second, that this responsibility, therefore, is no longer exclusive to governments, non-profit organisations, environmentalists, but a kind of shared responsibility that ensures that both the company and all its stakeholders (Hadj, 2020) have a fundamental job to develop processes and products that respect and reduce the ecological effect (Stock et al., 2018).

However, ensuring that organisations always consider this responsibility before designing products and manufacturing processes differs for industries of all industries. For example, in the machinery and transport industry, developing technology equipment already implies a high use of energy, which is generally electrical, translating into greater water consumption. However, other mechanisms have developed, such as using solar panel filters to reduce air pollution, sensors to prevent accidents in production plants, and alternating practices to balance the environmental effect. In the pharmaceutical industry, a large-scale ecological impact is sacrificed for small environmentally useful modifications, such as packaging modifications and amounts of plastic use, with continuous scientific development for improving the quality of life of patients and future patients. This comparison demonstrates that each industry will have different outcomes in terms of sustainability practices, but this does not necessarily mean that they will be less profitable. The study highlights that it is important for each industry to act responsibly according to their unique characteristics and invest in ecological practices that are specific to their

industry. Doing so will enable them to establish appropriate relationships with stakeholders and co-create more environmentally friendly products as they continue to learn and improve.

It is also important to discuss the significant role of corporate size in companies with sustainability practices and, therefore, superior performance; smaller companies may consider corporate success offered by sustainability practices as a path to continue growing in the market. Strengthening their market positioning and developing at the same time an economic cycle that allows them to grow and be recognised for good sustainability practices, they can invest more in research and new ecological practices, making the customer buy their products by considering them more ecological. In small and medium-sized enterprises, this incentive can be used by public policy entities to generate incentives for organisations that include sustainability activities in their manufacturing process. For example, mobilising resources for the development of these practices, tax reduction, business alliances, or, as demonstrated by the present study, managing greater investment in research, development, and technology activities that can build a business dynamic focused on the creation of activities within the production process and in the development of products, more responsible with the environment, which in the long term benefit the whole society.

In addition, it is important to highlight the management implications; corporate managers will observe that the implementation of sustainability practices in the company is not a cost but a medium-term investment that will grant the company better performance results, especially because they are associated with a genuine concern for the reduction in the use of very expensive resources such as water, electricity, and the proper management of waste derived from their corporate activities, which also generates a public policy concern, to develop legal frameworks (Salimova et al., 2020) that encourage more sustainable corporate practices, helping the entire business ecosystem to apply certain common practices that benefit both communities, customers, and stakeholders in general.

Finally, it is necessary to establish two fundamental elements for future research: first, technology and the ecological environment seem to go along different paths for industrial companies; reconciling both perspectives for environmentally responsible technology will be a short-term challenge for the manufacturing industry worth studying. Second, investments in research and development at the industrial level should not only be made to develop technology-based innovation but also to recognise other paths of innovative development with corporate social responsibility, which can be analysed through the connection between public policy and the business industry.

Conclusion

Manufacturing organisations have been developing better sustainability practices through an accelerated decrease in the use of resources such as water and energy. However, each industry is distinct in these practices; some industries may achieve better results than others as they can sacrifice the intensive use of some resources that do not necessarily generate direct value in their products. In this study, it has been established that the type of industry does not affect the relationship between sustainability practices and corporate performance, which can be explained as a direct relationship that does not depend exclusively on the industry but on the mere fact of having sustainability practices associated with energy use, water use, and waste utilisation. This result is a significant incentive for industrial organisations looking

to establish specific strategies regarding the best forms of sustainability, as well as the development of more ecological and innovative products.

In the past, some organisations considered sustainability a costly element to implement in the company, and intervening to carry out cleaner production processes seemed impossible. However, it can be established that these organisations obtain better corporate results that translate into higher sales and better financial indicators in the long term. Moreover, from the public policy perspective, better incentives exist to develop businesses that consider environmental sustainability a fundamental element of competitive strategy. This research can help managers and public policy developers establish business processes with sustainability practices and convince entrepreneurs who still need to join environmental initiatives to build environmentally sustainable companies.

It is also important to consider that this research significantly contributes to the theory by illustrating how sustainability practices in manufacturing firms can be integrated as a strategic decision across various industries to enhance performance. With the hierarchical regression model, the approach adds sophistication to our understanding of sustainability, highlighting the moderating role of industry types in the relationship between sustainability practices and corporate performance.

