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Innovations for sustainability in the roll-out of the Sustainable Development Goals

Innovaciones para la sostenibilidad en el despliegue de los Objetivos de Desarrollo Sostenible

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ABSTRACT

Companies have been adapting their strategic decisions in order to align with Sustainable Development Goals since 2015. A motivation for companies to align their strategic decisions with Sustainable Development Goals is to gain legitimacy among supranational organizations, governments, and civil society. Some demonstrate the strength of their commitment to these goals by investing in innovations designed to boost their organizational performance; while others turn to greenwashing in a bid to maintain profits. Investing in sustainability innovations has become a key manifestation of firms' commitment to Sustainable Development. This study aims to analyse the interaction between sustainability commitment, innovations for sustainability and organizational performance. A sample of 3,420 companies for the period 2015 to 2020 is used to test two working hypotheses. Despite the significant gains it brings in terms of sustainability performance, the results show that investing in innovation for sustainability carries the risk of short-term losses. This has several implications. Some companies may subscribe to Sustainable Development Goals in their pursuit of legitimacy rather than out of true commitment. However, actual engagement in innovation for sustainability can attract potential investors, and, in our view, should be encouraged by politicians and lawmakers.

Keywords: Sustainable Development Goals**,** Legitimacy, Innovations for sustainability, Organizational performance.

RESUMEN

Desde el año 2015, las empresas han ido adaptando sus decisiones estratégicas para alinearse con los Objetivos de Desarrollo Sostenible. Esta adaptación vendría justificada por la búsqueda de legitimidad ante la presión que ejercen los gobiernos, la sociedad civil, las organizaciones supranacionales y los mercados. Algunas empresas demuestran su compromiso con estos objetivos invirtiendo en innovaciones diseñadas para impulsar su desempeño organizacional; mientras que otras recurren a procesos de "green washing" en un intento por mantener sus niveles de rentabilidad. Invertir en innovaciones para la sostenibilidad se ha convertido en una manifestación clave del compromiso de las empresas con el desarrollo sostenible. Este estudio tiene como objetivo analizar la interacción entre el compromiso con los Objetivos de Desarrollo Sostenible, las innovaciones para la sostenibilidad y el desempeño organizacional. Para analizar esta interacción, se ha obtenido una muestra de 3.420 empresas para el período 2015 a 2020. A pesar de las mejoras significativas que las innovaciones asociadas al compromiso con los Objetivos de Desarrollo Sostenible suponen en términos de desempeño sostenible, los resultados muestran que invertir en este tipo de innovación conlleva cierto riesgo de perdidas a corto plazo. Este resultado tiene varias implicaciones. Algunas empresas pueden suscribir los Objetivos de Desarrollo Sostenible como una forma de ganar legitimidad y no por un verdadero compromiso. Por otra parte, el compromiso real con la innovación para la sostenibilidad puede atraer a inversores potenciales, siendo éste, en nuestra opinión, un fenómeno que decisores públicos y legisladores deberían potenciar.

Palabras clave: Objetivos de Desarrollo Sostenible**,** Legitimidad, Innovaciones para la sostenibilidad, Desempeño organizacional.

1. INTRODUCTION

In 2015, the United Nations General Assembly officially launched the Sustainable Development Goals (SDGs) as part of the 2030 Agenda for Sustainable Development. The implementation of this agenda involves collaboration between civil society, companies and public administrations. Specifically, it requires businesses to engage in innovation in the form of new ideas, behaviour, products and processes that will help to reduce environmental burden or achieve ecological sustainability targets (Rennings, 2000). At the same time, financial markets are showing growing interest in companies that invest in sustainability. Indeed, Bloomberg (2021) predicts that "global environmental, social and governance (ESG) assets are on track to exceed $53 trillion by 2025, representing more than a third of the $140.5 trillion in projected total assets under management". Companies must therefore modify their decision-making processes to adapt to the new challenges set by Agenda 2030.

Despite an initial show of commitment to SDGs, some companies may fall short of implementing the changes that are involved (Polo-Garrido *et al.*, 2022). For full compliance with the SDG agenda, firms need to develop innovations for sustainability; an undertaking that requires strategic changes (Pizzi *et al.*, 2020, 2021). Any innovation for sustainability needs to be backed up with strategic decisions that may prove difficult for firms that are unwilling or unable to invest organizational resources for such purposes (Hadjimanolis, 2019; Steinmo, 2021). Thus, companies professing commitment to SDGs, but unwilling to assume any risk that might threaten their profits, might well turn to greenwashing as a means to "form overly positive beliefs among stakeholders about (their) environmental practices" (Torelli *et al.*, 2020, p. 408). This kind of behaviour could be described as a quest for symbolic legitimacy requiring no actual SDG-related investment (Gonçalves *et al.*, 2020; Heras-Saizarbitoria *et al.*, 2022). Investment of resources in innovations for sustainability therefore emerges as a sign of true commitment to SDGs. However, we can find no previous study of how SDG commitment shapes sustainability innovations.

Therefore, the aim of this study is to analyse the interaction between SDG commitment, sustainability innovations and organizational (economic and sustainable) performance levels. The available sample comprised 3,420 companies for the period 2015 to 2020. The results show that, among companies that commit to SDGs, only those that invest in innovations for sustainability are able to make sustainability performance gains, despite some short-term economic loss. This has several implications. First, some companies could be motivated to subscribe to SDGs as a means to gain formal legitimacy rather than out of true commitment. Furthermore, innovations for sustainability are a way for companies to signal their concern for sustainability to potential investors. Lastly, political and legal measures should be taken to promote innovation for sustainability in some countries.

The remainder of this paper is structured as follows. Section 2 provides a literature review and a summary of our working hypotheses. Section 3 presents the data, study variables and statistical techniques. Section 4 discusses the results; and the final section offers some conclusions.

2. THEORETICAL FRAMEWORK

2.1. Sustainable Development Goals, legitimacy and organizational performance

The 17 SDGs of the 2030 Agenda for Sustainable Development framework were set to reduce the impact of human activity on the planet in the long term (Randers *et al.*, 2019). They are the result of multilateral negotiations in which the private sector has played an important role because of its ability both to innovate and impact society (Calabrese *et al.*, 2021). They are "a commendable metric and framework by which to measure practical improvements in various governments, communities or socio-economic regions" (Inieke, 2021). Pizzi *et al.* (2020) point out that, although SDG achievement can only be assessed at a supranational level, the negative externalities generated by the corporate sector make their collaboration absolutely necessary. Thus, SDG implementation calls for the strategic reorientation of businesses, and one of the key aspects of research on the adoption of SDGs at the corporate level must be an economic evaluation of the above-mentioned externalities (Calabrese *et al.*, 2021; Grueso-Gala & Zornoza, 2022; Ike *et al.*, 2019).

Legitimacy theory has been used as a theoretical framework to explain corporate commitment to SDGs (Sierra-García *et al.*, 2022). Suchman (1995, p. 574) defines legitimacy as "a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions". According to this theory, companies may adopt SGDs to gain either substantive or merely symbolic legitimacy. In the first case, companies would seek to adopt sustainable practices oriented towards a positive organizational performance based on a real improvement in their environment. In the latter case, however, they would try to improve their organizational performance without making any real contribution to environmental sustainability (Bebbington & Unerman, 2018; Deegan, 2019). Therefore, we should find that SDG commitment never diminishes organizational performance (Hadjimanolis, 2019; Pizzi *et al.*, 2020, 2021; Steinmo, 2021).

