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The Effect of Environmental Sustainability and Financial Performance on Social Responsibility: The Mediating –Moderating Role of Managerial Innovation and Industrial Structure of Tunisian Firms

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Abstract. With the growth of industrial development, environmental issues have become a major challenge for companies. Our study aims to examine the relationship between the social responsibility of managerial strategies, financial performance and environmental sustainability. The empirical analysis is based on a sample of 80 Tunisian industrial companies over the period from 2020 to 2023. The research findings showed that corporate social responsibility (CSR) have a significantly positive effect on the environmental sustainability of companies that prioritize organizational legitimacy. Furthermore, our findings reveal a positive and significant coefficient for the industrial structure index. This indicating that the industrial structure is conducive to environmental sustainability and plays a moderating role in the CSR strategies of industrial companies in Tunisia. Regarding financial performance, our results showed that CSR-based strategies have a significantly positive impact. Managerial innovation contributes substantially to company performance and acts as a mediating factor in the relationship between CSR strategy and financial performance.The study also offers useful insights on managerial practices and government policy. While the notion of industrial ecology is naturally motivating, it is always evolving, and its implementation necessitates the integration of multiple organizational restructurings.

1. INTRODUCTION

Corporate Social Responsibility (CSR) refers to the actions organizations take to address their social and environmental responsibilities towards stakeholders. Brundtland (1987) defines CSR as the process of recognizing the needs of both internal and external stakeholders, and incorporating business strategies that are socially responsible and ethically acceptable. Carroll (1991) further categorizes CSR into four dimensions: legal, economic, ethical, and discretionary, each addressing the potential impact of organizational activities on stakeholders.

In Tunisia, the commitment to CSR gained momentum in 2005 through the launch of the United Nations Global Compact, encouraging local companies to adopt international standards and certifications. This move was part of Tunisia's broader economic strategy following its accession to the World Trade Organization. The country also implemented favorable social and environmental laws to create a conducive environment for CSR practices. However, the methods for promoting and executing these initiatives remain underdeveloped. Following the 2011 revolution, Tunisian businesses increased their commitment to incorporating environmental and social factors into management plans. A commitment that is currently beneficial to their growth in terms of societal acceptance, while also responding to universal principles associated with sustainable development.

In addition, certain constraints must be considered in order to accurately identify the sustainability objectives. These constraints are : economic, which includes growth policies based on macroeconomic principles of balance and fair trade; social, which refers to the need to combat poverty and the value of social cohesion and minority defense; and environmental, which refers to the need to preserve the ecosystem and reduce the local environmental impacts of industrial firms. To promote effective adoption of CSR policies, the Sustainable Development Goals demand interaction across the three spheres: ecological, social, and economic.

Globalization is likely to emphasize the significance of incorporating management methods with social responsibility into organizational approaches, as this can boost a company's competitiveness. Thus, societal commitment necessitates the implementation of a proactive policy, guided by a long-term strategy that includes critical success elements and optimal conditions for organizational, technical, and strategic execution, facilitating access to international markets.

Social responsibility is part of Tunisia's management innovation agenda. Mastering innovation is critical for enterprises seeking to enter the market, as the degree of innovation within a sector influences the level of entry barriers for new rivals. A CSR strategy guarantees that innovation continues, despite limits that necessitate continual modifications across diverse organizational structures.

The present study offers decisive contributions on an empirical and conceptual level and allows us to understand the relationship between socially responsible managerial strategies, performance and environmental sustainability of industrial companies certified ISO 14001. This research is the first in the introduction of the mediating effect of managerial innovation in the context of CSR strategies in southern Tunisia, by highlighting the capacity of innovative, organizational and structural strategies to increase the performance of manufacturing companies, previous research has until then focused most of its attention on technological innovation (Bocquet et Mothe, 2013), where there is absence of the importance of managerial innovation on the industrial structure for example. Elsewhere, Kalai (2023) generalizes the results of his research across all of Tunisia, while there

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are regional specificities for each area of Tunisia. Our research emphasizes the importance of industrial structure and its moderating effect on the relationship between CSR strategy and environmental sustainability. The results obtained constitute an empirical reference that can be used both at the level of managerial and organizational strategies and at the level of government and regulatory policies.

2. LITERATURE REVIEW

2.1. Corporate Social Responsibility and Environmental Sustainability

The relationship between social responsibility and environmental sustainability is based on the idea that companies engage in social and environmental actions because their sustainability is threatened. The raw material supply resources can become scarce or even exhausted due to the effects of climate change.

Brundtland's report (1987) defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Newly found studies emphasize the utility of adopting green finance and undertaking environmental sustainability actions in developing countries, such as adopting modern technology for the production of biodegradable products, the ban on polyethylene bags as well as new production techniques that work for environmental sustainability. Economic growth linked to the extreme exploitation of natural resources is contradictory with the principles of adherence to the objectives of preserving natural resources for future generations and respect for the environment.

Institutional and governmental forces are driving the spread of social responsibility policies that prioritize environmental sustainability challenges. Thus, corporations seeking valorisation and recognition from diverse stakeholders work for the adoption of environmental standards and certifications. Indeed, regulations in favor of environmental sustainability put pressure on industrial companies so that they also act in compliance with environmental standards, essentially based on 3 mechanisms: an incentive system, a regulatory system and an institutional system. Thus, companies that adopt environmental certification standards such as ISO 14000, 14001 are obliged to take proactive measures to reduce the risks of ecological degradation and pollution.

