

Eco-innovations and firm economic performance in developing countries: Evidence from Moroccan firms

Éco-innovations et performance économique des entreprises dans les pays en développement : Le cas des entreprises marocaines

DROUZI Mounir

Doctorant

Faculté des Sciences Juridiques, Economiques et Sociales de Tétouan
Université Abdelmalek Essaâdi, Maroc
Laboratoire Management, Finance, Digitalisation et Statistiques Appliquées

RAJAA Mohammed

Enseignant chercheur

Faculté des Sciences Juridiques, Economiques et Sociales de Tétouan
Université Abdelmalek Essaâdi, Maroc
Laboratoire Management, Finance, Digitalisation et Statistiques Appliquées

MARROUN Said

Doctorant

Faculté des Sciences Juridiques, Economiques et Sociales de Tétouan
Université Abdelmalek Essaâdi, Maroc
Laboratoire Management, Finance, Digitalisation et Statistiques Appliquées

Date de soumission : 12/04/2025

Date d'acceptation : 15/05/2025

Pour citer cet article :

Drouzi. M. & AL. (2025) « Eco-innovations and firm economic performance in developing countries : Evidence from Moroccan firms », Revue Française d'Economie et de Gestion « Volume 6 : Numéro 5 » pp : 403- 430.

Author(s) agree that this article remain permanently open access under the terms of the Creative Commons
Attribution License 4.0 International License



Abstract

We witness a growing interest in environmental issues which prodded companies to look for ways to reduce environmental impact through eco-innovations (EI). Consequently, numerous researches tried to explore EI impact has on firm performance and clarify its modus operandi. Still, largely discussed in developed countries, the subject remains under dealt in developing nations. This study tries to enrich literature by examining the question in a developing country context. Using PLS-SEM on survey-data gathered from Moroccan companies, we discuss different EI effects on firm performance, precisely product EI, process EI, organisational EI and eco-efficiency. The empirical evidence confirms that the effect is heterogeneous. It is significantly positive in the case of process and organisational EI, while it remains insignificant when we deal with product EI or in the case of eco-efficiency. Generally, the EI effect is not similar but changes according to the EI type considered.

Keywords : Eco-innovation; eco-efficiency; firm performance; PLS-SEM; Morocco.

Résumé

Nous observons un intérêt croissant pour les questions environnementales qui a incité les entreprises à chercher des moyens de réduire leur impact environnemental grâce aux éco-innovations (EI). Par conséquent, de nombreuses recherches ont tenté d'explorer l'impact des EI sur la performance des entreprises et de clarifier leur mode de fonctionnement. Bien que largement étudié dans les pays développés, le sujet reste peu traité dans les nations en développement. Cette étude tente d'enrichir la littérature en examinant la question dans le contexte d'un pays en développement. En utilisant PLS-SEM sur des données d'enquête recueillies auprès d'entreprises marocaines, nous discutons des différents effets des EI sur la performance des entreprises, précisément l'EI de produit, l'EI de processus, l'EI organisationnelle et l'éco-efficience. Les preuves empiriques confirment que l'effet est hétérogène. Il est significativement positif dans le cas des EI de processus et organisationnelles, tandis qu'il reste non significatif lorsqu'il s'agit d'EI de produit ou dans le cas de l'éco-efficience. Généralement, l'effet des EI n'est pas similaire mais varie selon le type d'EI considéré.

Mots clés : Éco-innovation ; éco-efficience ; performance des entreprises ; PLS-SEM ; Maroc.

Introduction

Matters of pollution reduction and environmental impact mitigation resulting from company's activities have been brought to the fore of business world since the signing of KYOTO protocol in 1997. In a recent study led by the World Economic Forum (WEF), an exceptional 66% of surveyed corporate managers recognized climate-related risks as the most perilous global danger that potentially threatens today's businesses (WEF2024), surpassing all other risks.

Such global awareness points out to the importance of managing business environmental outcomes, since we sense the need to change the way we behave, the way we consume and how we produce (Cisneros Chavira et al., 2023). Indeed, environmental management (EM) is an effective approach to mitigate risks related to regulation, consumers, and capital investments (Song et al., 2017). Moreover, it allows efficient resource use, customer loyalty, gains in productivity and employees involvement (Fernandez, 2022). Not only developing Capabilities can be leveraged in specific situations such as new regulation introduction, but it enables firms to quickly adapt, increase efficiency, and reduce input and waste disposal costs (López-Gamero et al., 2009). So, Tackling environmental problems via EM adoption might enhance future financial outcomes of companies (Song et al., 2017). Early adopters of environmental practises are companies investing early in environment, hence following proactive approach toward environmental management (López-Gamero et al. 2009, De Burgos-Jiménez et al., 2013).

Seeking to protect the environment while performing activities is positively correlated with financial performance through development of specific capabilities and first mover competitive advantage (López-Gamero et al. 2009, (López-Gamero et al., 2010), (Noordewier and Lucas, 2020). As such, The question of whether environmental proactivity is positively correlated to business performance is not straightforward, because of the complexity of the issue and the lack of a simple solution to the problem (González-Benito and González-Benito, 2005). It could bring about competitive advantages affecting positively financial performance (Lopez-Gamero et al. 2009, Burgos-Jimenez et al. 2012). So, being proactive in Environmental management lead to a better firm's outcomes, for instance financial outcomes and competitive advantage (Lopez-Gamero et al. 2009). They are the consequence of declining costs, reduced pollution, and enhanced reputation and image. Amongst EM practises that most affects future financial performance are recycling noxious substances and methods for pollution control (Song at al. 2017).

The natural resource-based view (NRVB) is one the most used frameworks that try to answer the question of whether does it pay to be green or not. In fact , it posits that profitability is positively affected by the competitive advantage that is gained by taking environment as a decisive element in the competitiveness of companies as it enables them to proactively develop strategic capabilities such as pollution prevention, product stewardship, and sustainable development (Hart, 1995). Each strategy depends on different drivers, based on different resources and giving birth to a different competitive advantage. Those capabilities allow organisations to engage in environment preservation and at the same time pave the way for positive financial outcomes. In his NRVB theory, Hart (1995) explains the role that can be played by green products within companies rolling out product stewardship strategies in obtaining substantive positive gains. Those gains are results to the deployment of proactive strategies and practises. This innovation is intended to minimise environmental effects (Amores-Salvadó et al., 2014), and enhance environmental performance(Cheng et al., 2014).

There is a significant and positive correlation between EM investment and future financial stance (Song et al. 2017). Thence, EM offers a genuine pathway to attain economic performance through the development of Eco-Innovations (EI). Companies voluntarily invest in environmental protection if they sense that benefits perceived prevail over investments required to preserve the environment (Song et al. 2017). By result, firms adopting EI are able likely to increase their economic performance through the mediating effect of environmental performance (Cai and Li, 2018).

Considered a highly important topic, EI has attracted massive attention of scholars(Yurdakul and Kazan, 2020). EI literature can be divided into several categories (Díaz-García et al., 2015). Some are tackling drivers that motivate EI (Fernando et al., 2016, Kiefer et al., 2017, Cai and Li, 2018 Mercado-Caruso et al., 2022, Hasan and Rahman, 2023 , Palmié et al., 2023), others are concerned with effects EI have on employees' involvement and collaboration , while a third group discusses effects EI exert on firm performance (Ar, 2012, Dong et al., 2014, Eryigit and Özcüre, 2015, Xie et al., 2019, Mercado-Caruso et al., 2022 , Xie et al., 2022, Rahman, 2023). Finally a more recent stream of research focuses on the probable relation existing between EI and stock markets performance of publicly traded companies (Cainelli et al., 2011, Takacs 2023).