Organizational performance is a multidimensional concept that can be addressed with various operational approaches (López-Arceiz *et al.*, 2018, 2020). Richard *et al.* (2009) claim that it covers at least four business areas: economic, environmental (E), social (S) and governance (G). Findings from previous studies are inconclusive regarding the relationship between corporate SDG commitment and organizational performance (Muhmad & Muhamad, 2021). Some authors evidence a positive relationship between commitment towards the adoption of SDG practices and organizational performance (e.g. Diaz, 2021; Elalfy *et al.*, 2021; Khaled *et al.*, 2021; Morioka *et al.*, 2018). Various explanations for this positive link have been put forward. In relation to the economic component of organizational performance, Lassala *et al.* (2021) consider that a firm's commitment towards SDGs implies a global vision of its own impact which should positively influence its decision-making. The inclusion of SDGs in a firm's business strategy could result in more efficient use of some resources via cost reductions leading to economic performance gains (Muhmad & Muhamad, 2021). It could also

improve the firm's sustainability ranking, thereby reassuring investors, easing access to diversified funding sources and, potentially, creating competitive advantages (Zabala & Ślusarczyk, 2020). Malik (2015) also considers that contributing to SDGs through innovation benefits a firm's economic performance by enabling the creation of value-adding products and services. ESG performance gains are another advantage of SDG adoption. Khaled *et al.* (2021) highlight that it reduces information asymmetries between firms and investors, while enabling companies to meet stakeholders' interests, and respond to institutional pressures and social norms. In short, it should enable firms to improve in terms of both economic and ESG performance. However, other authors, such as Li and Wu (2017), claim that corporate SDG alignment involves environmentally friendly investments that could negatively affect the company's efficiency and productivity levels, at least temporarily during the implementation period. García-Meca & Martínez-Ferrero (2021) further assert that ambiguous goal definition, the non-alignment of SDGs with company objectives and the lack of a specific goal assessment method place stumbling blocks in the way of firms attempting to implement real social and environmental change. Similarly, some authors cast doubt on the "actionability" of SDGs, which could diminish their applicability in some isolated cases (Van Zanten & Van Tulder, 2018). In their view, the actionability of some SDGs depends on the collaboration of other economic agents, thereby reducing the possibility of organizational performance gains. Moreover, not all companies are able to aim for every SDG. Thus, some may generate synergies to help them achieve other objectives. It results in a "nexus challenge" which may affect a firm's economic performance (Van Zanten & Van Tulder, 2021). Additionally, an organization finding an incentive to promote some SDGs to the detriment of others; that is, to indulge in what might be termed "cherry picking", a process that would impact on the ultimate outcomes (Cuervo-Cazurra *et al.*, 2022; Heras-Saizarbitoria *et al.*, 2022).

Previous studies evidence that, by committing to SDGs a company can boost its legitimacy, and create a climate of trust among its stakeholders (Deegan, 2019). Despite other short-term adverse effects, heightened legitimacy should imply an improvement in organizational performance. This reasoning applies to both substantive and symbolic legitimacy, despite the difference in the underlying motives (Curtó-Pagès, 2021). Preliminary studies, however, have failed to consider either the diverse aspects of organizational performance in the context of SDGs or the role of legitimacy in evidencing levels of corporate SDG engagement. Thus, we propose to test the following working hypothesis in order to determine whether the corporate decision to commit to SDGs is driven by a desire to improve organizational performance:

H1: Corporate commitment to SDGs impacts on organizational performance.

2.2. SDG commitment, innovation for sustainability and organizational performance

Previous literature identifies that innovation for sustainability is a necessary requisite of corporate SDG commitment (Pizzi *et al.*, 2020, 2021). However, this is not the only way to contribute towards these goals. Ordonez-Ponce and Khare (2021) identify the following drivers of corporate contributions to SDGs: a) Collaborative position, b) integration of firm, society and environment, c) long-term impacts, d) transparency and accountability, e) cost and cost allocations, f) reduction of risks and g) incremental changes through innovation. Thus, it can be seen that there are different ways of contributing to SDGs, innovation being one of the core drivers. Traditionally, "innovations comprise the implementation of technologically new products and processes and significant technological improvements in products and processes" (OECD, 2018, p. 30). Innovations emerging in the corporate sustainability context are known as eco-innovations, green innovations or innovations for sustainability (Martínez-Ros & Kunapatarawong, 2019).

There are different explanations for the positive relationship between corporate SDG commitment and the development of innovations for sustainability (Dey *et al.*, 2020; Marques *et al.*, 2019). Pedersen *et al.* (2018) highlight improvements in terms of image, better customer relationships, efficiency and reputation as ways to achieve social validation. Consequently, innovations for sustainability are a potential signal of corporate SDG commitment; and, according to legitimacy theory (Silva, 2021) can be interpreted as an indicator of a substantive approach. Firms adopting such an approach would both attain organizational performance gains and make a positive impact on their environment (Khaled *et al.*, 2021). Recently, Hizarci-Payne *et al.* (2021) and Zheng and Iatridis (2022) report evidence of a positive impact of innovations for sustainability on all dimensions of organizational performance. Three theoretical arguments have been put forward to explain this effect (Yi *et al.*, 2021). Using resource-based theory, Asadi *et al.* (2020) claim that innovations for sustainability enable the development of clean technologies, green products and new production modes, which constitute a shift towards a long-term perspective leading to operational cost savings and greater legitimacy. In accordance with stakeholder theory (Xie *et al.*, 2019), moreover, these innovations are a way of aligning with stakeholder needs, responding to green consumer demand and attracting green investors. Finally, the institutional environment also exerts pressure on organizations to adopt SDGs and foster innovations for sustainability (Yi *et al.*, 2021). Thus, companies that invest resources in innovation and commit to SDGs will be more likely to attain performance gains, through higher process efficiency and the avoidance of unnecessary waste and expenditure (Evans *et al.*, 2017; Kennedy *et al.*, 2017; Khan *et al.*, 2021a).

Ghosh and Rajan (2019), Khan *et al.* (2021a, 2021b, 2022), and Hansen *et al.* (2021) suggest that SDG commitment is associated with disruptive innovations eventually leading to different and new markets and future competitive advantages. Hart *et al.* (2016) highlighted two drivers of these competitive advantages. One is stable networks of corporate and social organizations opting for innovation; the other is pressure from stakeholders and external agents urging organizations to commit to SDGs for the potential advantages to be gained. Innovations for sustainability are therefore a necessary part of any firm's contribution to SDGs (Van der Waal *et al.*, 2021). There are three possible mechanisms through which innovation can improve organizational performance (Adams *et al.*, 2016): a) Doing more with less —operational optimization—, b) Doing good by doing new things —organizational

transformation—, and c) Doing good by doing new things with others —collaborative innovation—. Therefore, innovations for sustainability will deliver organizational performance gains, both in the form of cost savings via operational optimization and in the form of process changes deriving from organizational transformation and collaborative innovation (Ho *et al.*, 2016; Lin *et al.*, 2021; Wang *et al.*, 2021). Nevertheless, some companies might commit to SDGs without developing any specific type of innovation for sustainability. Their aim in aligning themselves with SDGs would be to transform the way they are viewed by society. This would be typical of a symbolic legitimacy approach (Husillos *et al.*, 2011; Lindblom, 1993). In this sense, in a study of sustainable practices, Archel *et al.* (2009) found that, sometimes, a professed commitment to sustainability might be a bid to improve stakeholder perceptions. A similar symbolic approach in the context of SDGs could lead to a process of SDG washing, whereby companies appear more concerned about their image and legitimacy than about changing their internal processes (Gonçalves *et al.*, 2020; Heras-Saizarbitoria *et al.*, 2022). Companies opting for a symbolic approach to SDGs would not invest resources in innovations for sustainability (DiVito & Bohnsack, 2017; Kuckertz & Wagner, 2010; Leyva *et al.*, 2019; Rauter *et al.*, 2019). Additionally, financial uncertainty, investment in specific assets or managers engaging in moral hazard could lead companies to devoid of any innovations related to the SDGs (Leyva *et al.*, 2019).

Nevertheless, the possible mediating effect of innovations for sustainability has not been tested in previous literature, despite its relationship with SDG commitment and organizational performance levels. Thus, we propose the second working hypothesis:

H2: The level of innovation for sustainability mediates the relationship between SDG commitment and organizational performance levels.

Figure 1 depicts the interactions between SDG commitment, innovations for sustainability and organizational performance.

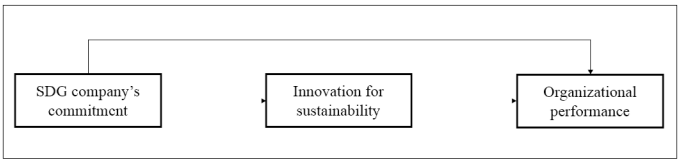

Figure 1
Theoretical model
Source: Own elaboration.