Laforest and al. (2015) highlight the importance of measuring environmental performance through specific indicators which evaluate the environmental impact of a product or process from the extraction of raw materials to the end of life. Apitsa (2019) also highlights the emergence of new technologies and practices aimed at improving environmental performance, such as renewable energies, circular economy practices, reduction of CO_2 emissions and the promotion of ecodesign in product development. Da Silva (2013) emphasizes the importance of coherent environmental policies and incentive regulations to encourage companies to adopt sustainable practices. Additionally, Becheker and Bekour (2021) highlight the crucial role of awareness, education and stakeholder participation for continuous improvement in environmental performance.

Despite the presence of numerous recent studies showing that the development of the activities of industrial companies with high pollution energy consumption and the usefulness of environmental concerns in leading all societies to progressively promote green development and protect natural resources in their CSR policies, these studies concern industrialized countries where there is a massive presence of high pollution energy, neglecting the rest of the countries including which of the companies adhering to the global pact which concerns environmental protection. Green finance and environmental finance are now key components of CSR strategies in manufacturing companies, reflecting a shift toward sustainability.

Environmental sustainability is assessed by the degree to which ecosystems are preserved globally, with the goal of steering company capital toward green industries. This approach aims to optimize the greening of industrial structures to prevent environmental harm, such as global warming and climate change. Managerial strategies focused on social responsibility positively influence industrial ecology, dynamically working to reduce the energy intensity of production activities and to promote the efficient use of natural systems (Adusei, 2016; Balaka and Yovo, 2023).

Hypothesis 1. CSR has a positive impact on the environmental sustainability of Tunisian industrial companies.

2.2. Corporate Social Responsibility, Industrial Structure and Environmental Sustainability

The policy of social responsibility based on environmental sustainability also aims to reduce non-renewable resources used by industrial activities, to systematically analyze the relationships between the company and the biosphere and to rigorously manage the interfaces between natural systems and production systems with the aim of reducing negative impacts on the environment.

Grossman and Krueger (1995) analyzed the relationship between carbon intensity and industrial structure adjustment. The results showed that industrial structure optimization depends on the degree of development of input-output structures among industries, which affect energy resources, the emission of polluting gases and carbon intensity. Thus, the upgrading of the industrial structure has an important role for the emission of polluting gases and the reduction of environmental pollution.

Zhang and al. (2014) utilized panel data and the ARDL approach to identify the factors influencing air pollution and environmental sustainability in China. Their findings revealed that industrial optimization plays a critical role in reducing carbon intensity. In a similar vein, Pallaro et al. (2017) examined the factors contributing to pollution in China using a dynamic spatial panel model. Their study, focused on upgrading the industrial structure, showed that pollution intensity is positively correlated with the development of the secondary industrial sector. These studies highlight the complex relationship between industrial development and environmental sustainability, particularly in the context of China’s evolving industrial landscape.

Thus, we should favor coordinated development between the optimization of the industrial structure and the different industries to ensure environmental sustainability. Indeed, the optimization of industrial structures makes it possible to ensure the coordination of development between manufacturing companies by promoting the rational allocation of energy factors between industries and the growth of productivity, and the training and development of the workforce.

The emergence of industrial growth and the high consumption of natural resources by industrial enterprises have increased in recent years, which has caused a very significant risk of natural degradation. The integration of CSR policies within industrial companies constitutes a key element for reducing the unfavorable repercussions of industrial activities on the environment (Ben Jebli et al., 2015).

Optimizing the industrial structure of manufacturing companies plays a crucial role in environmental sustainability by reducing the flow of natural resources and improving the efficiency of industrial production strategies. This is achieved through the promotion of values and practices that emphasize commitment to minimizing environmental pollution and respecting the ecosystem (Elu et Price, 2010).

Hypothesis 2. Industrial structure has a positive impact on the relationship between CSR and environmental sustainability of Tunisian industrial companies.

2.3. Corporate Social Responsibility and Financial Performance

The relationship between corporate social responsibility (CSR) and performance is the source of a wealth of literature. In the absence of a consensus on the relationship between CSR and financial performance (Galbreath, 2010; Oh & Park, 2015; Saeidi, Sofian, Saeidi, Saeidi, & Saaeidi, 2015; Mikołajek-Gocejna, 2016; Pradhan, 2016; Lu, Ren, Qiao, et al., 2019.) the relationship between these variables can be: positive, negative or neutral.

Nirino et al. (2021) showed that CSR presents a negative relationship with the financial performance of manufacturing companies due to the relatively high costs associated with sustainable development and environmental protection programs that do not give profit to the company compared to competitors who are less committed to socially responsible investments. Their study is consistent with the theory indicating that investment increases business costs, leads to a reduction in financial performance and dissipates resources. Thus, an investment decision in the acquisition of environmentally friendly industrial equipment generates a competitive disadvantage and thus causes a decline in financial performance, which can lead to shareholder discontent.

Feng et al. (2017) showed that there is a positive relationship between company financial performance and CSR and the result may vary depending on the industry structure. Their study was based on classifying stakeholders into two categories: non-investor stakeholders and investor stakeholders. They showed that CSR has a positive influence on performance to the extent that it guarantees the satisfaction of various stakeholders, which allows the minimization of risk to obtain financial resources, improve profitability and increase trust investors.