In fact, the establishment of a strong link binding EI and economic performance is not entirely verified (Antonioli et al., 2016). Many reasons explain such results. First, the very nature of EI in question (methods, processes, and products). Second, the time lag between EI internalization

et economic performance benefits actually felt by companies (Antonioli 2016). Then , other variables have to be considered during adoption such as market conditions, the capacity to absorb innovation cost, fiscal regime on profits ,training and upgrading employees which make firms more inclined to EI (Bitencourt et al., 2020).

EI might secure certain level of return, nevertheless the financial outcomes are lower than other types of innovations (Marin, 2014). This might be a deterrent to EI implementation, especially if we consider constrained capital expenditure allocated to environmental R&D , and the time it takes to make these returns impactful in the firm bottom-line which renders the willingness to set apart resources for introducing EI more challenging (Fernandez, 2022).

Against this background, the aim of this study is to investigate whether EI exert any effect on the firm performance of Moroccan companies and try to find any differences between types of EI and their economic outcomes. Therefore, our research question can be formulated as follows: To what extent do different types of eco-innovation (product, process, organizational) and eco-efficiency influence the economic performance of Moroccan firms? Our contribution to literature is to verify the possible impact of EI adoption on the financial outcomes of Moroccan companies, since, to our best of knowledge, this paper represents one of the few research projects ever led on the subject in Moroccan context.

To address this question, the remainder of this paper is organized as follows: Section 1 delves into the literature on eco-innovation and its relationship with firm performance, leading to hypothesis development. Section 2 details the methodology, data collection, and sample characteristics. Section 3 presents and discusses the empirical results derived from the PLS-SEM analysis. Finally, Section 4 concludes the study, acknowledges its limitations, and provides suggestions for future research avenues.

1. Literature review

EI is a nascent field of research (Doran and Ryan, 2012). The concept of EI has been first introduced to literature by Fussler and Peter James in the 1990's. Most scholars argue that there is no distinction between Eco innovation and environmental innovation, both are mere synonyms portraying the same concept (Diaz-Garcia 2015), others affirm that environmental innovation refers to any innovation benefitting environment while eco-innovation designates a special kind of innovation that tries to strike a balance between expected eco-performance and environmental innovation (Huppes et al. 2009). EI have gain a prominent position in the manufacturing sector (Geng et al., 2021) enabling firms to gain performance improvements

(Geng et al. 2021). In addition, EI are diverse in nature underlying multi-dimensional characteristics (Kiefer et al., 2017).

Such complexity added to a latency existing between when EM investments are committed and related benefits are observed, render the willingness to set apart resources for introducing EI more challenging (Song et al. 2017, Kiefer et al. 2017). Not to forget that, managers will embark on environmental endeavour only if they perceive that yields of EM practices outweigh investments costs (Song et al. 2017).

Among the first definitions ever been formulated on EI we propose:” *The process of developing new products, processes or services which provide customer and business value*” Fussler and James (1996). For Eco-Innovation Observatory (EIO), EI can be defined as:” *The introduction of any new or significantly improved product (good or service), process, organisational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle*”. The implementation of EI is done through both a scientific and technological approach as well as by learning-by-doing strategy (Parrilli et al., 2023). Thus, EI are interpreted as any innovation that aims to generate business possibilities while at the same time preserve environment through pollution reduction and material use minimisation. Also, EI permits companies to pursue an effective resource-saving strategy by minimising resource use, material consumption, and recycling (Yurdakul and Kazan, 2020).

A study in 442 Chinese firms, during 2017, on different drivers behind EI adoption revealed that factors, according to their importance, such as competitive forces, market-based forces, technological capabilities, customer demand, and environmental capabilities are inducing corporation to foster EI (Cai and Li, 2018). (Fernando et al., 2016) identified in their parsimonious model five drivers that motivate EI : regulation, technology, cross-functional coordination, supplier involvement and market focus. Not to forget that regulation and governments incentives are of crucial importance in prodding firms to eco-innovate (Doran and Ryan, 2012). (Geng et al., 2021) found out, based on their study on 382 Chinese manufacturing companies, that organisations can be divided into adopters of EI (50 %) seeking to reap performance enhancements, and a group of enterprises (40%) still in the phase of planning the adoption EI.

Investing in EI is an indicator of the willingness of the company to reinvent its business model and rely more on reuse, recycle and efficient exploitation of resources and shift to embed circularity into operations in order to achieve profits in the long term that compensate for the

cost incurred during EI introduction (Bassetti et al., 2021). (Przychodzen and Przychodzen, 2015) argue that, for a company to embark on EI experience, some prerequisites have to be largely available such as substantial financial assets and liquidity.

Eco-product innovation refers to a type of innovation which aims to reduce environmental impact throughout the life cycle of a product from the design phase until they are disposed of (Amores-Salvadó et al., 2014). They can be new or significantly modified product (Rennings, 2000; Rennings et al., 2006). EI are subdivided into: product, process and organizational EI. To highlight its importance, we observe that product EI are implemented by nearly 40 % of European SMEs (Parrilli et al., 2023).

Green process innovation refers to the use of eco-friendly processes and methods in manufacturing and operational activities in an attempt to minimize waste, cost, and ensuing pollution (Yurdakul and Kazan, 2020) (Chang 2011). Process EI is predominantly present in almost 50 % of SMEs across Europe (Parrilli et al., 2023). In a study using analytical Hierarchical process method on Chinese firms, scholars reveal 27 relevant factors that influence firms' decisions to pursue process EI (i.e. : green culture, green innovation policies,)(Teng et al., 2023). Besides, parameters such as competitive pressure, managerial environmental concern and customer demand prove to be of a major importance in spurring EI process adoption (Hojnik and Ruzzier, 2017)

Eco-Organizational innovation entails devotion of the company's culture and its management system to undertake environmental initiatives, monitor their performance and manage environmental impact of corporate activities (Cheng et al., 2014)

Porter Hypothesis argues that introducing stringent regulation does not threaten competitiveness but contrarily contributes to its improvement especially when those instruments are set up meticulously during design and implementation phases (Porter and Linde, 1995)

Eco-efficiency refers to situations in which companies are able to create economic value while at the same time having the least impact possible on environment (Desli et al., 2021), so it is a concept that entails both economic and environmental aspect, and serve as important indicator of the corporate sustainability (Heras-Saizarbitoria et al., 2020)

(Cheng et al. 2014, Oliveira-Brasil et al. 2016) stress the importance of considering all types of EI and interactions they have with each other to maximise productivity and competitiveness allowed by their implementation. Each type of EI has its own attributes (De Oliveira Brasil et

al., 2016) , and can be considered as green capabilities that bolster green competitive edge and business performance of companies (Cheng et al., 2014).

1.1. Effects of EI on firm performance:

A large body of research has been dedicated to analyse the relationship between EI and firm economic performance (Amores-Salvadó et al., 2014; Ar, 2012; Bassetti et al., 2021; De Oliveira Brasil et al., 2016; Doran and Ryan, 2012; Ghisetti and Rennings, 2014; Hojnik and Ruzzier, 2017; Piedra-Muñoz et al., 2016; Takacs, 2023; Vasileiou et al., 2022; Xie et al., 2019; Yurdakul and Kazan, 2020) . (González-Benito and González-Benito, 2005) distinguish several types of firm performance: operational, lean, marketing and financial/economic performance. Economic performance (EP) is reached through substantial increase in profits, sales, quality, and market shares. Still, the debate over the nature of relationship that binds EI to firm performance has yet to be settled.

Some scholars(Bassetti et al., 2021; Doran and Ryan, 2012; Sánchez-Medina et al., 2015; Zhang and Walton, 2017) argue that it exists a strong effect of EI on firm economic outcomes and can lead to higher levels of economic performance. While others(Cai and Li, 2018; González-Benito and González-Benito, 2005; Horváthová, 2012; Linder et al., 2014) deny or reject such assumption at least on the short term.