3. METHODOLOGY

3.1. Sample

To test the proposed working hypotheses, we accessed a sample of 3,420 companies for the period 2015 to 2020. Thus, year one of the sample period coincides with that of the initial SDG proposal (United Nations, 2015). In relation to the sample composition, 1,154 of the sample companies are listed in the S&P Sustainability Yearbook (previously RobecoSAM Yearbook), where they are classified according to their sustainability levels. The remaining 2,266 are not mentioned in the Yearbook, although they do belong to the RobecoSAM universe. The S&P Sustainability Yearbook is based on the S&P global universe, which is homogeneous in terms of firm size, both overall and within industries, thus facilitating between-firm comparability. Table 1 shows the main characteristics of the study sample.

The majority of the sample firms perform sustainably. Approximately, 59% of them have ESG scores above 40, according to EIKON-Refinitiv data. They are large in terms of total assets; and the main sectors represented are technology (14.18%), consumer cyclicals (13.48%), financials (14.12%) and industrials (14.06%). While the countries of domicile vary, the majority are located in the United States (21.43%), Japan (11.11%), China (9.21%) and the United Kingdom (7.69%). We observe no significant differences between the two subsamples[1]. The information on the different variables comes from the EIKON-Refinitiv and ORBIS databases.

3.2. Main variables

A. SDG commitment

Over the last few years, various proposals have been put forward for assessing levels of corporate commitment to SDGs (Jacob, 2017). The SDG compass developed by the United Nations (2015) is one of several measurement proposals designed by assessment agencies (Fleming *et al.*, 2017; Khaled *et al.*, 2021; Lior *et al.*, 2018). This study deploys the 17 Refinitiv-EIKON indicators, a set of dichotomous items designed to assess whether a company supports each of the 17 SGDs defined by the United Nations.

B. Innovations for sustainability

Innovations for sustainability can be viewed as radical or incremental (Harms & Klewitz, 2013; Klewitz & Hansen, 2014). This study considers both sustainable product innovations involving technologically new products (radical innovation) and technologically improved products (incremental innovation) (OECD, 2018). A product is technologically new if its characteristics or intended uses differ significantly from those of previously produced products, and it is technologically improved when its performance has been significantly enhanced or upgraded. To measure innovations for sustainability, we use the Refinitiv-EIKON indicator, originally designed to assess adoption of environmentally friendly products, clean energy products and sustainable building products[2], and, more recently, eco-designed products; i.e., those redesigned for reuse, recycling or the reduction of environmental impacts, and recycling products. These are sustainability-related products, enabling the reduction of potential risks by means of packaging return systems and recycling programmes. The indicator, which has been used previously by authors such as Papagiannakis *et al.* (2019), Birindelli *et al.* (2021), Semenova (2021) and Quintana-García *et al.* (2022) takes values ranging between 0 and 100, where zero indicates the lowest level of innovation for sustainability.

[1] A t-test on the control variables gives pvalue > 0.100 for all except the ESG score.

[2] An environmental product is designed to have positive effects on the environment. Clean energy products are products or technologies for use in clean and renewable energy. Sustainable building products involve improvements to boost energy efficiency in companies.

Table 1
Sample description

	Total		Medal		No medal	
Characteristic	**n**	**%**	**n**	**%**	**n**	**%**
ESG score						
Lower than 40	1,390	40.62	734	21.46	656	19.18
Between 40 and 60	808	23.65	42	1.23	766	22.40
Between 61 and 80	935	27.35	236	6.90	699	20.44
Higher than 81	287	8.38	142	4.15	145	4.24
Size						
Lower than $500 million	324	9.47	150	4.39	174	5.09
Between $500 and $1,000 million	53	1.55	1	0.03	52	1.52
Larger than $1,000 million	3,043	88.98	1,003	29.33	2,040	59.65
Activity						
Energy	169	4.94	66	1.93	103	3.01
Basic materials	291	8.51	133	3.89	158	4.62
Industrials	481	14.06	160	4.68	321	9.39
Consumer cyclicals	478	13.98	151	4.42	327	9.56
Consumer non-Cyclicals	325	9.50	120	3.51	205	5.99
Financials	483	14.12	176	5.15	307	8.98
Healthcare	253	7.40	66	1.93	187	5.47
Technology	485	14.18	146	4.27	339	9.91
Utilities	163	4.77	70	2.05	93	2.72
Real estate	211	6.17	61	1.78	150	4.39
Academic & Educational services	6	0.18	3	0.09	3	0.09
Others	75	2.19	2	0.06	73	2.13
Country						
United States	733	21.43	221	6.46	512	14.97
Japan	380	11.11	118	3.45	262	7.66
China	315	9.21	40	1.17	275	8.04
United Kingdom	263	7.69	107	3.13	156	4.56
France	131	3.83	77	2.25	54	1.58
India	126	3.68	23	0.67	103	3.01
Australia	113	3.30	52	1.52	61	1.78
Germany	103	3.01	41	1.20	62	1.81
South Korea	96	2.81	65	1.90	31	0.91
Hong Kong	88	2.57	11	0.32	77	2.25
Brazil	84	2.46	31	0.91	53	1.55
Canada	72	2.11	40	1.17	32	0.94
South Africa	69	2.02	17	0.50	52	1.52
Sweden	66	1.93	26	0.76	40	1.17
Switzerland	62	1.81	27	0.79	35	1.02
Netherlands	56	1.64	34	0.99	22	0.64
Others	663	19.39	224	6.55	439	12.84
Total	3,420	100.00	1,154	33.74	2,266	66.26

Source: Own elaboration.

C. Organizational performance

Organizational performance is a multidimensional concept including environmental (E), social (S), governance (G) and economic aspects and requiring complementary measurements for an overall understanding (López-Arceiz *et al.*, 2018). As an indicator of sustainability performance, this study uses the ESG indexes available from the EIKON-Refinitiv database. These indexes measure a "company's environmental, social and government aspects based on company-reported data" (EIKON-Re-

finitiv, 2019, p. 3) and takes values ranging from 0 to 100. An accounting indicator, return on assets (ROA), is used to measure economic performance (Ortas & Moneva, 2011).

D. Control variables

Various studies have revealed the potential impact of certain firm characteristics on the commitment to SDGs, innovation for sustainability and organizational performance (Loredo *et al.*, 2019). This study includes the following control variables: size, leverage and sector of activity. Mousavi *et al.* (2018, p. 230), in a study based on Cainelli *et al.* (2015) and Klewitz and Hansen (2014), and using organizational size as a control variable, have shown that "larger companies have more motivation and resources to introduce innovations for sustainability". We define organizational size (SZ) as the natural log of total assets (López-Arceiz *et al.*, 2018). Leverage has also been positively correlated with the implementation of innovations for sustainability (López-Arceiz *et al.*, 2018; Merkley, 2014); while Garcés-Ayerbe *et al.* (2019) have introduced the activity sector, having observed between-industry differences in innovation levels. This study uses the Thomson Reuters Business Classification (TRBC) codes for the following sectors: energy, basic materials, industrials, consumer cyclicals, consumer non-cyclicals, financials, health care, technology, telecommunication services and utilities.

The appendix includes a description of the variables presented in this section.