This contribution is particularly valuable in environmental management and sustainable development. It provides empirical evidence that supports customising sustainability strategies based on sector characteristics, thus pushing the theoretical boundaries beyond a one-size-fits-all approach to corporate sustainability.

Besides, the study has certain limitations as it is limited to a specific geographic region. Therefore, the findings may not be an accurate representation of companies in other regions or economic conditions. This implies that the results may differ significantly in countries with different regulatory environments and market dynamics.

Another limitation of the study is the need for qualitative information. Analysing the qualitative aspects of how sustainability practices are implemented and their impact on different aspects of an organisation could help better understand the differences between industries.

Furthermore, it is important to recognise that future studies should address other possible variables that affect the relationship between sustainable practices and performance, such as variables associated with corporate age, country of origin, corporate performance in international markets, and social and environmental innovations, which can add to the explanation of the relationship between these variables.

References

1. Ajemigbitse, M. A., Cannon, F. S., Klima, M. S., Furness, J. C., Wunz, C., & Warner, N. R. (2019). Raw material recovery from hydraulic fracturing residual solid waste with implications for sustainability and radioactive waste disposal. *Environmental Science: Processes & Impacts, 21*(2), 308-323. https://doi.org/10.1039/C8EM00248G
2. Angelakoglou, K., & Gaidajis, G. (2015). A review of methods contributing to the assessment of the environmental sustainability of industrial systems. *Journal of Cleaner Production, 108*, 725-747. https://doi.org/10.1016/j.jclepro.2015.06.094
3. Balconi, M., Sebastiani, R., & Angioletti, L. (2019). A Neuroscientific Approach to Explore Consumers' Intentions Towards Sustainability within the Luxury Fashion Industry. *Sustainability, 11*(18), 5105. https://doi.org/10.3390/su11185105

4. Banerjee, S., & Punekar, R. M. (2020). A sustainability-oriented design approach for agricultural machinery and its associated service ecosystem development. *Journal of Cleaner Production, 264*, 121642. https://doi.org/10.1016/j.jclepro.2020.121642
5. Batista, A., & Francisco, A. (2018). Organizational Sustainability Practices: A Study of the Firms Listed by the Corporate Sustainability Index. *Sustainability, 10*(1), 226. https://doi.org/10.3390/su10010226
6. Ben Amara, D., & Chen, H. (2020). A mediation-moderation model of environmental and eco-innovation orientation for sustainable business growth. *Environmental Science and Pollution Research, 27*(14), 16916-16928. https://doi.org/10.1007/s11356-020-08206-4
7. Betts, T. K., Wiengarten, F., & Tadisina, S. K. (2015). Exploring the impact of stakeholder pressure on environmental management strategies at the plant level: what does industry have to do with it? *Journal of Cleaner Production, 92*, 282-294. https://doi.org/10.1016/j.jclepro.2015.01.002
8. Bibi, R., Ahmad, Z., Imran, M., Hussain, S., Ditta, A., Mahmood, S., & Khalid, A. (2017). Algal bioethanol production technology: A trend towards sustainable development. *Renewable and Sustainable Energy Reviews, 71*, 976-985. https://doi.org/10.1016/j.rser.2016.12.126
9. Biswas, R. K., Kabir, E., & Rafi, R. B. R. (2019). Investment in Research and Development Compared to Military Expenditure: Is Research Worthwhile? *Defence and Peace Economics, 30*(7), 846-857. https://doi.org/10.1080/10242694.2018.1477235
10. Böttcher, C., & Müller, M. (2016). Insights on the impact of energy management systems on carbon and corporate performance. An empirical analysis with data from German automotive suppliers. *Journal of cleaner production*, *137*, 1449-1457. https://doi.org/10.1016/j.jclepro.2014.06.013
11. Braccini, A. M., & Margherita, E. G. (2018). Exploring Organizational Sustainability of Industry 4.0 under the Triple Bottom Line: The Case of a Manufacturing Company. *Sustainability, 11*(1), 36. https://doi.org/10.3390/su11010036
12. Brewer, M. K. (2019). Slow Fashion in a Fast Fashion World: Promoting Sustainability and Responsibility. *Laws, 8*(4), 24. https://doi.org/10.3390/laws8040024
13. Chandran, V. G. R., & Rasiah, R. (2013). Firm size, technological capability, exports and economic performance: the case of electronics industry in Malaysia. *Journal of Business Economics and Management, 14*(4), 741-757. https://doi.org/10.3846/16111699.2012.668860
14. Chaturvedi, U., Sharma, M., Dangayach, G. S., & Sarkar, P. (2017). Evolution and adoption of sustainable practices in the pharmaceutical industry: An overview with an Indian perspective. *Journal of cleaner production*, *168*, 1358-1369. https://doi.org/10.1016/j.jclepro.2017.08.184
15. Choongo, P. (2017). A longitudinal study of the impact of corporate social responsibility on firm performance in SMEs in Zambia. *Sustainability*, *9*(8), 1300. https://doi.org/10.3390/su9081300
16. Chuang, S.-P., & Huang, S.-J. (2018). The Effect of Environmental Corporate Social Responsibility on Environmental Performance and Business Competitiveness: The Mediation of Green Information Technology Capital. *Journal of Business Ethics, 150*(4), 991-1009. https://doi.org/10.1007/s10551-016-3167-x
17. Cucchiella, F., D'Adamo, I., Gastaldi, M., Koh, S. L., & Rosa, P. (2017). A comparison of environmental and energetic performance of European countries: A sustainability index. *Renewable and Sustainable Energy Reviews*, *78*, 401-413. https://doi.org/10.1016/j.rser.2017.04.077
18. Dahlmann, F., Branicki, L., & Brammer, S. (2019). Managing Carbon Aspirations: The Influence of Corporate Climate Change Targets on Environmental Performance. *Journal of Business Ethics, 158*(1), 1-24. https://doi.org/10.1007/s10551-017-3731-z