According to the Theory of “Good Management”, there is a positive relationship between the financial performance of the company and CSR practices. This result can be explained by the fact that the commitment of the company in socially responsible activities leads to privileged relationships with the “Key Stakeholders Groups” and implies an increase in performance.

Hypothesis 3. CSR has a positive effect on the financial performance of Tunisian industrial companies.

2.4. Corporate Social Responsibility, Managerial Innovation and Financial Performance

Corporate social responsibility reflects an ongoing commitment to responsible behavior. With the modernization of management methods and globalization, managerial innovation is gradually playing an important role in performance and maintaining sustainable development. Kimberly and Evanisko (1981) defined managerial innovation as: “a product or technique that differs significantly from the state of management traditional, when it is created for the first time and can affect the decision-making process in terms of quantity or quality of information.

The essence of managerial innovation comes from the conception that current innovation can generate sustainable innovation benefits for the company and increase performance. Innovations are also considered as organizational strategies aimed at the evolution of the company and the management of periods of doubt.

In an environment marked by intense product market competition, companies must develop a CSR strategy centered on long-term managerial innovation to sustain a competitive edge. However, innovation often entails high adjustment costs and information asymmetry, which can financially constrain firms.

Huarng et al. (2021) emphasizes that managerial innovation and CSR policy constitute the foundations of entrepreneurial performance. Thus, companies with a strong CSR strategy are extremely innovative. Despite the interest in studies on food innovation and its relationship with CSR, the results remain overlapping. Empirical research is quite rare and does not concern the specific effect of CSR on innovation.

Furthermore, CSR policies focused on performance-based compensation for heads of research and development units are also associated with more efficient companies. Kyereboah-Coleman (2007) showed that managerial incentives for innovation have a significant influence on business performance.

Hypothesis 4. Managerial innovation has a positive effect on the relationship between CSR and the financial performance of manufacturing companies.

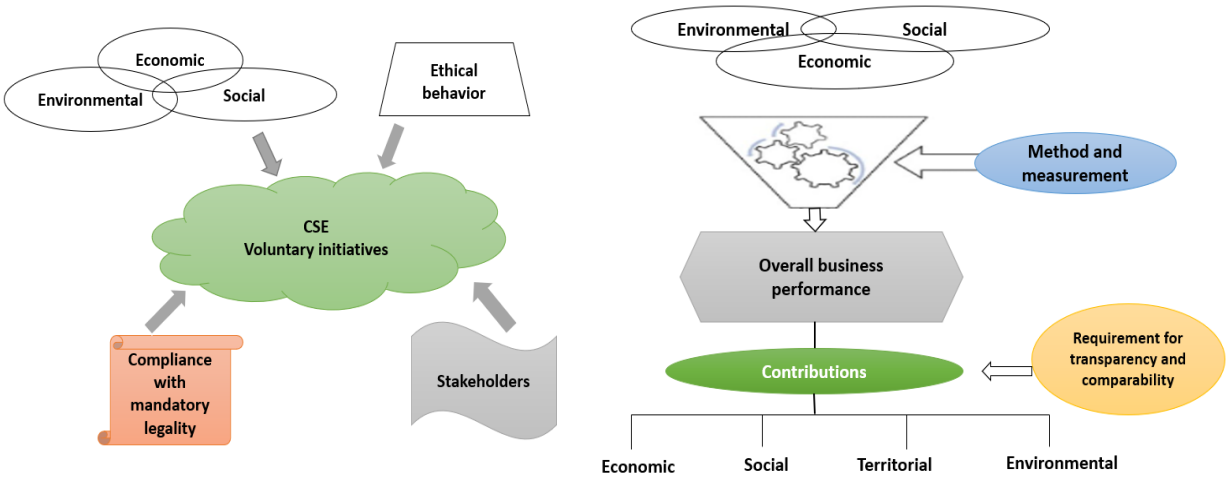

Figure 1: CSR in diagrams, Ellises editions, 2022.

Figure 1 represents the conceptual model of our study, which presents the hypotheses and defines the different elements taken into consideration the implementation of measures of managerial innovation, environmental sustainability and the industrial structure of manufacturing companies.