3.3. Statistical techniques

Given the objectives of this study, it begins with a descriptive analysis of the indicators in terms of their first- and second-order moments. After this preliminary analysis, structural equation modelling (SEM) is used to test the relationship between corporate SDG commitment, innovations for sustainability and organizational performance. The formulation of a mediating model, along with the sample size, the absence of multivariate normality and the temporal dependence between the observations, condition the statistic methodology (López-Arceiz *et al.*, 2017). The sample is split into two parts: one corresponding to companies listed in the RobecoSAM medal display table, the other to those not listed. The proposed model is defined by expressions [1] to [6] as follows.

$$INN_{imt} = \beta_{1m}^{w} \cdot SDG_{imt}^{w} + \Upsilon_{imt} \cdot Control_{imt} + \varepsilon_{imt} \quad [1]$$

$$ESG_{imt} = \alpha_{1m}^{w} \cdot SDG_{imt}^{w} + \alpha_{2m} \cdot INN_{imt} + \delta_{im} \cdot Control_{imt} + \varepsilon_{imt} \quad [2]$$

$$ROA_{imt} = \alpha_{1m}^{w} \cdot SDG_{imt}^{w} + \alpha_{2m} \cdot INN_{imt} + \delta_{im} \cdot Control_{imt} + \varepsilon_{imt} \quad [3]$$

$$INN_{ikt} = \beta_{1k}^{w} \cdot SDG_{ikt}^{w} + \Upsilon_{ik} \cdot Control_{ikt} + \varepsilon_{ikt} \quad [4]$$

$$ESG_{ikt} = \alpha_{1k}^{w} \cdot SDG_{ikt}^{w} + \alpha_{2k} \cdot INN_{ikt} + \delta_{ik} \cdot Control_{ikt} + \varepsilon_{ikt} \quad [5]$$

$$ROA_{ikt} = \alpha_{1k}^{w} \cdot SDG_{ikt}^{w} + \alpha_{2k} \cdot INN_{ikt} + \delta_{ik} \cdot Control_{ikt} + \varepsilon_{ikt} \quad [6]$$

where INN_{it}, ESG_{it} and ROA_{it} denote innovation for sustainability, sustainability performance and economic return for the i^{th} firm in period t, respectively. The term SDG_{it}^{w} stands for the commitment of the i^{th} firm to the w^{th} SDG in period t. The term $Control_{it}$ includes organizational size, leverage and sector of activity as control variables. Finally, α, β, γ and δ are the parameters of the estimated model, while e is random disturbance. The term *m* indicates companies listed in the medal display table, while *k* denotes those not listed. Using these expressions, we perform a multigroup analysis to compare the parameters of the two subsamples. Finally, to ensure the robustness of our analysis, we specify a model with lagged variables as shown in the following equations [7-9],

$$INN_{it-1} = \beta_{1}^{w} \cdot SDG_{it-1}^{w} + \Upsilon_{i} \cdot Control_{it-1} + \varepsilon_{it-1} \quad [7]$$

$$ESG_{it} = \alpha_{1}^{w} \cdot SDG_{it-1}^{w} + \alpha_{2} \cdot INN_{it-1} + \delta_{i} \cdot Control_{it} + \varepsilon_{it} \quad [8]$$

$$ROA_{it} = \alpha_{1}^{w} \cdot SDG_{it-1}^{w} + \alpha_{2} \cdot INN_{it-1} + \delta_{i} \cdot Control_{it} + \varepsilon_{it} \quad [9]$$

The subindex *t*-1 represents the lagged variables accounting for the possible impact of SDG commitment and innovations for sustainability in *t*-1 on sustainability and economic performance levels.

Two further analyses are conducted. First, we disaggregate the ESG score into three components: environmental (E), social (S) and governance (G). For the environmental score (ES), we consider only those items relating to emissions and resource use, thereby isolating the environmental innovation component. We then re-estimate the proposed models [1-9] including size, leverage and sector of activity as control variables. Additionally, using principal component analyses, we also build a construct for assessing organizational performance (OP). It is based on environmental (ES) (without the environmental innovation score) social (SS), governance (GS) scores and the economic return (ROA). After saving the factor scores, we estimate the proposed regression, as follows [10-11]:

$$INN_{it} = \beta_{1}^{w} \cdot SDG_{it}^{w} + \Upsilon_{i} \cdot Control_{it} + \varepsilon_{it} \quad [10]$$

$$OP_{it} = \alpha_{1}^{w} \cdot SDG_{it-1}^{w} + \alpha_{2} \cdot INN_{it} + \delta_{i} \cdot Control_{it} + \varepsilon_{it} \quad [11]$$

Where OP_{it} is the factor score for the organizational performance construct and the remaining terms have the same meaning as in expressions [1-6]. These regressions include the control variables. We also consider the effect of the lagged variables on organizational performance as in expressions [7-9]. A fixed effects estimator is used to accommodate the fact that we are working with a panel database and SPSS 25.0, EQS 6.3 and Stata 16.0 are the chosen software.

4. RESULTS AND DISCUSSION

4.1. Descriptive statistics and regressions

Table 2 shows the descriptive statistics for the study variables, which are grouped into three categories: SDGs, innovation for sustainability and organizational performance. The results reveal a low level of SDG commitment in the sample firms (mean < 0.200); a higher level being observed in those listed in

the medal display table. The highest levels of commitment are in SDG 13–Climate action (0.167) and SDG 12–Responsible consumption and production (0.148), and the lowest in SDG 14–Life below water (0.056) and SDG 2–Zero hunger (0.054). Although these results appear to reveal limited adoption of some SDGs, the observed standard deviations suggest caution in their interpretation. The innovation for sustainability indicator scored 34.848 out of 100, while both subsamples showed high performance levels for the ESG indicators (61.858 out of 100) and positive economic return (4.647%).

Table 3 shows the results of the proposed regressions, which include the direct and indirect effects together with the individual and global fit indices. The different regressions are estimated with and without the control variables (size, leverage and activity). Parameter estimates are obtained for both groups of firms (medal and non-medal). The direct effects in both groups reveal a positive relationship between SDG commitment and both innovation for sustainability [(0.023; 0.100); $p < 0.010$] and the sustainability performance score [(0.061; 0.136); $p < 0.010$]. Thus, H1 cannot be rejected, given that SDG commitment impacts on firms' sustainability performance, although its influence on economic return is negative [(–0.068; –0.018); $p < 0.010$]. Previous analysis of the relationship between commitment to SDGs and sustainability performance levels, has yielded apparently controversial results (Khaled *et al.*, 2021). Recently, Lassala *et al.* (2021), Muhmad and Muhamad (2021) and Feng *et al.* (2021) have reported evidence of SDG commitment contributing to an improvement in corporate sustainability practices, by balancing their environmental, social and economic impacts. Van Zanten and Van Tulder (2018) and Ramos *et al.* (2022) claim, on the other hand, that such a balance is impossible to achieve, because SDGs are not tailored to the potential of businesses and are therefore not directly actionable by them. Ma *et al.* (2017), Zhang and Chen (2017), Li and Wu (2017) and Ahmad and Buniamin (2021) even conclude that the achievement of some SDGs could negatively impact on economic performance, since the resources invested might not yield short-run returns. While these authors agree that firms need to adopt SDGs as part of their business strategy, they have different opinions regarding the implications their adoption in organizational terms. Thus, authors who foresee a positive impact recommend a more integrated approach, taking into account not only the economic, but also the environmental and social impact. This view contrasts with that put forward in other studies, which see economic return as proof of success in business. Our results reveal an association between commitment to SDGs and higher sustainability performance levels, along with some evidence of a sacrifice on economic returns.

Table 2
Descriptive statistics

	Total		Medal		No medal	
Indicator	**Mean**	**Std. D.**	**Mean**	**Std. D.**	**Mean**	**Std. D.**
SDG 1. No poverty	0.065	0.247	0.073	0.265	0.064	0.238
SDG 2. Zero hunger	0.054	0.226	0.061	0.235	0.052	0.221
SDG 3. Good health and well-being	0.134	0.341	0.146	0.361	0.133	0.331
SDG 4. Quality education	0.126	0.332	0.141	0.349	0.123	0.322
SDG 5. Gender equality	0.132	0.338	0.147	0.362	0.129	0.325
SDG 6. Clean water and sanitation	0.088	0.284	0.103	0.307	0.085	0.271
SDG 7. Affordable and clean energy	0.124	0.330	0.144	0.354	0.121	0.317
SDG 8. Decent work and economic growth	0.168	0.374	0.193	0.397	0.164	0.361
SDG 9. Industry, innovation and infraestructure	0.127	0.333	0.146	0.355	0.124	0.322
SDG 10. Reduced inequalities	0.095	0.294	0.104	0.355	0.124	0.286
SDG 11. Sustainable cities and communities	0.104	0.305	0.118	0.331	0.101	0.295
SDG 12. Responsible consumption and production	0.148	0.355	0.159	0.371	0.146	0.347
SDG 13. Climate action	0.167	0.373	0.198	0.398	0.162	0.359
SDG 14. Life below water	0.056	0.231	0.069	0.243	0.054	0.226
SDG 15. Life on land	0.081	0.273	0.078	0.262	0.097	0.295
SDG 16. Peace, justice and strong institutions	0.089	0.286	0.097	0.304	0.088	0.276
SDG 17. Partnerships	0.096	0.294	0.117	0.318	0.091	0.281
Innovation for sustainability	34.848	33.461	54.409	32.604	31.031	30.268
ESG score	56.858	27.678	74.102	13.147	52.672	18.363
Environmental score	51.858	23.678	75.587	17.948	47.229	25.706
Social score	58.012	21.509	78.174	15.992	54.079	22.000
Governance score	56.518	20.887	66.688	19.469	54.534	21.796
ROA (%)	4.647	15.901	4.453	6.364	4.681	17.018

Source: Own elaboration.