Being an environmentally-oriented company undermines EP compared to its traditional counterpart (Linder et al., 2014). Consequently, relying solely on environment-based differentiation is highly risky for the survival of firms since it can expose it to existential dangers. Thus, environmentally-purposed firms prove to be less economically performant if we compared them to non-environmentally oriented ones (Linder et al. 2014). In the same vein, On a Study conducted within service firms in Italy (Cainelli et al., 2011), they found that EI can be negatively correlated to employment, turnover, and labour productivity insinuating a likely negative effect on EP especially on the short term (Cainelli et al., 2011). Among reasons evoked to explain such result: efficiency improvements in workforce, employees lay off particularly of those with low skills, costs brought about to environmentally innovate (Cainelli et al., 2011). On a recent study, we mention that only half of companies adopting process EI initiatives succeed, while it is merely 37%, 24%, 11% that meet their goal in the case of product, organisational and marketing EI projects respectively (Parilli et al., 2023).As a result, There is no direct positive effect or the is effect is rather dim on firm EP (Gonzalez-Benito 2005, (Cai and Li, 2018)). In the case of product innovation, the effect remains insignificant and negative

especially when the objective through their implementation is to reduce externalities (air, water, soil, and noise) (Ghisetti and Rennings, 2014).

Conversely, A longitudinal panel study (Basseti et al., 2021) that analyses US firms over a given period of fifteen years established that it exists a strong correlation between EI and EP, as the former equips firms with proper capabilities to proactively face environmental challenges and gain substantial competitive advantage (Basseti et al., 2021; Porter and Linde, 1995). So, EI can help firms achieve EP on both short and long term and help them navigate difficult time such as financial crisis (Cainelli et al., 2011). Also, it might support growth on productivity, employment, and profits rendering businesses economically shocks-absorbents (Cainelli et al., 2011). According to (Rodríguez-García & al. 2022), Firms that are environmentally proactive are likely to increase their financial performance through an enhancement of their reputation and market recognition. Concretely, we found that the less a company emits CO₂ gases the more it will be financially performant. Environmental proactivity designates the tendency to undertake voluntarily actions to reduce environmental impact. Environmental proactivity contributes favourably in some areas of business performance such as marketing and operational (González-Benito and González-Benito, 2005).

A research on 83 green-oriented SMEs in New Zealand attempted to shed light on the nexus between EI and business performance (Zhang and Walton, 2017). They arrived at the conclusion that EI impact positively business performance in green-oriented SMEs although the relationship is complex and murky. They establish that environmental orientation of managers might boost its intensity besides the resource commitment. Also, we found that a direct link between environmental orientation and business performance is absent and that the more organisational resource is channelled toward EI the more chances are to achieve greater business performance (Zhang and Walton, 2017). EI affects positively both economic and environmental performance (Yurdakul et al., 2020), as it permits energy and material consumption reduction.

EI are positively correlated to business performance (Bitencourt et al., 2020; De Oliveira Brasil et al., 2016; Geng et al., 2021; Scarpellini et al., 2019). Yet, such effect differs according to the type of innovation and the degree of novelty of these innovations being radical or incremental (Szutowski, 2021). Especially, organisational and product innovations have direct impact on EP while process EI effects is indirect. A research led on farming companies in Spain ascertain that fostering environmentally sound practices and pursuing profitability present no evident conflict. More than that, we estimated that EI contribute up to 40% in profitability

(Piedra-Muñoz et al., 2016) This can attributed to a better resource use, the promotion of specialisation (single crop cultivation), adapting workforce and training them (Piedra-Muñoz et al., 2016)

A study on many types of innovations (process, product, and organizational) has been conducted in various groups of small, medium-sized ,and large companies representing different sectors (manufacturing, service, B2B, and B2C) found out that IE positively and significantly exert an influence on firm performance and that Incorporating competitive benefits enhance the strength of influence of EI firm's performance (Hojnik and Ruzzier, 2017).

The fact that there is no common agreement on the effect is mainly due to the variety of methods, and the multitude of metrics used to gauge both constructs (Bassetti et al., 2020). Another reason for mixed results resides in studying all EI as homogenous cluster regardless of their type (Ghisetti & Rennings, 2014).To clarify the question of whether EI contribute to EP, it is advisable to segregate EI into its different types , then studying separately each IE type-EP relationship since each type of EI has its own attributes (De Oliveira Brasil et al., 2016).

For the purpose of the study, we will consider the types of EI namely product, process and organisational innovation, and develop hypotheses regarding the impact each of these type has on the economic performance of Moroccan companies.

1.2. Hypotheses development

Green product innovations relate to innovations affecting the design of a product and aiming at reducing its environmental impact throughout the product's life cycle (Amores-Salvadó et al., 2014). They can be new or significantly modified products (Rennings et al., 2006). It is considered one of the two types of green technology innovation alongside green process innovations (Wang et al., 2021). Synonymous to green product innovation, Eco-product innovation entails incremental improvement or radical changes operated on products via eco-design, sustainable technologies and reverse engineering to abate environmental impacts caused by production, consumption and end use of these products (Oleivera-Brasil et al., 2016).Green product innovation can effectively enhance an enterprise's economic performance (Cheng et al., 2014; Wang et al., 2020).

The survey-based research, carried out on 140 Turkish manufactures, argues that the relationship between green product innovation and firm performance is positive and likely to be enhanced when managers are environmentally conscious (Ar, 2012). EI can leverage revenues through product innovation (Antonioli 2016).Green product innovation is positively related to firm performance and competitive capability (Huang and Li, 2017), nevertheless the

effect is stronger in the case of competitive capability compared to firm performance (Ar, 2012). Additionally, green image plays a notable role in bolstering green-product-innovation-firm-performance relationship (Amores-Salvadó et al., 2014). A study on Spanish metal manufacturing, founded on NRVB theory, concluded the presence of a slight positive effect green product innovation has on firm performance (Amores-Salvadó et al., 2014). An explanation to this, is the need of immense up-front investments to induce green innovation particularly for an experienced and innovative firms (Amores-Salvadó et al., 2014). In other words, front money to undertake EI might offset potentially expected gains. A careful attention is to be given to devising stricter environmental policies that foster green product innovation, promote activities intended to deal with environmental issues, and therefore resulting into an increased firm performance (Ar, 2012; Cui et al., 2022).

A disagreement related to this relationship evokes the novelty of products. Specifically, for some, The effect on economic performance is significantly positive regardless of the degree of novelty (Szutowski, 2021), while for others the effect is strictly positive in the case of new product introduction (Palmer and Truong, 2017) and not significant when we deal with modified existing products.

Therefore, we propose the following hypothesis:

H1: product eco-innovation affects positively firm business performance

Eco-process innovation deals with new production techniques including lowered CO2 emissions, zero losses, and eco-efficiency reduce labour cost through process EI implementation (Antonioli et al., 2016; De Oliveira Brasil et al., 2016) leading to an enhanced organisational and economic performance (Huang and Li, 2017) .

According to (Rodríguez-García et al., 2022) , Firms that are environmentally engaged are likely to increase their financial performance through an enhancement of their reputation and market recognition. Concretely, we found that the less a company emits CO2 gases the more it will be financially performant. Amongst EM practises that most affects future financial performance are recycling noxious substances and methods for pollution control (Song at al., 2017).