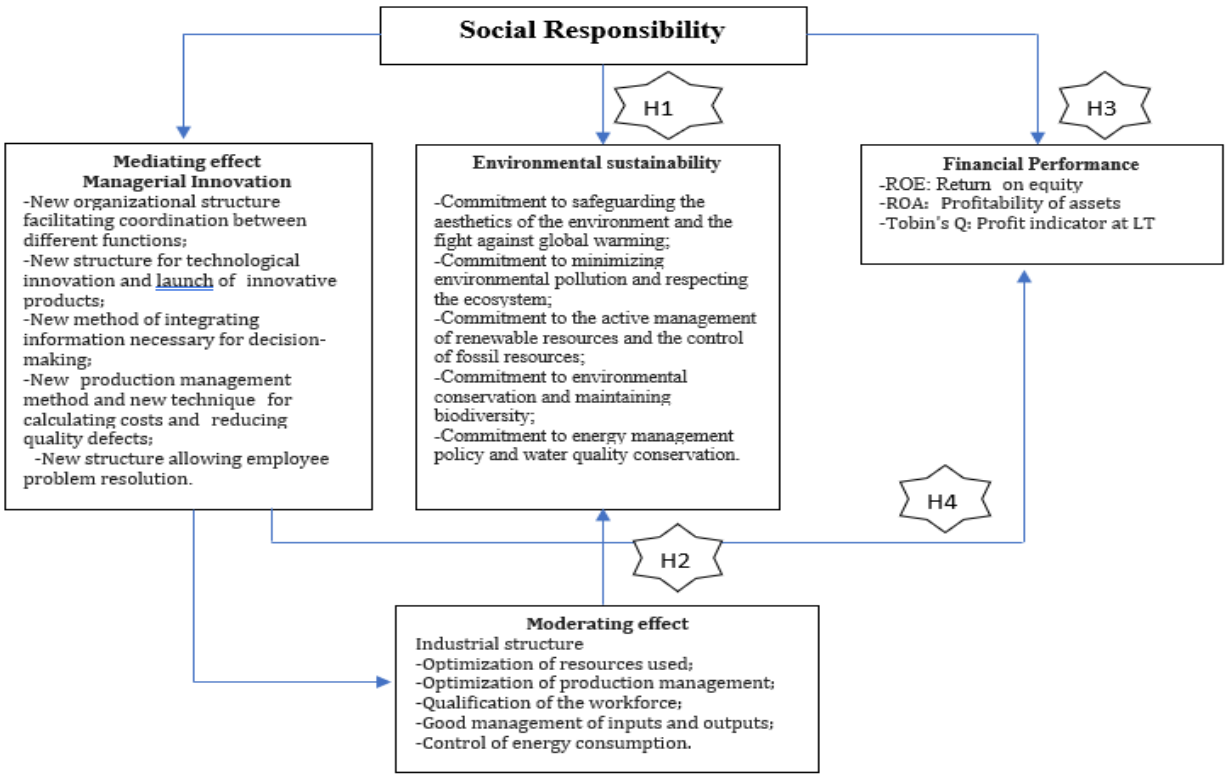

Figure 2: Conceptual Model.

3. METHODOLOGY

3.1. Econometric Model

For the analysis of the relationship between corporate social responsibility (CSR) and the financial performance (FP) of Tunisian manufacturing companies, we based our empirical study on numerous regression models:

Model (1) is established the relationship between environmental sustainability (ES) and CSR, as well as the relationship between CSR and financial performance. Our model is written as follows :

$$CSR_{it} = \alpha_0 + \alpha_1 FP_{it} + \alpha_2 ES_{it} + \alpha_3 T_{it} + \alpha_4 LE_{it} + \varepsilon_{it} \quad (1)$$

Where CSR_{it} represents the Social Responsibility; FP_{it} denotes the financial performance index, ES_{it} represents the environmental sustainability index, which measured by three key ratios : ROA, ROE and Tobin's Q, T represents size; LE deotes leverage effect; ε_{it} denotes the error term.

Model (2) establishes the mediating effect of industrial structure on the relationship between environmental sustainability and CSR. In this context, (ISit× ESit) refers to the interaction between the industrial structure and the environmental sustainability of the manufacturing company. Our model is written as follows:

$$CSR_{it} = \theta_0 + \theta_1 FP_{it} + \theta_2 ES_{it} + \theta_3 (IS_{it} \times ES_{it}) + \theta_4 IS_{it} + \theta_5 T_{it} + \theta_6 LE_{it} + \varepsilon_{it} \quad (2)$$

Model (3) highlights the role of managerial innovation on the relationship between financial performance and CSR.

$$CSR_{it} = \lambda_0 + \lambda_1 ES_{it} + \lambda_2 FP_t + \lambda_3 (MIN_{it} \times FP_{it}) + \lambda_4 MIN_{it} + \lambda_5 T_{it} + \lambda_6 LE_{it} + \varepsilon_{it} \quad (3)$$

Where (MINit × Fpit) indicates the interaction between managerial innovation and the company's financial performance.

3.2. Sample and Data Collected

Our study is based on a sample of 80 Tunisian companies in the manufacturing sectors, including construction materials and buildings, industrial goods and services, basic materials, oil exploration and telecommunications and Gas. In selecting the sample, we relied on annual activity reports and chose companies that disclosed information on CSR activities and regularly published sustainability reports and annual reports on their respective sites during the period 2020-2023 due to data availability.

Table 1: statistiques of SMEs according to their branches of activity.

N°	Sectors of activity	Effective	Percentage (%)
1	Materials and buildings	83	26.18
2	Industrial goods and services	106	33.43
3	Basic materials	94	29.65
4	Oil exploration and telecommunications and Gas	34	10.72
Total		317	100

Source: Tunisian Business Directory Report 2020.

It appears from this table that the majority of SMEs (33.43%) operating in Tunisia are found in the goods sectors and industrial services, which reflects the importance of indistry, the other sectors respectively sharing almost the same percentages; basic materials (29.65%), materials and buildings (26.18%). Oil exploration and telecommunications and gas only have 10.72% reporting.

We could not take all the data from 317 SMEs due to constraints of time and means. Thus, we wanted to extract a representative sample by using to the following formula:

$$n = \left[\frac{(Z)^2 \times N \times p(1-p)}{(N-1) \times (E)^2 \times (p)^2 + 9p\,(1-p)}\right]$$

(Bugandwa, D, 2013).
We then carried out a pilot survey among 30 SMEs with the recommendations of Giannelloni and Vernette (2001) relating to determination of sample[1] size. Applying the data from the formula, we have obtained a total sample of 80 SMEs[2], based on the following formula :

$$\mathrm{n} = \left[\frac{(1.96)^2 \mathrm{x} 317 \mathrm{x} 0.6333 \mathrm{x} 0.3667}{(317-1)\mathrm{x}(0.10)^2 \times (0.6333)^2 + 9 \times 0.6333\mathrm{x}\ 0.3667}\right] = \mathbf{80\ SMEs}$$

4. EMPIRICAL RESULTS AND DISCUSION

For the most coherent model selection and the choice between fixed effects and random effects, we carried out the likelihood tests as well as the Hausman test which allows the verification of the presence of a correlation between the specific effects and the explanatory variables models. The results obtained allowed us to choose the fixed effects model.