Table 3
Direct and indirect effects

	Medal			No medal			χ^2 test		
	Innovation	**ESG**	**ROA**	**Innovation**	**ESG**	**ROA**	**(1)**	**(2)**	**(3)**
Direct Effect									
SDG1	0.048***	0.085***	−0.025***	0.093***	0.125***	−0.026**	***	***	—
Innovation		0.397***	−0.053**		0.442***	−0.014		***	*
Indirect Effect									
SDG1		0.019***	−0.003**		0.041***	-0.001			
R^2	0.002	0.168	0.004	0.009	0.221	0.001			
Goodness-of-fit			χ^2: 3.491, pvalue: 0.321, RMSEA: 0.015, CFI: 0.998, NNFI: 0.998						
Direct Effect									
SDG2	0.023***	0.061***	−0.024***	0.097***	0.115***	−0.014	***	***	—
Innovation		0.400***	−0.052**		0.442***	−0.015		***	*
Indirect Effect									
SDG2		0.009	−0.001		0.043***	−0.001			
R^2	0.001	0.165	0.003	0.010	0.219	0.001			
Goodness-of-fit			χ^2: 3.392, pvalue: 0.335, RMSEA: 0.015, CFI: 0.999, NNFI: 0.998						
Direct Effect									
SDG3	0.050***	0.136***	−0.030***	0.130***	0.191***	−0.040***	***	***	—
Innovation		0.395***	−0.052**		0.429***	−0.011		***	*
Indirect Effect									
SDG3		0.020***	−0.003**		0.056***	−0.001			
R^2	0.003	0.180	0.004	0.017	0.242	0.002			
Goodness-of-fit			χ^2: 3.984, pvalue: 0.263, RMSEA: 0.017, CFI: 0.998, NNIF: 0.990						
Direct Effect									
SDG4	0.067***	0.111***	−0.041***	0.135***	0.188***	−0.037***	***	***	—
Innovation		0.394***	−0.051**		0.428***	−0.011		***	*
Indirect Effect									
SDG4		0.026***	−0.003**		0.058***	−0.001			
R^2	0.004	0.173	0.005	0.018	0.240	0.002			
Goodness-of-fit			χ^2: 3.968, pvalue: 0.265, RMSEA: 0.017, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG5	0.070***	0.120***	−0.037***	0.137***	0.198***	−0.039***	***	***	—
Innovation		0.393***	−0.051**		0.427***	−0.011		***	*
Indirect Effect									
SDG5		0.027***	−0.004**		0.058***	−0.001			
R^2	0.005	0.175	0.004	0.019	0.244	0.002			
Goodness-of-fit			χ^2: 4.018, pvalue: 0.259, RMSEA: 0.017, CFI: 0.998, NNIF: 0.990						
Direct Effect									
SDG6	0.046***	0.120***	−0.018*	0.148***	0.148***	−0.019**	***	***	—
Innovation		0.396***	−0.053***		0.432***	−0.013		***	*
Indirect Effect									
SDG6		0.018***	−0.002*		0.064***	−0.002			
R^2	0.002	0.175	0.003	0.022	0.227	0.001			
Goodness-of-fit			χ^2: 3.504, pvalue: 0.320, RMSEA: 0.015, CFI: 0.999, NNIF: 0.998						

	Medal			No medal			χ^2 test		
	Innovation	**ESG**	**ROA**	**Innovation**	**ESG**	**ROA**	**(1)**	**(2)**	**(3)**
Direct Effect									
SDG7	0.094***	0.091***	−0.068***	0.169***	0.162***	−0.044***	***	***	**
Innovation		0.393***	−0.047***		0.426***	−0.008		***	*
Indirect Effect									
SDG7		0.037***	−0.004**		0.072***	−0.001			
R^2	0.009	0.169	0.008	0.029	0.231	0.002			
Goodness-of-fit			χ^2: 4.157, pvalue: 0.244, RMSEA: 0.018, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG8	0.090***	0.127***	−0.050***	0.160***	0.211***	−0.054***	***	***	—
Innovation		0.390***	−0.049**		0.420***	−0.007		***	*
Indirect Effect									
SDG8		0.035***	−0.004**		0.067***	−0.001			
R^2	0.008	0.177	0.005	0.026	0.249	0.003			
Goodness-of-fit			χ^2: 4.492, pvalue: 0.212, RMSEA: 0.019, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG9	0.100***	0.093***	−0.047***	0.159***	0.170***	−0.040***	***	***	—
Innovation		0.392***	−0.049**		0.427***	−0.010		***	*
Indirect Effect									
SDG9		0.039***	−0.005**		0.068***	−0.002			
R^2	0.010	0.170	0.005	0.025	0.234	0.002			
Goodness-of-fit			χ^2: 3.914, pvalue: 0.270, RMSEA: 0.017, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG10	0.043***	0.100***	−0.044***	0.113***	0.172***	−0.045***	***	***	—
Innovation		0.397***	−0.052**		0.434***	−0.011		***	*
Indirect Effect									
SDG10		0.017***	−0.002*		0.049***	−0.001			
R^2	0.002	0.171	0.005	0.013	0.235	0.002			
Goodness-of-fit			χ^2: 3.980, pvalue: 0.263, RMSEA: 0.017, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG11	0.092***	0.092***	−0.055***	0.166***	0.137***	−0.058***	***	***	—
Innovation		0.393***	−0.049**		0.431***	−0.006		***	*
Indirect Effect									
SDG11		0.036***	−0.004**		0.072***	−0.001			
R^2	0.008	0.169	0.006	0.028	0.224	0.004			
Goodness-of-fit			χ^2: 4.038, pvalue: 0.257, RMSEA: 0.017, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG12	0.051***	0.128***	−0.032***	0.162***	0.197***	−0.040***	***	***	—
Innovation		0.395***	−0.052**		0.422***	−0.009		***	**
Indirect Effect									
SDG12		0.020***	−0.003**		0.068***	−0.002			
R^2	0.003	0.177	0.004	0.026	0.244	0.002			
Goodness-of-fit			χ^2: 3.995, pvalue: 0.261, RMSEA: 0.017, CFI: 0.998, NNIF: 0.997						