19. De Steur, H., Temmerman, H., Gellynck, X., & Canavari, M. (2020). Drivers, adoption, and evaluation of sustainability practices in Italian wine SMEs. *Business Strategy and the Environment*, *29*(2), 744–762. https://doi.org/10.1002/bse.2436
20. Dinero. (2020) Producción de petróleo puede caer en mayo a niveles de hace 10 años. https://www.dinero.com/economia/articulo/produccion-de-petroleo-en-colombia-caeria-entre-184-y-161-en-mayo/289868
21. Disli, M., Yilmaz, M. K., & Mohamed, F. F. M. (2022). Board characteristics and sustainability performance: empirical evidence from emerging markets. *Sustainability Accounting, Management and Policy Journal, 13*(4), 929-952. https://doi.org/10.1108/sampj-09-2020-0313
22. Feng, P., & Ngai, C. S. B. (2020). Doing More on the Corporate Sustainability Front: A Longitudinal Analysis of CSR Reporting of Global Fashion Companies. *Sustainability, 12*(6), 2477. https://doi.org/10.3390/su12062477
23. Flygansvær, B., Dahlstrom, R., & Nygaard, A. (2018). Exploring the pursuit of sustainability in reverse supply chains for electronics. *Journal of Cleaner Production, 189*, 472-484. https://doi.org/10.1016/j.jclepro.2018.04.014
24. Fok, L. Y., Morgan, Y.-C., & Zee, S. M. L. (2021). A Multi-Industry Study of Sustainability, Total Quality Management, Organizational Culture, and Performance. *International Journal of Operations and Quantitative Management, 27*(1), 45. https://doi.org/10.46970/2021.27.1.3
25. Forés, B., & Camisón, C. (2016). Does incremental and radical innovation performance depend on different types of knowledge accumulation capabilities and organizational size? *Journal of Business Research, 69*(2), 831-848. https://doi.org/10.1016/j.jbusres.2015.07.006
26. Frisby. (2019). Compnia. https://frisby.com.co/compania.
27. Gawer, A., & Cusumano, M. A. (2014). Industry Platforms and Ecosystem Innovation. *Journal of Product Innovation Management, 31*(3), 417-433. https://doi.org/10.1111/jpim.12105
28. Goode, J. R. (2018). Critical Materials Traceability: More Important Than Metallurgy. *The Minerals, Metals & Materials Series*, 2513-2522. https://doi.org/10.1007/978-3-319-95022-8_212
29. Guliyeva, A. E., & Lis, M. (2020). Sustainability Management of Organic Food Organizations: A Case Study of Azerbaijan. *Sustainability, 12*(12), 5057. https://doi.org/10.3390/su12125057
30. Gupta, N., Poddar, K., Sarkar, D., Kumari, N., Padhan, B., & Sarkar, A. (2019). Fruit waste management by pigment production and utilization of residual as bioadsorbent. *Journal of Environmental Management, 244*, 138-143. https://doi.org/10.1016/j.jenvman.2019.05.055
31. Hadj, T. B. (2020). Effects of corporate social responsibility towards stakeholders and environmental management on responsible innovation and competitiveness. *Journal of Cleaner Production, 250*, 119490. https://doi.org/10.1016/j.jclepro.2019.119490
32. Haessler, P. (2020). Strategic decisions between short-term profit and sustainability. *Administrative Sciences*, *10*(3), 63. https://doi.org/10.3390/admsci10030063
33. Hasan, I., Singh, S., & Kashiramka, S. (2022). Does corporate social responsibility disclosure impact firm performance? An industry-wise analysis of Indian firms. *Environment, Development and Sustainability*, *24*(8), 10141-10181. https://doi.org/10.1007/s10668-021-01859-2
34. Hasheminasab, H., Gholipour, Y., Kharrazi, M., & Streimikiene, D. (2018). Life cycle approach in sustainability assessment for petroleum refinery projects with fuzzy-AHP. *Energy & Environment, 29*(7), 1208-1223. https://doi.org/10.1177/0958305x18772425