Table 2 presents the estimates of the coefficients of the variables of model (1) with the application of fixed effects model and that of generalized least squares, three regressions are carried out depending on the financial performance indicator: ROA, ROE or the Tobin's Q

For our sample, we note that the main variables are positively associated with CSR. In particular, model (1) shows that the coefficients of environmental sustainability are positive and statistically significant at the 10% level for the fixed effects model as well as for the General Least Square

(GLS) model. Hypothesis H1 which assumes that social responsibility has a positive impact on environmental sustainability is confirmed.

CSR helps to promote the interest of business managers in the principles of industrial ecology. The implementation of standards, which refer to sustainable development, leads to an improvement in the policy undertaken by the manager aimed at preserving the environment, because these certifications do not only require concrete environmental commitments. They ask certified companies to undergo audits aimed at verifying the company's application of the requirements of the ISO system, which helps support the optimization of the CSR strategy in terms of environmental sustainable development.

CSR is strongly correlated with environmental sustainable development; it is essential to note that the social responsibility of managers is considered by all stakeholders. This leads us to believe that industrial companies must consider the requirements of regulatory authorities and customers in terms of environmental sustainability to gain the trust of their shareholders and maintain their market value (Fumey and Egwaikhide, 2018).

Numerous studies have shown that the quest for management with social responsibility is positively correlated with the concept of a sustainable environment. Indeed, the company, concerned with preserving the integrity of the ecosystems necessary for its survival and growth, adopts a CSR policy which calls for major modifications aimed at reducing energy and material flows and allowing the improving the eco-efficiency of industrial metabolisms and generalizing practices which aim to ensure environmental sustainability as well as the preservation of natural resources. The polymorphic nature of the sustainable environment highlights a need for sustainable development in perpetual metamorphosis which is positively associated with the purposes of management with social responsibility.

Table 2 shows that the financial performance coefficients are positive and significant at the 10% level. This allows us to accept hypothesis H3 according to which there is a positive relationship between the financial performance of manufacturing companies and CSR.

The results also allow us to deduce that the more managers are involved in socially responsible policies, the higher the financial performance of the industrial company. Thus, socially responsible companies that attach importance to staff well-being and the human factor, through the social component and by investing in environmental issues, offer the advantage of being perceived positively by the market, which leads to the strengthening of their growth and an increase in their financial values.

According to these results, financial performance and environmental sustainability are positively related to CSR. This means that socially responsible managers make decisions that positively affect the financial performance of manufacturing companies and environmental sustainability.

Regarding the control variables, the coefficient of company size is positive and significant at the 1% level for small companies which have higher performance and growth opportunities than large companies.

The leverage coefficient is positive, but not significant. Socially responsible companies also have a lower risk profile than other companies. They benefit from greater ease of access to capital and the possibility of granting credit on favorable conditions, unlike companies not committed to CSR.

[1] The central concern was whether or not SME managers had published annual activity reports on their sites during the last ten years. After aggregating the results, we found that 63.33% of respondents claim to have published during the last ten years (i.e. the value of P) and 36.67% others have not published (i.e. 1-P).

[2] the sampling rate being located within an acceptable margin (f= n/N, i.e. 80/317 = 0.2523, greater than 5%), the Distribution of the sample to the different strata of the population is as shown in the table.

Table 2: Regression results: Model (1).

Return on Capital						
Return on Assets: ROA		Clean: ROE		Tobin's Q		
	Fixed Effects	GLS	Fixed Effects	GLS	Fixed Effects	GLS
FP_{it}	0,274*	0,253*	0,369*	0,463*	0,344*	0,284*
	(4,51)	(3,85)	(4,44)	(3,88)	(5,84)	(3,87)
ES_{it}	0,491*	0,641*	0,376*	0,555*	0,243*	0,664*
	(3,754)	(2,845)	(2,46)	(6,28)	(2,087)	(4,87)
T_{it}	0,055*	0,059*	0,086*	0,058*	0,034*	−0,144*
	(2,74)	(2,981)	(2,464)	(4,123)	(2,89)	(−4,18)
LE_{it}	0,043	0,042	0,043	0,047	0,043	0,044
	(0,006)	(0,006)	(0,008)	(0,005)	(0,007)	(0,005)
Constant	11,371	9,954	10,881	7,251	12,651	8,582
	(0,52)	(0,51)	(0,52)	(0,41)	(0,85)	(0,83)
R^2	0,645	0,632	0,634	0,634	0,643	0,628

Note: Values in parentheses represent t-test statistics, ***, **, and * indicate the significance of the estimates at the respective thresholds of 1%, 5%, and 10%.