	Medal			No medal			χ^2 test		
	Innovation	**ESG**	**ROA**	**Innovation**	**ESG**	**ROA**	**(1)**	**(2)**	**(3)**
Direct Effect									
SDG13	0.088***	0.133***	−0.052***	0.176***	0.213***	−0.052***	***	***	—
Innovation		0.390***	−0.049**		0.416***	−0.007		***	*
Indirect Effect									
SDG13		0.034***	−0.004**		0.073***	−0.001			
R^2	0.008	0.179	0.006	0.031	0.250	0.003			
Goodness-of-fit			χ^2: 4.546, pvalue: 0.208, RMSEA: 0.019, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG14	0.040***	0.079***	−0.050***	0.105***	0.117***	−0.031***	***	***	**
Innovation		0.398***	−0.050**		0.442***	−0.013		***	*
Indirect Effect									
SDG14		0.016***	−0.002*		0.046***	−0.001			
R^2	0.002	0.167	0.005	0.011	0.220	0.001			
Goodness-of-fit			χ^2: 3.715, pvalue: 0.293, RMSEA: 0.016, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG15	0.050***	0.091***	−0.042***	0.135***	0.140***	−0.032***	***	***	—
Innovation		0.397***	−0.052**		0.435***	−0.012		***	*
Indirect Effect									
SDG15		0.020***	−0.003**		0.059***	−0.002			
R^2	0.002	0.169	0.005	0.018	0.225	0.001			
Goodness-of-fit			χ^2: 3.752, pvalue: 0.289, RMSEA: 0.016, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG16	0.051***	0.069***	−0.032***	0.103***	0.148***	−0.043***	***	***	—
Innovation		0.398***	−0.052**		0.438***	−0.012		***	*
Indirect Effect									
SDG16		0.020***	−0.003**		0.045***	−0.001			
R^2	0.003	0.166	0.004	0.011	0.228	0.002			
Goodness-of-fit			χ^2: 3.625, pvalue: 0.304, RMSEA: 0.016, CFI: 0.998, NNIF: 0.997						
Direct Effect									
SDG17	0.048***	0.113***	−0.029***	0.119***	0.153***	−0.033***	***	***	—
Innovation		0.396***	−0.052**		0.436***	−0.012		***	*
Indirect Effect									
SDG17		0.019***	−0.002**		0.052***	−0.001			
R^2	0.002	0.174	0.004	0.014	0.229	0.001			
Goodness-of-fit			χ^2: 3.726, pvalue: 0.292, RMSEA: 0.016, CFI: 0.998, NNIF: 0.997						

Note: The terms innovation, ESG and ROA refers the variables innovation for sustainability, sustainability and economic performance, respectively. *** pvalue < 0.010; ** pvalue < 0.050; * pvalue < 0.100.

Source: Own elaboration.

We also note a lack of significance in the parameter that relates innovations for sustainability and economic return for companies not listed on the medal display table [(–0.015; –0.006); p > 0.100]. This might indicate that they take a symbolic approach to the adoption of SDGs, avoiding innovation except as a means to improve their economic performance. Those listed on the medal display table, on the other hand, are willing to take risks and compromise their profitability through investment in innovation and SDG commitment, which would imply a substantive approach. A similar conclusion is reached when indirect effects are analysed. Thus, we cannot reject H2, since it emerges that, in the latter group, the level of innovations for sustainability mediates in the relationship between SDG commitment and sustainability performance levels. Therefore, the amount of resources a company is ready to risk appears to indicate whether it is taking a symbolic or a substantive approach to SDG commitment. These results are in line with a substantive reaction according to legitimacy theory (Gunawan *et al.*, 2020; Nicolò *et al.*, 2022). In this case, companies would be showing genuine commitment to SDGs, which would revert in a better sustainability performance, albeit at the expense of economic return. A more superficial level of SDG commitment would be consistent with a symbolic approach (García-Meca & Martínez-Ferrero, 2021). Even if professing a stronger commitment to SDGs, firms taking this option would not invest in innovations for sustainability, but rather resort to SDG washing (Ferrón *et al.*, 2022; Heras-Saizarbitoria *et al.*, 2022; Silva, 2021). The distinction between the two types of commitment was highlighted by Archel *et al.* (2009), who observed that there are different ways to implement corporate sustainability.

Nonetheless, a comparison between companies listed and those not listed on the medal display table is necessary in order to account for their differences. First, we should highlight the reasonable goodness of fit of the proposed models (χ^2 p > 0.100; RMSEA < 0.080; CFI > 0.900, NNFI > 0.900). We should also note that the connections between SDG commitment and the implementation of innovations for sustainability are stronger (χ^2-test(1): p < 0.010) in firms not listed on the medal display table. The same is found for the relationship between SDG commitment and the sustainability performance (χ^2-test(2): p < 0.010). Nevertheless, the negative effect of SDG commitment on ROA is similar for both groups of firms (χ^2-test(3)-SDG: p> 0.100). Consequently, innovations for sustainability has a positive effect on ESG performance in both medal and non-medal firms, but only firms in the medal display table are willing to sacrifice short-term economic resources for sustainability (χ^2-test(3)-innovation: p < 0.100). As it has been shown in table 3, non-medal firms have higher economic return but lower levels of innovation for sustainability and ESG scores, suggesting a symbolic approach to sustainability in comparison with those companies in the medal display table. There are several explanations for the stronger commitment to SDGs observed in medal-holders. One is that it indicates consideration of stakeholder needs, which should mean easier access to economic, human and financial resources (Nicolò *et al.*, 2022). Another factor behind this positive effect is the social pressure placed on firms to align themselves with SDGs (Calabrese *et al.*, 2021). Lastly, legitimacy motives could lead some firms to adopt SDGs as part of a strategy to appear more committed to and conscious of the environment challenges around them (Kücükgül *et al.*, 2022). Thus, we can conclude that the mediating effect of innovations for sustainability varies in intensity and outcome between medal-winning and non-medal-winning firms. This conclusion also holds for the lagged models used in the robustness check[3].

Table 4 shows the ESG score components; in particular, the environmental, social and governance scores. It can be seen that the results hold for the various components of the ESG score. That is, there is a positive association between SDG commitment and innovations for sustainability [(0.023; 0.176); p < 0.100]; and evidence of a positive influence of SDG commitment on the environmental [(0.037; 0.169); p < 0.100], social [(0.070; 0.216); p < 0.100] and governance [(0.018; 0.112); p < 0.100] scores. The relationship between innovations for sustainability and the environmental [(0.577; 0.717); p < 0.100], social [(0.230; 0.300); p < 0.100] and governance [(0.068; 0.127) scores maintains both its sign p < 0.100] and significance, although it has less impact on the governance score than on the environmental score. These results support the previous conclusions, evidencing that SDG commitment has a positive impact on the various dimensions of sustainability performance, as reported by Khaled *et al.* (2021) and Muhmad and Mohamad (2021). Table 4 also reinforces our conclusions about non-medal-winning firms (χ^2-test: p < 0.010), which show low SDG commitment consistent with the symbolic approach described by legitimacy theory (García-Meca & Martínez-Ferrero, 2021).

Table 5 contains the results for the organizational performance factor, which combines economic return and the three dimensions of the ESG score. It is possible to observe that the main conclusions still hold after including this performance indicator. The only difference is that the positive sign of the ESG score outweighs the negative sign of economic return (p < 0.010). The indirect effect estimates also confirm a symbolic approach to sustainability among non-medal-winning firms, contrasting with medal winners' risk-taking and investing to improve their reputation and image (Nicolò *et al.*, 2022). We can therefore state that SDG commitment influences firm performance levels, with innovations for sustainability mediating this relationship.

[3] The estimates are available upon request. Those for the control variables show that larger size and lower leverage are linked to lower levels of innovation for sustainability. The health care and technology sectors stand out as the most innovative. Leverage is seen to be positively associated with the level of sustainability performance; and all sectors, especially energy and health care, perform better than those in the "others" category. Finally, the activity sector also determines the economic performance, although it is not possible to detect a general pattern.