35. He, Q., Wang, Z., Wang, G., Xie, J., & Chen, Z. (2022). The Dark Side of Environmental Sustainability in Projects: Unraveling Greenwashing Behaviors. *Project Management Journal, 53*(4), 349-366. https://doi.org/10.1177/87569728211042705
36. Hepburn, C., Pless, J., & Popp, D. (2018). Policy Brief—Encouraging Innovation that Protects Environmental Systems: Five Policy Proposals. Review of Environmental Economics and Policy, 12(1), 154-169. Retrieved from https://ora.ox.ac.uk/objects/
37. Ho, F. H., Abdul-Rashid, S. H., Raja Ghazilla, R. A., & Woo, Y. L. (2019). Resources Sustainability through Material Efficiency Strategies: An Insight Study of Electrical and Electronic Companies. *Resources, 8*(2), 117. https://doi.org/10.3390/resources8020117
38. Hurditch, W. J. (2018). Planning for Sustainability in the Australian Pulp and Paper Industry. *WIT Transactions on Ecology and the Environment*, *217*, 93–103. https://doi.org/10.2495/sdp180091
39. Huurdeman, A., & Rozhkova, A. (2019). Balancing Petroleum Policy: Toward Value, Sustainability, and Security. https://doi.org/10.1596/978-1-4648-1384-9
40. Jha, S., Balaji, M. S., Yavas, U., & Babakus, E. (2017). Effects of frontline employee role overload on customer responses and sales performance: Moderator and mediators. *European Journal of Marketing, 51*(2), 282-303. https://doi.org/10.1108/ejm-01-2015-0009
41. Jiang, F., Li, T., Li, Y., Zhang, Y., Gong, A., Dai, J., Hitz, E., Luo, W., & Hu, L. (2018). Wood-Based Nanotechnologies toward Sustainability. *Advanced Materials, 30*(1). https://doi.org/10.1002/adma.201703453
42. Kihombo, S., Saud, S., Ahmed, Z., & Chen, S. (2021). The effects of research and development and financial development on CO2 emissions: evidence from selected WAME economies. *Environmental Science and Pollution Research*, *28*(37), 51149-51159. https://doi.org/10.1007/s11356-021-14288-5
43. Küberling-Jost, J. A. (2021). Paths of Corporate Irresponsibility: A Dynamic Process. *Journal of Business Ethics, 169*(3), 579-601. https://doi.org/10.1007/s10551-019-04263-z
44. Kumar, A., & Anbanandam, R. (2019). Development of social sustainability index for freight transportation system. *Journal of Cleaner Production, 210*, 77-92. https://doi.org/10.1016/j.jclepro.2018.10.353
45. Lamm, F., & Lips-Wiersma, M. (2018). A disaster waiting to happen: Silently silencing stakeholders at the Pike River Coal Mine. *Journal of Industrial Relations, 60*(4), 560-583. https://doi.org/10.1177/0022185618774595
46. Lenzo, P., Traverso, M., Mondello, G., Salomone, R., & Ioppolo, G. (2018). Sustainability Performance of an Italian Textile Product. *Economies, 6*(1), 17. https://doi.org/10.3390/economies6010017
47. León-Bravo, V., Caniato, F., Caridi, M., & Johnsen, T. (2017). Collaboration for Sustainability in the Food Supply Chain: A Multi-Stage Study in Italy. *Sustainability, 9*(7), 1253. https://doi.org/10.3390/su9071253
48. Li, Z., Meng, N., & Yao, X. (2017). Sustainability performance for China's transportation industry under the environmental regulation. *Journal of Cleaner Production, 142*, 688-696. https://doi.org/10.1016/j.jclepro.2016.09.041
49. Liang, D.T., Wu, X., H., & Fukao, K. (2022). *Estimation of China's investment in ICT assets and accumulated ICT capital stock* (No. 833). Institute of Developing Economies, Japan External Trade Organisation (JETRO). https://www.ide.go.jp/English/Publish/Reports/Dp/833.html
50. Lin, S. J., Lu, I. J., & Lewis, C. (2007). Grey relation performance correlations among economics, energy use and carbon dioxide emission in Taiwan. *Energy Policy*, *35*(3), 1948-1955. https://doi.org/10.1016/j.enpol.2006.06.012
51. Liu, Y., Huang, X., & Chen, W. (2019). The dynamic effect of high-tech industries' R&D investment on energy consumption. *Sustainability*, *11*(15), 4090. https://doi.org/10.3390/su11154090