4.1. Is The Effect of Industrial Structure Considered Moderating or Mediating?

The results of estimating industry structure as a mediating effect of environmental sustainable development are present in Table 2. We admit that the coefficient of industrial structure is statistically significant for the case of fixed effects and generalized least squares estimations, which suggests that CSR is associated with industrial structure in a significant way, our results confirm those of (Zhang, Kong and Choi, 2014), who identified the factors influencing environmental sustainability, in the same perspective our results confirm those of (Pallaro et al., 2017), which focused on the upgrading of industrial structure, our results do not go hand in hand with those of Kalai (2023), perhaps because of the period of the study, the size of the sample or the region of the study. Indeed, the environmental sustainability and industrial structure interaction terms present a positively significant relationship at the 10% level for the three performance measures, ROA, ROE and Tobin's Q.

These results lead us to accept hypothesis 3 which assumes that environmental sustainability will be improved as CSR strategies focused on optimizing industrial structure improve. Thus, we can deduce that industrial structure has an interaction effect which can promote the positive relationship between CSR policy and environmental sustainability of industrial companies compared to model (1) for which the industrial structure index is not taken into account.

Table 3: Regression results: Model (2).

Return on Capital						
Return on Assets: ROA		Clean: ROE		Tobin's Q		
	Fixed Effects	GLS	Fixed Effects	GLS	Fixed Effects	GLS
FP_{it}	0.258*	0.253*	0.443*	0.312*	0.287*	0.189*
	(2.174)	(2.254)	(3.254)	(4.240)	(3.184)	(4.335)
ES_{it}	0.151*	0.141*	0.252*	0.344*	0.143*	0.439*
	(2.035)	(2.086)	(3.042)	(2.182)	(3.067)	(2.082)
$IS_{it} \times ES_{it}$	(0.274)*	(0.197)*	(0.223)*	(0.125)*	(0.343)*	(0.164)*
	(2.014)	(2.152)	(3.425)	(2.977)	(2.124)	(3.019)
IS_{it}	0.135	0.113	0.312	0.083	0.134	0.064
	(0.07)	(0.04)	(0.03)	(0.18)	(0.08)	(0.03)
T_{it}	0.035*	0.023*	0.041*	0.055*	0.043*	0.042*
	(2.14)	(1.88)	(2.24)	(1.96)	(2.84)	(2.28)
LE_{it}	0.256	0.123	0.154	0.224	0.214	0.198
	(0.004)	(0.015)	(0.014)	(0.001)	(0.006)	(0.004)
Constant	2.934	2.795	2.798	2.432	2.087	2.083
	(0.34)	(0.39)	(0.36)	(0.36)	(0.44)	(0.42)
R^2	0.614	0.642	0.698	0.681	0.613	0.634

Note: Values in parentheses represent t-test statistics, ***, **, and * indicate the significance of the estimates at the respective thresholds of 1%, 5%, and 10%.

Indeed, the degree of rationalization of the industrial structure of manufacturing companies and the level of resource allocation must be taken into account with regard to sustainable development policies and strategies. In Tunisia, companies with a weak industrial structure have a low level of production, uncontrolled energy consumption and cannot easily support the purposes of environmental preservation and resource rationalization, this result is confirmed by the CSR policy of industrial companies and the coefficient of interaction between environmental sustainability which is positive. Industrial ecology is subordinate to respecting the integrity of ecosystems. It is associated with profit and growth. Industrial companies with low profits can guarantee restructuring likely to minimize the consumption of energy factors and preserve the environment. They present an industrial structure adapted to the purposes of environmental sustainable development, enabling it to ensure inclusive development and facilitating their integration into global value chains and international markets.

The regression results tell us that companies with a high industrial structure index and financial performance can afford to operate in favor of a CSR policy supporting environmental sustainable development objectives. Commitment to industrial ecology requires the adherence of business managers and personnel of manufacturing companies to ethical principles which are based on the limitation of natural resources, the efficient use of energy factors as well as the motivation and training of the workforce in environmental issues.

We note that the Tunisian industrial structure is still at the primary stage and that there are still efforts to add for the development of prospects for active management of natural resources, in order to improve the use of fossil resources and ensure the optimization of greenhouse gas emissions and toxic waste.

4.2. The Mediating Effect of Managerial Innovation

The results of Model 3, which integrates managerial innovation as a mediating factor between financial performance and CSR policy, indicate that the coefficient θ_3 is both positive and statistically significant. This suggests that industrial companies implementing CSR policies centered around innovation management experience a more substantial impact on performance compared to those that do not.

Table 3 presents the coefficient estimates, showing that the relationship between CSR, financial performance, and managerial innovation is positive and significant across all three performance measures: ROA, ROE, and Tobin's Q. These findings support the acceptance of Hypothesis 4, which posits that manufacturing companies' financial performance improves as CSR strategies emphasizing managerial innovation are developed.

Table 4: Results of the relationship between financial performance and CSR in the presence of managerial innovation.

	Return on Assets: ROA		Return on Capital Clean: ROE		Tobin's Q	
	Fixed Effects	GLS	Fixed Effects	GLS	Fixed Effects	GLS
ES_{it}	0.555*	0.481*	0.388*	0.489*	0.333*	0.388*
	(3.986)	(2.897)	(2.971)	(4.148)	(2.452)	(3.682)
MIN_{it}	0.477*	0.254*	0.378*	0.342*	0.365*	0.432*
	(4.185)	(3.148)	(4.052)	(3.038)	(4.062)	(2.977)
$MIN_{it} \times FP_{it}$	0.424*	0.575*	0.633*	0.687*	0.687*	0.812*
	(2.343)	(2.985)	(3.033)	(2.98)	(2.994)	(3.912)
FP_{it}	0.374*	0.238*	0.376*	0.432*	0.245*	0.412*
	(3.754)	(2.885)	(2.47)	(6.28)	(2.087)	(4.87)
T_{it}	0.286*	0.157*	0.223*	0.134*	0.243*	0.133*
	(2.56)	(2.977)	(2.444)	(4.111)	(2.87)	(4.18)
LE_{it}	0.144	0.147	0.244	0.243	0.248	0.248
	(0.087)	(0.025)	(0.082)	(0.028)	(0.087)	(0.027)
Constant	1.394	3.976	1.883	2.244	1.651	3.582
	(0.43)	(0.43)	(0.45)	(0.41)	(0.65)	(0.63)
R^2	0.687	0.612	0.693	0.624	0.617	0.624