Moreover, Green companies are more efficient compared to traditional ones as they generate more profits from fewer resources exploited during production process and tend to be lighter in terms of assets possessed (Bassetti et al., 2020)

Some scholars point out that companies are more concerned about implementing process EI and that process EI precede product EI (Chang-Muñoz et al., 2022; Wang et al., 2021)

.Expressly, the effect is significantly positive when it EI are implemented to save energy and material usage through process EI implementation (Ghisetti & Rennings., 2014, Cheng et al., 2014, Wang et al., 2021). Subsequently, we formulate the hypothesis:

H2: process eco-innovation impacts positively firm business performance

Organisational eco-innovations are linked to the implementation of new programs related to organisational systems, life cycle assessment tools, cleaner production and sustainable consumption (De Oliveira Brasil et al., 2016). Environmental management system (EMS) are one aspect of organisational EI practises that do not influence much firm performance (Hojnik & ruszzier.,2017). The reason that explains why ISO14001 is negatively impacting economic performance is the need for constant investments to maintain EMSs in shape and improve their performance, which might offset benefits reaped by their implementation (cost reduction, enhanced reputation, improved customer satisfaction) (Hojnik & ruszzier., 2017).

Nevertheless, a panel study on secondary data retrieved from periodic announcements and financial data of 140 EU stock markets-listed companies for the period from January 2016 until June 2019 (Szutowski, 2020) found that for organisational and process innovation the effect is positive in radical change, but remain negative when we deal with incremental innovation (Szutowski, 2020). For (Cheng et al., 2014; Ch'ng et al., 2021), we established that the effects of organizational eco-innovations on economic performance are directly positive, particularly when firms are still figuring out how to implement them (Geng et al., 2021), and in the case when management commit sufficient resources to adopt such practises (Li, 2014).

Based on the above we argue that implementing organisational green innovations lead to a higher firm performance. Thus, we propose the following hypothesis:

H3: organizational eco innovations affect positively firm business performance

The environmental orientation of employees contributes to their inclination to be more suggestive of improvements to be carried out. Interestingly , through an analysis of a sample of 283 employees in the hospitality sector, (Palmié et al., 2023) they establish that employees environmental orientation leads to economically attractive enhancements, reflected by resource consumption efficiency and waste reductions. Employees orientation can be amplified in companies that encourage such attitude which could be dubbed a golden voice of green employees (Palmié et al., 2023).

Yet, eco-efficiency measures are heterogeneous (Heras-Saizarbitoria et al., 2020) .The most commonly used metric to measure company's eco-efficiency is the ratio CO2 emission-to sales

(Rodríguez-García et al., 2022). The conclusion made by the study establishes that the higher the ratio is, the more a company is eco-efficient.

Some scholars stress the fact that companies seldom use indicators to measure eco-efficiency even in the case of environmentally engaged corporation (Heras-Saizarbitoria et al., 2020), in fact, they found that only 42 % of surveyed companies gather data on eco-efficiency as a part of their performance monitoring on environmental management approaches.

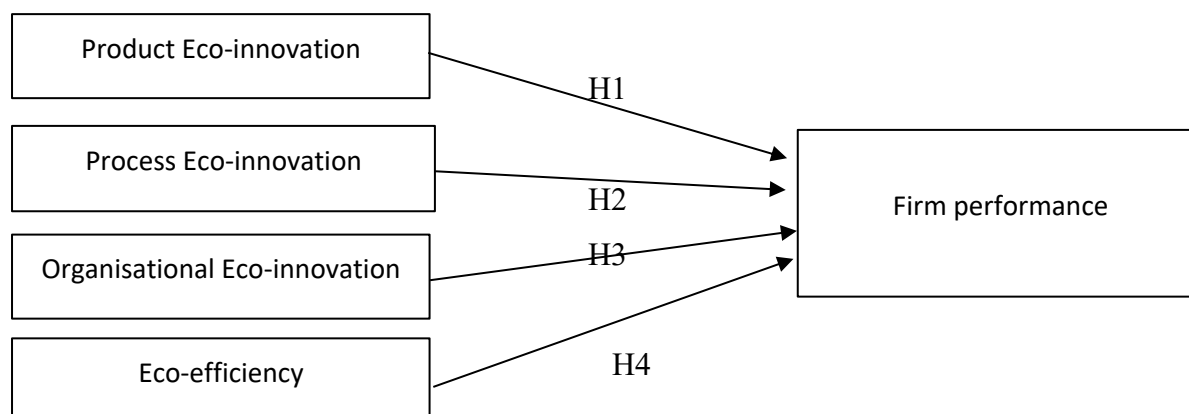
According to (Rodríguez-García et al., 2022), Firms that are environmentally engaged are likely to increase their financial performance through an enhancement of their reputation and market recognition. Empirically, they found that the less a company emits CO₂ gases the more it will be financially performant.

Hence, we propose the following hypothesis:

H4: eco-efficiency affects positively firm business performance

Figure 1 shows the proposed model along the hypotheses that address the main objective of the study.

Figure 1. Theoretical model



Source: Authors

2. Methodology

The present study is adopting a multisector perspective to study the relationship that exists between multiple EI dimensions and the firm economic performance. We tried to examine to what extent each of the types influences economic outcomes of companies. The empirical study is led in a developing nation context, based on online survey that was conducted on different industries. submitted responses were processed using structural model equation method for the analysis of data.

2.1. Sample and data

In this study, we collected primary data from a survey distributed to Moroccan companies to empirically investigate effects different types of EI have on economic performance. Questionnaire is the fittest and most convenient method to glean information on EI (Arundel & Kemp 2009, Yurdakul et al 2020). In order to gather data, we self-constituted a mailing list of businesses from several sectors. To our best of knowledge, this research represents the first of its kind led in the Moroccan context, discussing the impact EI exert on economic performance. Furthermore, due to its novelty, we tried to reach as much as possible companies regardless of sectors to which they belong to. A pre-test of the questionnaire is performed by two academicians to ensure that questions translated from English to French, are consistent, non-ambiguous, and clear to respondents. Subsequent adjustments were made according to their feedback.

Data collection was carried out in different Moroccan cities during a period of one month (December 2023), after that two reminder emails, with one-week span, have been addressed to participants to increase the response rate. A total number of 374 questionnaires were handed out. The yielded response rate is of 16.84%, representing 63 duly filled questionnaires that have been received. The sample size is acceptable to launch a causal model appreciation, if we consider the 10 times rule (Barclay et al. 1995, Hair et al. 2020), which states that, for a valid empirical study, the minimum sample size should surpass ten times the number of relationships existing between dependent and independent construct in the inner model.

The study is descriptive and quantitative seeking to shed light on the relationship linking different Eco innovation types with economic performance of the companies. The questionnaire used to achieve this objective is mainly drawn from (Cheng et al., 2014; De Oliveira Brasil et al., 2016). Concerning the firm performance construct, it was established by the work of (Ar, 2012) on the Turkish manufacturing sector. The main purpose of this research was to apply the model previously established and perceive to what extent it remains valid in the context of a developing nation in Africa.

To do so, EI is divided into four components (Cheng et al., 2014, (De Oliveira Brasil et al., 2016)): product eco innovation consisting of 04 items, process EI which comprises 06 items, organisational EI is divided in 09 items, and eco-efficiency construct is measured by 04 items. For firm performance we employ 04 items (Ar, 2012). All items were evaluated using a 05 Points-Likert scale (1= not at all agree, 2 = agree, 3 = neutral (nor agree or disagree), 4 = agree, 5 = totally agree).

Table 1. Demographic characteristics of the sample

Size	Frequency	Percentage
+ 500 employees	22	34.9
100-499 employees	16	25.4
20-99 employees	9	14.3
1-19 employees	16	25.4
Operating period		
Less than a year	2	3.2
Between 1 and 3 years	6	9.5
Between 3 and 5 years	12	19.1
≥ 5 years	43	68.2
Region		
Casablanca	26	41.2
Tangiers	26	41.2
Rabat	4	6.5
Other	7	11.1
Sector		
Automotive industry	16	25.4
Logistics and transport	13	20.6
Energy sector	6	9.5
FMCG	3	4.8
construction	4	6.4
Food and Beverage Industry	3	4.8
Mining sector	2	3.2
clothing sector	2	3.2
Other	14	22.1

Source: Authors

Table A1 displays descriptive data related to the sample. Concerning the size, we notice that more than one third of companies belongs to large corporations, followed by micro and medium enterprises which represent 26.3%, and 24.6 % respectively, while companies employing between 20 and 99 employees make about 13.1 % of the sample.