52. Lützner, R., Friedli, T., Budde, L., & Noflatscher, S. (2016). Performance effects of factory-within-a-factory designs. 23rd EurOMA Conference. Trondheim, Norway. https://www.alexandria.unisg.ch/server/api/core/bitstreams/55219060-88ab-4925-ab0b-ad833baf1c45/content
53. Malesios, C., Skouloudis, A., Dey, P. K., Abdelaziz, F. B., Kantartzis, A., & Evangelinos, K. (2018). Impact of small- and medium-sized enterprises sustainability practices and performance on economic growth from a managerial perspective: Modeling considerations and empirical analysis results. *Business Strategy and the Environment, 27*(7), 960-972. https://doi.org/10.1002/bse.2045
54. Maletič, M., Maletič, D., & Gomišček, B. (2016). The impact of sustainability exploration and sustainability exploitation practices on the organisational performance: a cross-country comparison. *Journal of Cleaner Production, 138*, 158-169. https://doi.org/10.1016/j.jclepro.2016.02.132
55. Manuelita. (2020). Manuelita Productos. https://manuelita.com/manuelita-productos/energias-renovables/
56. Miroshnychenko, I., & De Massis, A. (2022). Sustainability practices of family and nonfamily firms: a worldwide study. *Technological Forecasting and Social Change*, *174*, 121079. https://doi.org/10.1016/j.techfore.2021.121079
57. Molina-Sánchez, E., Leyva-Díaz, J. C., Cortés-García, F. J., & Molina-Moreno, V. (2018). Proposal of Sustainability Indicators for the Waste Management from the Paper Industry within the Circular Economy Model. *Water, 10*(8), 1014. https://doi.org/10.3390/w10081014
58. Naidoo, M., & Gasparatos, A. (2018). Corporate environmental sustainability in the retail sector: Drivers, strategies and performance measurement. *Journal of Cleaner Production, 203*, 125-142. https://doi.org/10.1016/j.jclepro.2018.08.253
59. Oláh, J., Aburumman, N., Popp, J., Khan, M. A., Haddad, H., & Kitukutha, N. (2020). Impact of Industry 4.0 on Environmental Sustainability. *Sustainability*, *12*(11), 4674. https://doi.org/10.3390/su12114674
60. Oriade, A., Osinaike, A., Aduhene, K., & Wang, Y. (2021). Sustainability awareness, management practices and organisational culture in hotels: Evidence from developing countries. *International Journal of Hospitality Management*, *92*, 102699. https://doi.org/10.1016/j.ijhm.2020.102699
61. Paz del Río. (2020). Available at: http://www.pazdelrio.com.co/es-es/Sostenibilidad/Paginas/ssma.aspx. Consultado en Julio 10 de 2020.
62. Pedersen, E. R. G., Gwozdz, W., & Hvass, K. K. (2018). Exploring the Relationship Between Business Model Innovation, Corporate Sustainability, and Organisational Values within the Fashion Industry. *Journal of Business Ethics, 149*(2), 267-284. https://doi.org/10.1007/s10551-016-3044-7
63. Pereira, V., Silva, G. M., & Dias, Á. (2021). Sustainability practices in hospitality: Case study of a luxury hotel in Arrábida Natural Park. *Sustainability*, *13*(6), 3164. https://doi.org/10.3390/su13063164
64. Pham, D. C., Do, T. N. A., Doan, T. N., Nguyen, T. X. H., & Pham, T. K. Y. (2021). The impact of sustainability practices on financial performance: empirical evidence from Sweden. *Cogent Business & Management, 8*(1). https://doi.org/10.1080/23311975.2021.1912526
65. Propal. (2019). Proceso de fabricación de nuestro papel. https://www.propal.com.co/proceso-de-fabricacion
66. Qi, X., Fu, Y., Wang, R. Y., Ng, C. N., Dang, H., & He, Y. (2018). Improving the sustainability of agricultural land use: An integrated framework for the conflict between food security and environmental deterioration. *Applied Geography, 90*, 214-223. https://doi.org/10.1016/j.apgeog.2017.12.009
67. Rabadán, A., González-Moreno, Á., & Sáez-Martínez, F. J. (2019). Improving Firms' Performance and Sustainability: The Case of Eco-Innovation in the Agri-Food Industry. *Sustainability, 11*(20), 5590. https://doi.org/10.3390/su11205590