Note: Values in parentheses represent t-test statistics, ***, **, and * indicate the significance of the estimates at the respective thresholds of 1%, 5%, and 10%.

In our research, managerial innovation plays a mediating role between financial performance and CSR. It reflects the managerial efficiency of manufacturing companies, as well as their future potential. The company manager's social responsibility policy thus makes it possible to improve the company's performance by enabling the various stakeholders to understand the benefits of sustainable development and to support investment strategies in innovation.

Innovation in management constitutes a primary objective for emerging countries such as Tunisia. Industrial companies seek innovation in its various forms in order to increase financial performance, by building on relationships of trust with financial partners and stakeholders, by promoting better involvement, improved accountability and decision-making transparency.

In terms of research in managerial policy, the recognition of managerial innovation constitutes an important issue today. Innovation can include the development of any new organizational structure which allows the launch of an innovative product or which allows the resolution of a problem and the launch of any production or management optimization technique. The managerial innovation strategy allows certain industrial companies to penetrate new markets while others disappear because they were unable to modernize. Furthermore, in order to be innovative, the CSR strategy consists of involving the business manager and human resources as an element inherent to innovation and stakeholders of the organization.

The positive impact of managerial innovation on the association between financial performance and CSR, presents a fairly low level of the coefficient θ_3 for certain manufacturing companies, this can be explained by the fact that company managers whose policy CSR is focused on managerial innovation facing challenges in ensuring the accelerated diffusion of new information technologies and supporting continuous changes that require structural and permanent adaptations capable of assuming the financial, technical and legal risks associated with it . The innovation process allows an improvement in the financial performance and growth of companies, but only in a conducive environment that supports the usefulness of the changes, which constitutes a real obstacle for certain companies belonging to emerging countries.

These results confirm hypothesis H4 according to which managerial innovation presents a mediating effect on the relationship between CSR policy and the financial performance of industrial companies.

5. DISCUSSION

The results of our study showed that strategies based on corporate social responsibility have a positive effect on the environmental sustainability of Tunisian industrial companies. Our results are in the same direction with the study by Kalai (2023) indicating that environmental concerns lead several companies to promote green development and protect natural resources in their CSR policies. Environmental sustainability is assessed according to the degree of conservation of the vitality of ecosystems on a global scale, it aims to optimize the greening of the industrial structure and to direct the company's capital flows towards green industry in order to avoid environmental harm. Thus, managerial strategies focused on social responsibility operate positively on industrial ecology and act to reduce the intensity of energy resources essential to production activities and the exploitation of efficient natural systems (Adusei, 2016; Balaka and Yovo 2023).

Indeed, it is essential to note that the social responsibility of managers is considered by all stakeholders. This leads us to believe that industrial companies must take into account the requirements of regulatory authorities and customers in terms of environmental sustainability to gain the trust of their shareholders and maintain their market value (Fumey and Egwaikhide, 2018).

The results of our study show a positive and significant coefficient for the industrial structure index, our results do not go hand in hand with those of Kalai (2023), thus, the industrial structure is favorable to the objectives of environmental sustainability in

southern Tunisia, the study of Kalai (2023) was general over all of Tunisia, as there is a differentiation between the regions, the north of Tunisia includes old manufacturing companies, characterized by the obsolescence of its materials and the technology used, then that in southern Tunisia, most manufacturing companies are recently established and that the nature of their activities use developed technologies. However, the degree of rationalization of the industrial structure of manufacturing companies and the level of resource allocation remain limited with regard to long-term sustainable development policies and strategies in northern Tunisia, thus, we must count on the modernization of the industrial fabric in northern Tunisia and apply the same processes and strategies applied in the south of Tunisia.

In fact, for the identification of factors influencing China's air pollution and environmental sustainability, Zhang, Kong, and Choi (2014) conducted a study on the subject, their results revealed that industrial optimization plays a determining role in reducing carbon intensity. In the same perspective, Pallaro et al. (2017) identified the factors responsible for pollution in China, in the attempt to upgrade the industrial structure, their study results showed that pollution intensity is positively correlated with the development of the secondary industrial sector.

In Tunisia, companies with a weak industrial structure have a low level of production, uncontrolled energy consumption and cannot support the purposes of preserving the environment and rationalizing resources. Industrial ecology is subordinate to respecting the integrity of ecosystems. It is associated with profit and growth. Industrial companies with low profits cannot guarantee restructuring likely to minimize the consumption of energy factors and preserve the environment. They present an industrial structure not adapted to the purposes of environmental sustainable development, allowing it to ensure inclusive development and facilitating their integration into global value chains and international markets.