More than 68.2 % of questioned companies are operational for more than 5 years, whilst a third of them are conducting their activities for a period less than 5 years. Almost 41.2 % have their headquarters in Casablanca, while the northern region of Tangier harbours 41.2 % of them, whereas the rest of companies are scattered in several regions in Morocco. Furthermore, Automotive sector is the most represented sector in our sample with a percentage of 25.4 %, while the clothing sector is the least represented with 3.2 %.

followed by logistics and transport (20.6%), energy sector (9.5%), construction (6.4%), FMCG (4.8%), food and beverage (4.8%), mining sector (3.2%), clothing sector (3.2%), and other sectors (22.1%).

2.2. Non-response bias and common method bias

We chose the first 10 % of responses and compared them to the last 10 % replies. By using chi-square test to assess differences in terms of size, operating period, and region, we found that there are no significant differences among the two sets of data. So, this indicates that the non-response bias seems not to be a major concern for this study.

To verify the inexistence of common method bias (CMB), we followed the test proposed by (Kock, 2015). The author argues that the existence of multi-collinearity indices VIF between constructs above 3,3 is considered a sign of presence of CMB in the model. Table A3 indicates that all collinearity statistics are below the limit value. Thus, we suggest that CMB is not a concern for the research.

Table 2: Collinearity statistics between constructs

	VIF
EC_EFF -> FP	1.276
EM-> FP	2.151
Epc-> FP	2.154
Epr-> FP	1.835

Source: Authors

2.3. Measurement model

The software Smart-PLS 4.0 was used in order to apply the partial least squares structural equation model (PLS-SEM) method to examine the validity of the outer model and its reliability, and assess the significance of hypothesised relationships developed previously.

Table A4 portrays variables, measurement items, factors loadings, Cronbach's alpha, Composite reliability (CR), and average variance extracted (AVE) of the specified model. To confirm that a model shows a satisfactory internal consistent validity, several prerequisites have to be checked (Hair et al., 2020). First, all items measuring variables have factor loadings above 0.7, except for EC_EFF2 which is at 0.553. Second, CR values of individual constructs are larger than the lower limit of 0.7, as well as Cronbach's alpha which surpass the threshold of 0.7. Subsequently, we assume that items show a high degree of consistency when gauging internal constructs. Furthermore, the average variance extracted AVE of each variable exceeds

0.5, indicating convergent validity of constructs. Thus, we confirm that the model's overall reliability and validity is approved.

Table 3: Model measurement results

variable	Measurement item	meaning	Factor loading	Cronbach's alpha	CR	AVE
Epr	Epr1	Q1	0.740	0.909	0.929	0.687
	Epr2	Q2	0.847			
	Epr3	Q3	0.760			
	Epr4	Q4	0.906			
	Epr5	Q5	0.802			
	Epr6	Q6	0.902			
EM	EM1	Q7	0.778	0.952	0.960	0.725
	EM2	Q8	0.871			
	EM3	Q9	0.876			
	EM4	Q10	0.867			
	EM5	Q11	0.867			
	EM6	Q12	0.883			
	EM7	Q13	0.837			
	EM8	Q14	0.842			
	EM9	Q15	0.853			
Epc	Epc1	Q16	0.847	0.945	0.957	0.787
	Epc2	Q17	0.865			
	Epc3	Q18	0.824			
	Epc4	Q19	0.895			
	Epc5	Q20	0.942			
	Epc6	Q21	0.944			
EC_EFF	EC_EFF1	Q26	0.885	0.844	0.901	0.702
	EC_EFF2	Q27	0.561			
	EC_EFF3	Q28	0.953			
	EC_EFF4	Q29	0.896			
FP	ROI	Q22	0.805	0.886	0.922	0.747
	SALES	Q23	0.914			
	M_SHARES	Q24	0.878			
	PROFIT	Q25	0.856			

Source: Authors

Notes: Epr: product Eco innovation, Epc: process Eco innovation, EM: organisational Eco innovation method, EC_EFF: eco efficiency, FP: firm performance, ROI: return on

investments, SALES: sales during a year, M_SHARES: market shares of a company, PROFIT: profitability of a company, Qn: question number in the survey.

Discriminant validity suggests the independence and distinctiveness of each construct in relation to its peers in the model (Hair et al. 2020). To evaluate discriminant validity, the applying of Fornell-Larcker criterion remains the method commonly used (Fornell & Larcker 1981, Hair et al. 2020). Table A5 depicts correlation coefficients for each individual variable and the square root of AVE. We note that the square root of AVE is larger than shared variances between constructs. Also, referring to heterotrait-monotrait ratio (Table A6), we can observe that different in-between indicators correlations are below 0.85 (Henseler et al. 2015). So, discriminant validity of the model is assured. Thus, we conclude that validity and reliability of the measurement model is inarguably established.

Table 4: Discriminant validity assessment by Fornell-Larcker criterion

	Epr	EM	Epc	EC_EFF	FP
Epr	<i>0.829</i>				
EM	0.600	<i>0.851</i>			
Epc	0.605	0.689	<i>0.887</i>		
EC-EFF	0.422	0.396	0.383	<i>0.838</i>	
FP	0.498	0.623	0.622	0.309	<i>0.864</i>

Source: Authors

Note: the italic bold values in diagonal refer to the root square of the average variance extracted, while other values correspond to correlations values of constructs

Table 5: Discriminant validity assessment by heterotrait-monotrait ratio (HTMT)

	Epr	EM	Epc	EC_EFF
Epr				
EM	0.634			
Epc	0.627	0.724		
EC_EFF	0.501	0.439	0.421	
FP	0.519	0.667	0.677	0.352

All correlation is below the threshold of 0.85

Source: (Henseler, Ringle, & Sarstedt, 2015)

3. Results and Discussion

We provide a theoretical framework that discusses effects different aspects of EI, namely product, process, organisational and eco-efficiency have on the firm economic performance

(fig. 2). Final results from the proposed model support some of initial hypotheses and reject some others. The goodness of-fit indexes are as follows: chi-square= 995.225; NFI = 0.596; SRMR = 0.088, which (Hojnik and Ruzzier, 2017) First, we found that the effect product EI exerts on the economic performance of companies remains insignificant and unimportant although it is positive ($\beta = 0.094$, $t = 0.841$, $p < 0.05$). Also, the path coefficient does not exceed 0.09 and p-value stands at 0.20, which means that EI product dimension do not contribute much to FP. Found fact of low contribution of product EI in the FP is in contradiction with the prior hypothesised assertion that assumed an influential impact of product Eco innovation. The result can be interpreted as the consequence of lack of success factors for disseminating EI products such as insufficient R&D investments, leniency in the regulation regarding the environment or the market conditions that do not urge enough companies to eco-innovate (De Medeiros et al., 2014). Besides, the fact products' failure to grow popular among consumers could be the result of the unwillingness of local consumers to pay for green products.

Additionally, EI process innovations impact positively and significantly firm performance ($\beta = 0.315$, $t = 1.984$, $p < 0.05$). As such, the effect is both significant and positive, confirming the hypothesis which assumes that firms adopting green process achieve higher degree of economic performance. The comparison of process with product and managerial EI shows that process EI is the most influencing in terms of contribution to EP. This is in line with (Luan et al., 2016) who consider eco-process adoption as the best way for companies to implement green activities. A company can gain in term of profitability, growth, and financial performance (Hojnik and Ruzzier, 2017), and rely on EI process more than other types of innovation to achieve such outcomes (Chang-Muñoz et al., 2022). Also, green process innovations contributes to competitive advantage acquisition (Xie et al., 2019), and higher economic performance which explains the predominance of companies adopting process EI (Parilli 2023).