68. Rahman, H. U., Zahid, M., & Khan, M. (2022). Corporate sustainability practices: a new perspective of linking board with firm performance. *Total Quality Management & Business Excellence*, *33*(7-8), 929-946. https://doi.org/10.1080/14783363.2021.1908826
69. Rahmani, K., Emamisaleh, K., & Iranzadeh, S. (2018). Sustainable Supply Chain Management Practices and Sustainability Performance in the Food Industry. *The South East Asian Journal of Management, 12*(1). https://doi.org/10.21002/seam.v12i1.8689
70. Raju, G., Sarkar, P., Singla, E., Singh, H., & Sharma, R. K. (2016). Comparison of environmental sustainability of pharmaceutical packaging. *Perspectives in Science, 8*, 683-685. https://doi.org/10.1016/j.pisc.2016.06.058
71. Rankin, W. J. (2017). Sustainability - the role of mineral processing and extractive metallurgy. *Mineral Processing and Extractive Metallurgy, 126*(1-2), 3-10. https://doi.org/10.1080/03719553.2016.1264164
72. Ren, J. (2018). Life cycle aggregated sustainability index for the prioritization of industrial systems under data uncertainties. *Computers & Chemical Engineering, 113*, 253-263. https://doi.org/10.1016/j.compchemeng.2018.03.015
73. Renault. (2020). Renault en Colombia. https://www.renault.com.co/renault-en-colombia.html
74. Saidani, W., Msolli, B., & Ajina, A. (2017). Research and development investment and financing constraints: The case of Japan. *Research in International Business and Finance, 42*, 1336-1342. https://doi.org/10.1016/j.ribaf.2017.07.070
75. Salimova, T., Vukovic, N., & Guskova, N. (2020). Towards sustainability through Industry 4.0 and Society 5.0. *International Review*(3-4), 48-54. https://doi.org/10.5937/intrev2003048s
76. Sameer, H., & Bringezu, S. (2019). Life cycle input indicators of material resource use for enhancing sustainability assessment schemes of buildings. *Journal of Building Engineering, 21*, 230-242. https://doi.org/10.1016/j.jobe.2018.10.010
77. Scordato, L., Klitkou, A., Tartiu, V. E., & Coenen, L. (2018). Policy mixes for the sustainability transition of the pulp and paper industry in Sweden. *Journal of Cleaner Production, 183*, 1216-1227. https://doi.org/10.1016/j.jclepro.2018.02.212
78. Sicoli, G., Bronzetti, G., & Baldini, M. (2019). The Importance of Sustainability in the Fashion Sector: ADIDAS Case Study. *International Business Research, 12*(6), 41. https://doi.org/10.5539/ibr.v12n6p41
79. Stock, T., Obenaus, M., Kunz, S., & Kohl, H. (2018). Industry 4.0 as enabler for a sustainable development: A qualitative assessment of its ecological and social potential. *Process Safety and Environmental Protection, 118*, 254-267. https://doi.org/10.1016/j.psep.2018.06.026
80. Sun, Y., Wang, H., Liu, L., & Wang, X. (2017). Solid wastes utilization in the iron and steel industry in China: towards sustainability. *Mineral Processing and Extractive Metallurgy, 126*(1-2), 41-46. https://doi.org/10.1080/03719553.2016.1258170
81. Tan, S. H., Habibullah, M. S., Tan, S. K., & Choon, S. W. (2017). The impact of the dimensions of environmental performance on firm performance in travel and tourism industry. *Journal of Environmental Management, 203*, 603-611. https://doi.org/10.1016/j.jenvman.2017.02.029
82. Tang, C. F., & Tan, B. W. (2014). The linkages among energy consumption, economic growth, relative price, foreign direct investment, and financial development in Malaysia. Quality & Quantity, 48(2), 781-797. https://doi.org/10.1007/s11135-012-9802-4
83. Tapaninaho, R., & Heikkinen, A. (2022). Value creation in circular economy business for sustainability: A stakeholder relationship perspective. *Business Strategy and the Environment, 31*(6), 2728-2740. https://doi.org/10.1002/bse.3002
84. Velez, O. I. M. (2023). Innovation investment and its impact on permanent employment. *Business: Theory and Practice*, *24*(2), 371-378.
85. Vu, H. M., Chan, H. K., Lim, M. K., & Chiu, A. S. F. (2017). Measuring business sustainability in food service operations: a case study in the fast food