Regarding financial performance, our results showed that RES-based strategies have a significant positive impact. Our results go hand in hand with those of Mikołajek-Gocejna (2016) indicating the importance of financial performance and CSR, while they do not confirm those of Nirino et al. (2021) who showed that CSR presents a negative relationship with the financial performance of manufacturing companies due to the relatively high costs associated with sustainable development and environmental protection programs that do not yield profit to the company per compared to competitors who are less committed to socially responsible investments. Thus, an investment decision in the acquisition of environmentally friendly industrial equipment generates a competitive disadvantage and thus causes a decline in financial performance, which can lead to shareholder discontent. Furthermore, Feng et al. (2017) showed that there is a positive relationship between company financial performance and CSR and the result may vary depending on the industry structure. They showed that CSR has a positive influence on performance to the extent that it guarantees the satisfaction of various stakeholders, which allows the minimization of risk to obtain financial resources, improve profitability and increase investor confidence.

Huarng et al. (2021) argue that managerial innovation and CSR policy constitute the foundations of entrepreneurial performance. Thus, companies with a strong CSR strategy are highly innovative. But, despite the interest in studies on food innovation and its relationship with CSR, the results remain overlapping. Empirical research is quite rare and does not concern the specific effect of CSR on innovation.

5.1. Conclusions, Implications, Limitations and Future Research

The empirical study examined the impact of environmental sustainable development and financial performance on social responsibility, considering the mediating role of managerial innovation and industrial structure, with a focus on Tunisian companies. The empirical analysis revealed that the financial performance and environmental sustainable are positively and significantly associated with the social responsibility efforts of industrial companies.

CSR strategies enable contribution to improving financial performance. The positive relationship between the two variables is extremely important for companies that have a fairly high managerial innovation index. Our results emphasize the mediating effect of managerial innovation on the association between financial performance and managerial strategies based on CSR.

The CSR strategies of Tunisian companies focused on managerial innovation are based on the company's ability to create new innovative strategies and structures, to assume the technical, financial, human, commercial and legal risks linked to them in the support for continuous changes that require effort and constant adaptation by all stakeholders of the company.

For industrial companies, even if managerial innovation plays a positive mediating role on the relationship between financial performance and CSR, improvements remain to be made. These improvements concern the constraints linked to the accelerated diffusion of new technologies, structural modifications and the need for continuous and permanent adaptations to the new structures that they imply. Indeed, it is essential to develop action plans that promote managerial innovation in order to contribute to the optimization of manager decisions and to overcome the constraints which are mainly linked to the regulatory framework and entrepreneurial culture.

The study emphasized the presence of a positive and significant relationship between social responsibility and environmental sustainability. Indeed, our study showed the efficiency of CSR strategies in preserving the environment for manufacturing companies. The implementation of ISO standards which clearly refer to environmental sustainability has enabled companies to partially respond to sustainable development objectives within a structured framework.

Regulations in favor of environmental sustainability have increased the probability of adoption of managerial policies appropriate to environmental issues by industrial companies. The analysis of the importance of the role of industrial structure on the relationship between CSR and environmental sustainability allowed the demonstration of a significant negative coefficient. The managerial strategy based on the concept of industrial structure aims to reduce the intensity of energy resources useful for production activities and the exploitation of efficient natural systems with the aim of ensuring the preservation of the environment. For Tunisian industrial companies, the adoption of environmental standards, optimization of the industrial and regulatory structure constitutes challenges that require permanent structural changes.

For the success of achieving the sustainable development objectives, many prerogatives must be adopted: an improvement in the quality of industrial training for a better qualification of the staff of labor-intensive manufacturing companies, a optimization of the configuration of the industrial structure and to focus on the purposes of efficiency and preservation of natural resources.

Indeed, despite the decisive craze for industrial ecology, achieving sustainable development objectives still remains at the primary stage for Tunisian industrial companies, explaining the moderating effect of the structure of the industry on the impact of CSR. on environmental sustainability. The government finds itself obliged to revise its policy with a view to linking the ends of regional sustainable development to the optimization and upgrading of companies' industrial structures, taking into consideration the specificity of each region of Tunisia, the age of the industrial structure, the technology used, the work processes and adapting policies according to the needs of each area.

At the level of organizational and managerial implications, we deduce that the commitment of company managers to CSR policies which are focused on the adoption of managerial innovation strategies, the renewal of organizational problem-solving structures and openness to technological innovation to launch innovative competitive products, are able to bring about useful changes in the management of manufacturing companies and increase financial performance. Thus, strategies to develop Tunisian industry should focus on the implementation of institutional directives and innovative structural reforms, which aim to anchor the principles of managerial innovation in governance strategies.

The results of this study are decisive for managerial practices and government policies. Also, improving the manufacturing structure constitutes for companies the privileged means which allows them to allows them to develop their environmental sustainability and increase their legitimacy vis-à-vis their stakeholders. Regulatory authorities must: strengthen the implementation of laws and regulations aimed at supervision of the degree of commitment of companies to sustainable development and environmental protection, developing preferred financing methods to ensure environmental promotion, strengthening public climate policies with the aim of developing systems environmental governance and ensure carbon pricing and strengthen ecotaxes to reduce greenhouse gases and mitigate air pollution.

Despite the importance of the present study and the results obtained, the results may have limitations represented by the number of companies that publish data on their websites. There may be institutions concerned with corporate social responsibility but which do not publish their data on their websites. Therefore, it might be better for researchers in the future to travel on site to provide data directly. Furthermore, future research should address the rest of the different variables affecting corporate social responsibility in order to benefit from their results.

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