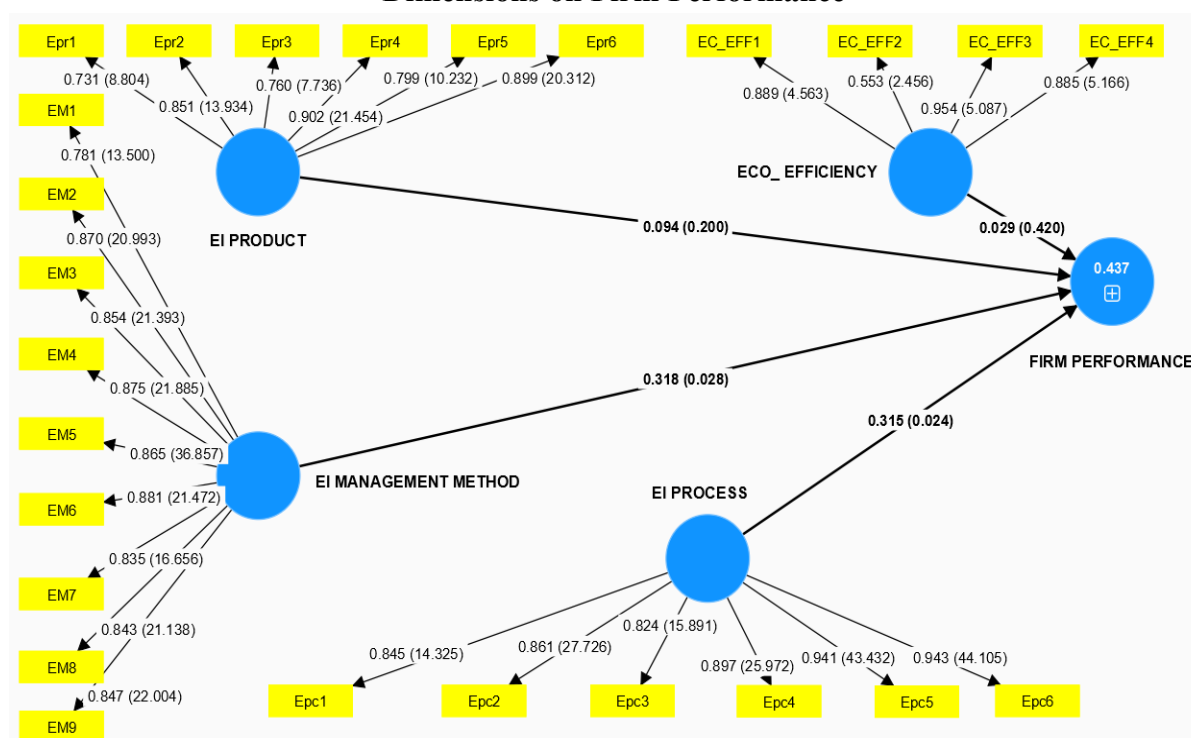
Furthermore, for managerial EI, it seems that the impact on firm performance is both positive and significant ($\beta = 0.318$, $t = 1.905$, $p < 0.05$). This confirms the hypothesis of the positive direct effect green managerial practises have on firm performance ($p\text{-value} = 0.028$). It suggests that enterprises implementing EI managerial methods would benefit from such initiatives by increasing their economic performance (Ch'ng et al., 2021). This assertion is in line with (Cheng et al., 2014; Szutowski, 2021; Vasileiou et al., 2022) who argue that organisational EI, through introduction of new management techniques and pro environmental practises, play a major role in strategy formulation and execution leading to better financial outcomes. Companies implementing organisational practises aiming at reducing the environmental impact

such as ISO14000 experience more growth and better economic performance (Heras-Saizarbitoria et al., 2020).

Lastly, the impact of eco-efficiency on firm performance is significantly low although it is positive ($\beta = 0.029$, $t = 0.202$, $p < 0.05$). This result disproves the hypothesis that presumes a significant effect exerted by eco-efficiency on firm performance. Consequently, we do not accept this hypothesis and stand on the opposite side of (Porter and Linde, 1995; Rodríguez-García et al., 2022) who assert the positive and noteworthy effect of eco-efficiency on the financial outcomes of firms. Even so, (Lucato et al., 2017) adopt the same position as ours and declare that there exist no significant relationship between environmental performance measured by eco-efficiency and firm performance.

We observe that the correlation between different EI and the overall economic performance is medium as the result show that nearly 43,7% of variance in the dependant variable is explained by the four constructs. This means that other variables besides those considered in the study support company's financial performance. This conform to the fact that environmental practises support partially business performance and effect is intermediate especially in the short term (González-Benito and González-Benito, 2005).

Figure 2: Structural Equation Model Illustrating the Impact of Eco-Innovation Dimensions on Firm Performance



Source: Authors

Notes: $p < 0.05$ (one tailed); Bootstrapping subsamples: 5000, For outer model values designate for each variable: factor loading and t-value (between bracket s), For inner model values designate for each variable: path coefficient and p-value (between brackets), items for dependent variable are not shown.

Conclusion

This research tried to answer the question of whether EI have an impact on the firm economic performance. We conducted a structural model equation method to shed light on different EI types and relationships they maintain with business performance, namely product EI, process EI, organisational EI, and eco-efficiency in the context of Moroccan firms. Our research constitutes an attempt to fill the gap of scarce discussing of the question in a developing economy.

We found out that process and managerial EI affect positively EP , henceforth we endorse (Cheng et al., 2014; De Oliveira Brasil et al., 2016) who confirm that these types contribute greatly in enhancing overall business performance. Also, we argue that product EI and eco-efficiency hold significant importance in supporting firm economic stance, in contradiction with previous studies , such as (Rahman, 2023; Rodríguez-García et al., 2022) that established a strong positive relation between the two constructs. Possible reasons to such results could lay in the unwillingness to pay extra cost to acquire green products, or the nature of local customers who do not prioritise green products and consider green features trivial while performing the purchase. As a response, firms are reluctant to offer EI products.

Since results are not the same for all types. It is vital for companies to follow a holistic approach while designing, setting, developing, and maintaining eco-innovation initiatives in order to ensure that all EI aspects benefit business performance (Maldonado Guzmán and Pinzón Castro, 2023). Importantly, the pursuit of EI introduction have to be permanent rather an occasional endeavour. More benefits can be reaped if a change in company's mentality takes place and consider EI as a result of an assiduous effort endorsed by manager's hands-on commitment and policy makers support (Parilli et al. 2023).

However, this study is not exempt from limitations. First, although it is a cross-sectional study, firms forming the research sample do not represent the entire Moroccan economic sphere, which poses the problem of findings' generalisability to the entire economy. So, we are unable to confirm that results are applicable to all sectors. Second, we did not operate segregation of companies according to sectors to which they belong (manufacturing vs. service), hence facts illustrated can be true for some sectors and fallacious for others. Third, the study relies on

perceptual, self-reported data for both EI activities and firm performance. This introduces potential subjectivity and susceptibility to common method bias (despite statistical checks) and social desirability bias, where firms might overstate their environmental engagement or performance. Objective financial or environmental metrics were not used. Last but not least, findings are specific to the Moroccan context during the study period and may not directly apply to other developing countries with different institutional environments, market structures, or levels of environmental awareness.