industry. *Benchmarking: An International Journal, 24*(4), 1037-1051. https://doi.org/10.1108/bij-04-2015-0030

86. Wu, D., Rosen, D. W., Wang, L., & Schaefer, D. (2015). Cloud-based design and manufacturing: A new paradigm in digital manufacturing and design innovation. *Computer-Aided Design, 59*, 1-14. https://doi.org/10.1016/j.cad.2014.07.006
87. Wu, L., & Chiu, M. L. (2015). Organizational applications of IT innovation and firm's competitive performance: A resource-based view and the innovation diffusion approach. Journal of Engineering and Technology Management, 35, 25-44. https://doi.org/10.1016/j.jengtecman.2014.09.002
88. Yngfalk, C. (2019). Subverting sustainability: market maintenance work and the reproduction of corporate irresponsibility. *Journal of Marketing Management, 35*(17-18), 1563-1583. https://doi.org/10.1080/0267257x.2019.1682031
89. Yoshikuni, A. C., Galvão, F. R., & Albertin, A. L. (2022). Knowledge strategy planning and information system strategies enable dynamic capabilities innovation capabilities impacting firm performance. *VINE Journal of Information and Knowledge Management Systems, 52*(4), 508-530. https://doi.org/10.1108/vjikms-07-2020-0128
90. Yurdakul, M., & Kazan, H. (2020). Effects of Eco-Innovation on Economic and Environmental Performance: Evidence from Turkey's Manufacturing Companies. *Sustainability, 12*(8), 3167. https://doi.org/10.3390/su12083167
91. Zhu, Q., Liu, J., & Lai, K.-h. (2016). Corporate social responsibility practices and performance improvement among Chinese national state-owned enterprises. *International Journal of Production Economics, 171*, 417-426. https://doi.org/10.1016/j.ijpe.2015.08.005

About the author

Iris Maria Velez Osorio, PhD is an Assistant Professor at the Faculty of Economics and Business Science at Pontificia Universidad Javeriana Cali in the Department of Organisations Management. She received a PhD in Management at the Faculty of Economics at Universidad de Valencia, Spain. She obtained a master's degree in business from Tulane University's Freeman School in the United States and a master's in organisational science from Universidad del Valle. Her research interests are innovation, strategy, sustainability, organisations, and education. The author can be contacted at **irismariavelez@gmail.com**