Table 4
Direct effects: Environmental (ES), social (SS) and governance (GS) scores

	Medal			No medal			χ^2 test		
Direct Effect	**Innovation**	**ES**	**ROA**	**Innovation**	**ES**	**ROA**	**(1)**	**(2)**	**(3)**
SDG1	0.048***	0.037***	−0.025***	0.093***	0.104***	−0.026***	***	***	—
Innovation		0.644***	−0.053**		0.663***	−0.014		***	*
SDG2	0.023*	0.042***	−0.024***	0.097***	0.105***	−0.014*	***	***	—
Innovation		0.644***	−0.052**		0.662***	−0.015		***	*
SDG3	0.050***	0.072***	−0.030***	0.130***	0.159***	−0.040***	***	***	—
Innovation		0.642***	−0.052**		0.652***	−0.011		***	*
SDG4	0.067***	0.052***	−0.041***	0.135***	0.145***	−0.037***	***	***	—
Innovation		0.642***	−0.051**		0.653***	−0.011		***	*
SDG5	0.070***	0.055***	−0.037***	0.137***	0.150***	−0.039***	***	***	—
Innovation		0.642***	−0.051**		0.652***	−0.011		***	*
SDG6	0.046***	0.085***	−0.018*	0.148***	0.134***	−0.017**	***	***	—
Innovation		0.642***	−0.053***		0.652***	−0.013		***	*
SDG7	0.094***	0.046***	−0.068***	0.169***	0.144***	−0.044***	***	***	**
Innovation		0.641***	−0.047**		0.648***	−0.008		***	*
SDG8	0.090***	0.065***	−0.050***	0.160***	0.162***	−0.054***	***	***	—
Innovation		0.640***	−0.049**		0.646***	−0.007		***	*
SDG9	0.100***	0.045***	−0.047***	0.159***	0.129***	−0.040***	***	***	—
Innovation		0.641***	−0.049**		0.652***	−0.010		***	*
SDG10	0.043***	0.044***	−0.044***	0.113***	0.134***	−0.045***	***	***	—
Innovation		0.644***	−0.052**		0.657***	−0.011		***	*
SDG11	0.092***	0.046***	−0.055***	0.166***	0.118***	−0.058***	***	***	—
Innovation		0.641***	−0.049**		0.653***	−0.006		***	*
SDG12	0.051***	0.082***	−0.032***	0.162***	0.166***	−0.040***	***	***	—
Innovation		0.614***	−0.052**		0.645***	−0.009		***	**
SDG13	0.088***	0.066***	−0.052***	0.176***	0.169***	−0.052***	***	***	—
Innovation		0.640***	−0.049**		0.643***	−0.007		***	*
SDG14	0.044***	0.047***	−0.050***	0.105***	0.116***	−0.031***	***	***	**
Innovation		0.644***	−0.052**		0.660***	−0.013		***	*
SDG15	0.050***	0.071***	−0.042***	0.135***	0.136***	−0.032***	***	***	—
Innovation		0.642***	−0.052**		0.654***	−0.012		***	*
SDG16	0.051***	0.044***	−0.032***	0.103***	0.124***	−0.043***	***	***	—
Innovation		0.643***	−0.052**		0.660***	−0.012		***	*
SDG17	0.048***	0.117***	−0.029***	0.119***	0.088***	−0.033***	***	***	—
Innovation		0.717***	−0.052**		0.577***	−0.012		***	*

	Medal			No medal			χ^2 test		
Direct Effect	**Innovation**	**SS**	**ROA**	**Innovation**	**SS**	**ROA**	**(1)**	**(2)**	**(3)**
SDG1	0.048***	0.086***	−0.025***	0.093***	0.123***	−0.026***	***	***	—
Innovation		0.236***	−0.053***		0.299***	−0.014		***	*
SDG2	0.023*	0.070***	−0.024***	0.097***	0.105***	−0.014	***	***	—
Innovation		0.239***	−0.052***		0.300***	−0.015		***	*
SDG3	0.050***	0.122***	−0.030***	0.130***	0.190***	−0.040***	***	***	—
Innovation		0.234***	−0.052***		0.286***	−0.011		***	*
SDG4	0.067***	0.117***	−0.041***	0.135***	0.193***	−0.037***	***	***	—
Innovation		0.232***	−0.051***		0.285***	−0.011		***	*
SDG5	0.070***	0.112***	−0.037***	0.137***	0.195***	−0.039***	***	***	—
Innovation		0.232***	−0.051***		0.284***	−0.011		***	*
SDG6	0.046***	0.112***	−0.018*	0.148***	0.148***	−0.017**	***	***	—
Innovation		0.235***	−0.053***		0.289***	−0.013		***	*
SDG7	0.094***	0.087***	−0.068***	0.169***	0.153***	−0.044***	***	***	**
Innovation		0.232***	−0.047***		0.285***	−0.008		***	*
SDG8	0.090***	0.115***	−0.050***	0.160***	0.216***	−0.054***	***	***	—
Innovation		0.230***	−0.049***		0.276***	−0.007		***	*
SDG9	0.100***	0.092***	−0.047***	0.159***	0.173***	−0.040***	***	***	—
Innovation		0.231***	−0.049**		0.283***	−0.010		***	*
SDG10	0.043***	0.097***	−0.044***	0.113***	0.171***	−0.045***	***	***	—
Innovation		0.236***	−0.052**		0.291***	−0.011		***	*
SDG11	0.092***	0.083***	−0.055***	0.166***	0.138***	−0.058***	***	***	—
Innovation		0.233***	−0.049**		0.290***	−0.006		***	*
SDG12	0.051***	0.114***	−0.032***	0.162***	0.202***	−0.040***	***	***	—
Innovation		0.234***	−0.052**		0.278***	−0.009		***	**
SDG13	0.088***	0.119***	−0.052***	0.176***	0.215***	−0.052***	***	***	—
Innovation		0.230***	−0.049**		0.273***	−0.007		***	**
SDG14	0.040***	0.073***	−0.050***	0.105***	0.107***	−0.031***	***	***	**
Innovation		0.237***	−0.052**		0.300***	−0.013		***	*
SDG15	0.050***	0.070***	−0.042***	0.135***	0.133***	−0.032***	***	***	—
Innovation		0.237***	−0.052**		0.293***	−0.012		***	**
SDG16	0.051***	0.070***	−0.032***	0.103***	0.152***	−0.043***	***	***	—
Innovation		0.237***	−0.052**		0.295***	−0.012		***	*
SDG17	0.048***	0.099***	−0.029***	0.119***	0.152***	−0.033***	***	***	—
Innovation		0.236***	−0.052**		0.293***	−0.012		***	*

	Medal			No medal			χ^2 test		
Direct Effect	**Innovation**	**GS**	**ROA**	**Innovation**	**GS**	**ROA**	**(1)**	**(2)**	**(3)**
SDG1	0.048***	0.054***	−0.025***	0.093***	0.064***	−0.026***	***	***	—
Innovation		0.074***	−0.053***		0.126***	−0.014		***	*
SDG2	0.023*	0.018*	−0.024***	0.097***	0.063*	−0.014***	***	***	—
Innovation		0.076***	−0.052***		0.126***	−0.015		***	*
SDG3	0.050***	0.094***	−0.030***	0.130***	0.093***	0.040***	***	***	—
Innovation		0.072***	−0.052***		0.120***	−0.011		***	*
SDG4	0.067***	0.069***	−0.041***	0.135***	0.089***	−0.037***	***	***	—
Innovation		0.072***	−0.051***		0.120***	−0.011		***	*
SDG5	0.070***	0.080***	−0.037***	0.137***	0.112***	−0.039***	***	***	—
Innovation		0.071***	−0.051***		0.117***	−0.011		***	*
SDG6	0.046***	0.058***	−0.018*	0.148***	0.062***	−0.017**	***	—	—
Innovation		0.074***	−0.053***		0.123***	−0.013		***	*
SDG7	0.094***	0.056***	−0.068***	0.169***	0.083***	−0.044***	***	***	**
Innovation		0.072***	−0.047***		0.118***	−0.008		***	*
SDG8	0.090***	0.089***	−0.050***	0.160***	0.106***	−0.054***	***	***	—
Innovation		0.069***	−0.049***		0.115***	−0.007		***	*
SDG9	0.100***	0.055***	−0.047***	0.159***	0.088***	−0.040***	***	***	—
Innovation		0.071***	−0.049***		0.118***	−0.010		***	*
SDG10	0.043***	0.065***	−0.044***	0.113***	0.089***	−0.045***	***	***	—
Innovation		0.074***	−0.052***		0.122***	−0.011		***	*
SDG11	0.092***	0.064***	−0.055***	0.166***	0.058***	−0.058***	***	—	—
Innovation		0.071***	−0.049***		0.123***	−0.006		***	*
SDG12	0.051***	0.067***	−0.032***	0.162***	0.093***	−0.040***	***	**	—
Innovation		0.113***	−0.052***		0.094***	−0.009		***	**
SDG13	0.088***	0.093***	−0.052***	0.176***	0.109***	−0.052***	***	***	—
Innovation		0.068***	−0.049***		0.113***	−0.007		***	*
SDG14	0.040***	0.050***	−0.050***	0.105***	0.031***	0.054***	***	—	**
Innovation		0.075***	−0.052**		0.127***	−0.013		***	*
SDG15	0.050***	0.042***	−0.042***	0.135***	0.067***	−0.032***	***	***	—
Innovation		0.117***	−0.052***		0.098***	−0.012		**	*
SDG16	0.051***	0.021*	−0.032***	0.103***	0.067***	−0.043***	***	***	—
Innovation		0.076***	0.021***		0.125***	−0.012		***	*
SDG17	0.048***	0.077***	−0.029***	0.119***	0.074***	−0.033***	***	***	—
Innovation		0.073***	−0.052***		0.123***	−0.012		**	*

Note: The term innovation refers the variable innovation for sustainability. The terms ES, SS, GS and ROA represent the environmental score, social score, governance score and return on assets, respectively. *** pvalue < 0.010; **pvalue < 0.050; *pvalue < 0.100.