Future researches ought to disentangle each EI type individually and discuss its effect on firm performance in a similar context, for example in the MENA region, Sub-Saharan region.... Precisely, it is advisable to operate comparisons between similar countries and dig deeper so to explain differences in results. Also, Future models could incorporate potential mediating variables (e.g., competitive advantage, reputation, innovation capability) and moderating factors (e.g., firm resources, industry characteristics, regulatory stringency, market turbulence, managerial environmental orientation) to provide a more comprehensive understanding of the EI-performance nexus. Investigating potential interactions and complementarities between different EI types would also be valuable.

References

- Amores-Salvadó, J.**, Castro, G.M., & Navas-López, J.E. (2014). Green corporate image: moderating the connection between environmental product innovation and firm performance. *Journal of Cleaner Production*, 83, 356-365.
- Antonioli, D.**, Borghesi, S., & Mazzanti, M. (2016). Are regional systems greening the economy? Local spillovers, green innovations and firms' economic performances. *Economics of Innovation and New Technology*, 25, 692-713.
- Ar, I.M.** (2012). The Impact of Green Product Innovation on Firm Performance and Competitive Capability: The Moderating Role of Managerial Environmental Concern.
- Arundel, A.** & Kemp, R. (2009). Measuring eco-innovation. MERIT Working Papers 2009-017, United Nations University - Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT).
- Barclay, D.**, Higgins, C., & Thompson, R. (1995). The partial least squares (PLS) approach to causal modeling: Personal computer adoption and use as an illustration. *Technology Studies*, 2, 285-309.

- Bassetti, T., Blasi, S., & Sedita, S.R.** (2021). The management of sustainable development: a longitudinal analysis of the effects of environmental performance on economic performance. *Business Strategy and the Environment*, 30, 21-37.
- Bitencourt, C.C., De Oliveira Santini, F., Zanandrea, G., Froehlich, C., & Ladeira, W.J.** (2020). Empirical generalizations in eco-innovation: a meta-analytic approach. *Journal of Cleaner Production*, 245, 118721.
- Cai, W. & Li, G.** (2018). The drivers of eco-innovation and its impact on performance: evidence from China. *Journal of Cleaner Production*, 176, 110-118.
- Cainelli, G., Mazzanti, M., & Zoboli, R.** (2011). Environmentally oriented innovative strategies and firm performance in services. Micro-evidence from Italy. *International Review of Applied Economics*, 25, 61-85.
- Chang, C. H.** (2011). The influence of corporate environmental ethics on competitive advantage: the mediation role of green innovation. *Journal of Business Ethics*, 104(3), 361-370.
- Chang-Muñoz, E., Mercado-Caruso, N., Gazabon, D.O., Segarra-Oña, M., & Osorio, S.N.** (2022). Product or process innovation? The dilemma for exporting SMEs in emerging economies: the case of the Colombian Caribbean. *Procedia Computer Science*, 198, 620-625.
- Cheng, C.C.J., Yang, C., & Sheu, C.** (2014). The link between eco-innovation and business performance: a Taiwanese industry context. *Journal of Cleaner Production*, 64, 81-90.
- Ch'ng, P.-C., Cheah, J., & Amran, A.** (2021). Eco-innovation practices and sustainable business performance: the moderating effect of market turbulence in the Malaysian technology industry. *Journal of Cleaner Production*, 283, 124556.
- Cisneros Chavira, P., Shamsuzzoha, A., Kuusniemi, H., & Jovanovski, B.** (2023). Defining green innovation, its impact, and cycle – a literature analysis. *Cleaner Engineering and Technology*, 17, 100693.
- Cui, X., Wang, P., Sensoy, A., Nguyen, D.K., & Pan, Y.** (2022). Green credit policy and corporate productivity: evidence from a quasi-natural experiment in China. *Technological Forecasting and Social Change*, 177, 121516.
- De Burgos-Jiménez, J., Vázquez-Brust, D., Plaza-Úbeda, J.A., & Dijkshoorn, J.** (2013). Environmental protection and financial performance: an empirical analysis in Wales. *International Journal of Operations & Production Management*, 33(8), 981-1018.
- De Medeiros, J.F., Ribeiro, J.L.D., & Cortimiglia, M.N.** (2014). Success factors for environmentally sustainable product innovation: a systematic literature review. *Journal of Cleaner Production*, 65, 76-86.

- De Oliveira Brasil, M.V.,** Sá De Abreu, M.C., Da Silva Filho, J.C.L., & Leocádio, A.L. (2016). Relationship between eco-innovations and the impact on business performance: an empirical survey research on the Brazilian textile industry. *Revista de Administração*, 51(3), 276-287.
- Desli, E.,** Gkoulgkoutsika, A., Sdrolia, E., & Zarotiadis, G. (2021). Eco-efficiency: a methodological framework and assessment. *Cleaner Environmental Systems*, 3, 100049.
- Díaz-García, C.,** González-Moreno, Á., & Sáez-Martínez, F.J. (2015). Eco-innovation: insights from a literature review. *Innovation: Management, Policy & Practice*, 17(1), 6-23.
- Dong, Y.,** Wang, X., Jin, J., Qiao, Y., & Shi, L. (2014). Effects of eco-innovation typology on its performance: empirical evidence from Chinese enterprises. *Journal of Engineering and Technology Management*, 34, 78-98.
- Doran, J. & Ryan, G.** (2012). Regulation and firm perception, eco-innovation and firm performance. *European Journal of Innovation Management*, 15(4), 421-441.
- Eryigit, N. & Özcüre, G.** (2015). Eco-innovation as modern era strategy of companies in developing countries: comparison between Turkey and European Union. *Procedia - Social and Behavioral Sciences*, 195, 1216-1225.
- Fernandez, V.** (2022). Environmental management: implications for business performance, innovation, and financing. *Technological Forecasting and Social Change*, 182, 121797.
- Fernando, Y.,** Xin, W.W., & Gani, A.B.D. (2016). Five drivers of eco-innovation: insights from parsimonious model using a content analysis approach. *International Journal of Disease Control and Containment for Sustainability*, 1, 12-31.
- Fornell, C. & Larcker, D.F.** (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50.
- Fussler, C. & James, P.** (1996). *Driving eco-innovation: A breakthrough discipline for innovation and sustainability*. London: Pitman Publishing.
- Geng, D.,** Lai, K., & Zhu, Q. (2021). Eco-innovation and its role for performance improvement among Chinese small and medium-sized manufacturing enterprises. *International Journal of Production Economics*, 231, 107869.
- Ghisetti, C. & Rennings, K.** (2014). Environmental innovations and profitability: how does it pay to be green? An empirical analysis on the German innovation survey. *Journal of Cleaner Production*, 75, 106-117.
- González-Benito, J. & González-Benito, Ó.** (2005). Environmental proactivity and business performance: an empirical analysis. *Omega*, 33(1), 1-15.

- Hair, J. F., Jr., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2009).** Multivariate Data Analysis (6th ed.). India: Dorling Kindersley.
- Hair, J. F., Jr., Howard, M. C., & Nitzl, C. (2020).** Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research*, 109, 101-110.
- Hart, S.L. (1995).** A natural-resource-based view of the firm. *The Academy of Management Review*, 20(4), 986-1014.
- Hasan, M.J. & Rahman, M.S. (2023).** Determinants of eco-innovation initiatives toward sustainability in manufacturing SMEs: evidence from Bangladesh. *Heliyon*, 9(7), e18102.
- Heras-Saizarbitoria, I., Boiral, O., García, M., & Allur, E. (2020).** Environmental best practice and performance benchmarks among EMAS-certified organizations: an empirical study. *Environmental Impact Assessment Review*, 80, 106315.
- Hojnik, J. & Ruzzier, M. (2017).** Does it pay to be eco? The mediating role of competitive benefits and the effect of ISO14001. *European Management Journal*, 35(4), 581-594.
- Horváthová, E. (2012).** The impact of environmental performance on firm performance: short-term costs and long-term benefits? *Ecological Economics*, 84, 91-97.
- Huang, J.-W. & Li, Y.-H. (2017).** Green innovation and performance: the view of organizational capability and social reciprocity. *Journal of Business Ethics*, 145(2), 309-324.
- Huppes, G. & Ishikawa, M. (2009).** Eco-efficiency guiding micro-level actions towards sustainability: ten basic steps for analysis. *Ecological Economics*, 68(6), 1687-1700.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015).** A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43(1), 115-135.
- Kiefer, C.P., Carrillo-Hermosilla, J., Del Río, P., & Callealta Barroso, F.J. (2017).** Diversity of eco-innovations: a quantitative approach. *Journal of Cleaner Production*, 166, 1494-1506.
- Kock, N. (2015).** Common method bias in PLS-SEM: a full collinearity assessment approach. *International Journal of e-Collaboration*, 11(4), 1-10.
- Li, Y. (2014).** Environmental innovation practices and performance: moderating effect of resource commitment. *Journal of Cleaner Production*, 66, 450-458.
- Linder, M., Björkdahl, J., & Ljungberg, D. (2014).** Environmental orientation and economic performance: a quasi-experimental study of small Swedish firms. *Business Strategy and the Environment*, 23(5), 333-348.

- López-Gamero, M.D.,** Molina-Azorín, J.F., & Claver-Cortés, E. (2010). The potential of environmental regulation to change managerial perception, environmental management, competitiveness and financial performance. *Journal of Cleaner Production*, 18(10-11), 963-974.
- López-Gamero, M.D.,** Molina-Azorín, J.F., & Claver-Cortés, E. (2009). The whole relationship between environmental variables and firm performance: competitive advantage and firm resources as mediator variables. *Journal of Environmental Management*, 90(11), 3110-3121.
- Luan, C.-J.,** Tien, C., & Chen, W.-L. (2016). Which “green” is better? An empirical study of the impact of green activities on firm performance. *Asia Pacific Management Review*, 21(2), 102-110.
- Lucato, W.C.,** Costa, E.M., & De Oliveira Neto, G.C. (2017). The environmental performance of SMEs in the Brazilian textile industry and the relationship with their financial performance. *Journal of Environmental Management*, 203, 550-556.
- Maldonado Guzmán, G.** & Pinzón Castro, S.Y. (2023). Collaboration, eco-innovation and economic performance in the automotive industry. *International Journal of Industrial Engineering and Operations Management*, 5(2), 200-219.
- Marin, G.** (2014). Do eco-innovations harm productivity growth through crowding out? Results of an extended CDM model for Italy. *Research Policy*, 43(2), 301-317.
- Mercado-Caruso, N.,** Segarra-Oña, M., Peiró-Signes, Á., Portnoy, I., & Navarro, E. (2022). Eco-innovation and its economic effect on industrial clusters - an FsQCA analysis. *Procedia Computer Science*, 203, 673-677.
- Noordewier, T.G.** & Lucas, M.T. (2020). On being green and profitable: does industry context matter? *International Journal of Production Economics*, 223, 107528.
- Palmer, M.** & Truong, Y. (2017). The impact of technological green new product introductions on firm profitability. *Ecological Economics*, 136, 86-93.
- Palmié, M.,** Rüegger, S., Holzer, M., & Oghazi, P. (2023). The “golden” voice of “green” employees: the effect of private environmental orientation on suggestions for improvement in firms’ economic value creation. *Journal of Business Research*, 156, 113492.
- Parrilli, M.D.,** Balavac-Orlić, M., & Radicic, D. (2023). Environmental innovation across SMEs in Europe. *Technovation*, 119, 102541.
- Piedra-Muñoz, L.,** Galdeano-Gómez, E., & Pérez-Mesa, J. (2016). Is sustainability compatible with profitability? An empirical analysis on family farming activity. *Sustainability*, 8(9), 893.

- Porter, M.E. & van der Linde, C.** (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, 9(4), 97-118.
- Przychodzen, J. & Przychodzen, W.** (2015). Relationships between eco-innovation and financial performance – evidence from publicly traded companies in Poland and Hungary. *Journal of Cleaner Production*, 90, 253-263.
- Rahman, M.** (2023). The virtuous circle between green product innovation and performance: the role of financial constraint and corporate brand. *Journal of Business Research*, 154, 113296.
- Rennings, K.** (2000). Redefining innovation — eco-innovation research and the contribution from ecological economics. *Ecological Economics*, 32(2), 319-332.
- Rennings, K., Ziegler, A., Ankele, K., & Hoffmann, E.** (2006). The influence of different characteristics of the EU environmental management and auditing scheme on technical environmental innovations and economic performance. *Ecological Economics*, 57(1), 45-59.
- Rodríguez-García, M.D.P., Galindo-Manrique, A.F., Cortez-Alejandro, K.A., & Méndez-Sáenz, A.B.** (2022). Eco-efficiency and financial performance in Latin American countries: an environmental intensity approach. *Research in International Business and Finance*, 59, 101547.
- Sánchez-Medina, P.S., Díaz-Pichardo, R., Bautista-Cruz, A., & Toledo-López, A.** (2015). Environmental compliance and economic and environmental performance: evidence from handicrafts small businesses in Mexico. *Journal of Business Ethics*, 126(3), 381-393.
- Scarpellini, S., Portillo-Tarragona, P., & Marin-Vinuesa, L.M.** (2019). Green patents: a way to guide the eco-innovation success process? *Academia Revista Latinoamericana de Administración*, 32(2), 225-243.
- Song, H., Zhao, C., & Zeng, J.** (2017). Can environmental management improve financial performance: an empirical study of A-shares listed companies in China. *Journal of Cleaner Production*, 141, 1051-1056.
- Szutowski, D.** (2021). The impact of eco-innovation on the stock returns of technology-based KIBS: role of eco-innovation type and its degree of novelty. *Social Responsibility Journal*, 18(1), 130-155.
- Takacs, A.** (2023). The positive effects of green technology investments on growth expectations. *Technology in Society*, 75, 102407.
- Teng, Z., Guo, C., Zhao, Q., & Mubarik, M.S.** (2023). Antecedents of green process innovation adoption: an AHP analysis of China's gas sector. *Resources Policy*, 85, 103959.
- World Economic Forum. (2024). The global risks report 2024 (19th ed.). World Economic Forum.

- Vasileiou, E.,** Georgantzis, N., Attanasi, G., & Llerena, P. (2022). Green innovation and financial performance: a study on Italian firms. *Research Policy*, 51(7), 104530.
- Wang, M.,** Li, Y., Li, J., & Wang, Z. (2021). Green process innovation, green product innovation and its economic performance improvement paths: a survey and structural model. *Journal of Environmental Management*, 297, 113282.
- Wang, Y.,** Font, X., & Liu, J. (2020). Antecedents, mediation effects and outcomes of hotel eco-innovation practice. *International Journal of Hospitality Management*, 85, 102345.
- Xie, X.,** Hoang, T.T., & Zhu, Q. (2022). Green process innovation and financial performance: the role of green social capital and customers' tacit green needs. *Journal of Innovation & Knowledge*, 7(2), 100165.
- Xie, X.,** Huo, J., & Zou, H. (2019). Green process innovation, green product innovation, and corporate financial performance: a content analysis method. *Journal of Business Research*, 101, 697-706.
- Yurdakul, M. &** Kazan, H. (2020). Effects of eco-innovation on economic and environmental performance: evidence from Turkey's manufacturing companies. *Sustainability*, 12(8), 3167.
- Zhang, J.A. &** Walton, S. (2017). Eco-innovation and business performance: the moderating effects of environmental orientation and resource commitment in green-oriented SMEs. *R&D Management*, 47(5), E26-E39.