Source: Own elaboration.

Table 5
Direct and indirect effects: Organizational performance (OP) score

	Medal		No medal		χ^2 test	
	Innovation	**OP**	**Innovation**	**OP**	**(1)**	**(2)**
Direct Effect						
SDG1	0.048***	0.079***	0.093***	0.126***	***	***
Innovation		0.457***		0.479***		***
Indirect Effect						
SDG1		0.022***		0.045***		
Direct Effect						
SDG2	0.023*	0.062***	0.097***	0.117***	***	***
Innovation		0.459***		0.479***		***
Indirect Effect						
SDG2		0.011*		0.047***		
Direct Effect						
SDG3	0.050***	0.128***	0.130***	0.191***	***	***
Innovation		0.455***		0.466***		***
Indirect Effect						
SDG3		0.023***		0.060***		
Direct Effect						
SDG4	0.067***	0.108***	0.135***	0.185***	***	***
Innovation		0.454***		0.466***		***
Indirect Effect						
SDG4		0.030***		0.063***		
Direct Effect						
SDG5	0.070***	0.111***	0.137***	0.196***	***	***
Innovation		0.453***		0.464***		***
Indirect Effect						
SDG5		0.032***		0.064***		
Direct Effect						
SDG6	0.046***	0.117***	0.148***	0.150***	***	***
Innovation		0.456***		0.469***		***
Indirect Effect						
SDG6		0.021***		0.069***		
Direct Effect						
SDG7	0.094***	0.085***	0.169***	0.164***	***	***
Innovation		0.453***		0.463***		***
Indirect Effect						
SDG7		0.043***		0.078***		
Direct Effect						
SDG8	0.090***	0.120***	0.160***	0.457***	***	***
Innovation		0.450***		0.209***		***
Indirect Effect						
SDG8		0.041***		0.073***		
Direct Effect						
SDG9	0.100***	0.087***	0.159***	0.168***	***	***
Innovation		0.452***		0.464***		***
Indirect Effect						
SDG9		0.045***		0.074***		

	Medal		No medal		χ^2 test	
	Innovation	OP	Innovation	OP	(1)	(2)
Direct Effect						
SDG10	0.043***	0.093***	0.113***	0.170***	***	***
Innovation		0.457***		0.472***		***
Indirect Effect						
SDG10		0.020***		0.053***		
Direct Effect						
SDG11	0.092***	0.087***	0.166***	0.136***	***	***
Innovation		0.453***		0.468***		***
Indirect Effect						
SDG11		0.042***		0.078***		
Direct Effect						
SDG12	0.051***	0.121***	0.162***	0.198***	***	***
Innovation		0.455***		0.459***		***
Indirect Effect						
SDG12		0.023***		0.074***		
Direct Effect						
SDG13	0.088***	0.124***	0.176***	0.212***	***	***
Innovation		0.450***		0.454***		***
Indirect Effect						
SDG13		0.040***		0.080***		
Direct Effect						
SDG14	0.040***	0.077***	0.105***	0.120***	***	***
Innovation		0.458***		0.479***		***
Indirect Effect						
SDG14		0.018***		0.050***		
Direct Effect						
SDG15	0.050***	0.086***	0.135***	0.144***	***	***
Innovation		0.457***		0.472***		***
Indirect Effect						
SDG15		0.023***		0.064***		
Direct Effect						
SDG16	0.051***	0.064***	0.103***	0.149***	***	***
Innovation		0.458***		0.476***		***
Indirect Effect						
SDG16		0.023***		0.049***		
Direct Effect						
SDG17	0.048***	0.106***	0.119***	0.153***	***	***
Innovation		0.456***		0.473***		***
Indirect Effect						
SDG17		0.022***		0.056***		

Note: The term innovation refers the variable innovation for sustainability. The term OP represent the organizational performance. *** pvalue < 0.010; **pvalue < 0.050; *pvalue < 0.100.

Source: Own elaboration.

5. CONCLUSIONS

The aim of this study was to examine the interaction between SDG commitment, innovations for sustainability and organizational performance (economic and sustainability). The results show that full commitment to SDGs through innovation has a positive impact on sustainability performance levels by demonstrating the firm's trustworthiness, reputation and legitimacy to its stakeholders (Ho *et al.*, 2016; Lin *et al.*, 2021), while also enabling competitive advantages (Wang *et al.*, 2021). It also serves

as an image-enhancing response to institutional pressures (Khan *et al.*, 2021a). However, it appears to involve a loss of economic return in the case of medal-winning firms. This result supports the view of Khan *et al.* (2022) who assert that innovation requires a capital investment and an extensive implementation period in order to generate revenues.

These results have several implications. From the academic viewpoint, they provide evidence that firms may adopt either one of two basic approaches to SDG commitment: substantive or symbolic, as described by legitimacy theory. While both approaches generate positive organizational performance, a stronger impact is obtained via the substantive approach. Thus, the adoption of SDGs in some companies could be more a question of form than of content. Managers should promote this cultural change by shifting from reactive to proactive commitment towards SDGs. This will enable them to develop innovations for sustainability. Policy-makers should also promote SDG adoption in private firms, by designing specific policies to encourage innovation for sustainability, address today's environmental and social challenges and establish sustainability disclosure requirements. Moreover, funders and investors need to be aware which approach to SDG commitment is being taken by the company they support. Otherwise, they could be acting under the mistaken belief that they are helping to meet the challenges associated with SDGs and Agenda 2030. Of course, the possibility of such changes depends on individual cultures and contexts. Thus, analysis of the role of institutional factors is a potential extension of this study.

We also need to mention some of the limitations of this research. One is its focus on multinational and transnational companies, which may have more resources to invest in SDG commitment while also feeling more pressure from financial markets and regulators. This study also analyses innovations for sustainability with a single indicator for two types of innovation, thereby leaving a gap for further research on other types. Also left unexplored is the possible role of the institutional context in SDG adoption. The use of multiple indicators of sustainability performance could also alter the results. These limitations leave open future lines of research built upon an integration of the legitimacy and institutional theories and potentially addressing other shortcomings.

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APPENDIX

Table A.1
Main variables

Variable	Indicator	Meaning
Sustainable Development Goals' engagement	SDG	Does the company support the UN Sustainable Development Goal "i"?
Innovations for sustainability	INN	Elaboration of environmental friendly products, clean energy products and sustainable building products. This variable also introduces eco-designed products, which are re-designed for reuse, recycling or the reduction of environmental impacts, and recycling products. These products are associated with sustainable products which supposes the reduction of potential risks using take-back procedures and recycling programmes
Organizational performance	ROA	Return on assets
	ESG	Multidimensional construct involves environmental, social, governance and economic performance
	E	Company's impact on living and non-living natural systems, including the air, land and water, as well as complete ecosystems
	S	Company's capacity to generate trust and loyalty with its workforce, customers and society, through its use of best management practices
	G	Company's systems and processes, which ensure that its board members and executives act in the best interests of its long term shareholders
Control variables	Size	Natural log of the total assets
	Leverage	Relationship between debt and equity
	Activity	Activity sector based on the TRBC classification

Source: Own elaboration.