GLOBAL CORPORATE PERFORMANCE EVALUATION AND SUSTAINABILITY REPORTING

Luigi Borré *, Lorenzo Gelmini **

* *Corresponding author*, Department of Business Studies, University of Eastern Piedmont, Vercelli, Italy
Contact details: Department of Business Studies, University of Eastern Piedmont, Via del Duomo, 6, 13100 Vercelli VC, Italy
** Department of Ecological Transition, University of Eastern Piedmont, Vercelli, Italy

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Abstract

Amongst the recent trends in the field of sustainability reporting, the implementation of Corporate Sustainability Reporting Directive (CSRD) and related legislation by the EU and its member states poses a number of challenges for stakeholders. A key issue in this regard is the recognition of the inextricable link between sustainability issues and financial factors — the traditional focus of business disciplines for many years. In this sense, there is a growing need for interpretive models that express a firm's overall performance based on both financial and non-financial factors. This need cannot be met by simply combining data and information from both areas into a single document (such as the integrated report). The risk is creating overly complex, unstructured, and inconsistent documents (both over time and across contexts) that can confuse users and, in some cases, "paralyze" their ability to make informed decisions. This paper proposes a model able to capture the overall performance of a company, into which both the financial factors and the non-financial (including sustainability) items are taken into account and related. The novelty of the current study, and its most meaningful outcome, consists in the exact construction of an innovative accounting model that comprises, in numerical terms and in terms of the relationship between financial and non-financial dimensions; in doing so, the sustainability reporting ceases to be an adjunctive factor that is detached from the financial reporting sphere, and is specifically related to and harmonized with the latter.

Keywords: Global Performance, Financial Performance, Non-Financial Performance, Sustainability, Financial Accounting, Financial Reporting

Authors' individual contribution: Conceptualization — L.B.; Methodology — L.B.; Resources — L.B.; Writing — Original Draft — L.B.; Writing — Review & Editing — L.G.; Visualization — L.B.; Supervision — L.B.

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1. INTRODUCTION

Sustainability reporting regulation is at a turning point. In response to growing public demand, both European and national regulators have accelerated their legislative and regulatory processes, building on frameworks developed over the past decades.

In recent years, the topic of reporting and assessing corporate sustainability performance has received considerable attention from scholars, leading to the development of several research streams.

Elkington (1998) made a significant contribution by introducing the "triple bottom line",

incorporating economic, social, and environmental dimensions into the evaluation of corporate performance. His work has had a profound impact on sustainability reporting, encouraging firms to consider their social and environmental impact alongside their financial performance. It has also provided valuable insights for academic research on corporate performance, shaping the study of sustainability in business. Over the past two decades, governance and evaluation issues related to sustainability have attracted the interest of numerous scholars, including the challenge of establishing clear and transparent criteria and processes for assessing and evaluating sustainability profiles (Gibson et al., 2005; Hahn & Kühnen, 2013; Kolk, 2008).

At the same time, legislative interventions have evolved from initial tentative approaches to increasingly structured measures. The scope of regulation has also gradually expanded from voluntary adoption to the establishment of specific mandatory requirements.

The issuance of European Directive 2022/2464 (Corporate Sustainability Reporting Directive, CSRD) and the subsequent Delegated Regulation (EU) 2023/2772, which set sustainability reporting standards, marked an acceleration in the European approach to sustainability reporting.

This reform is a key step toward standardized and harmonized sustainability disclosure across Europe, going beyond the more flexible framework of the previous Directive 2014/95/EU. One of its key objectives is to bridge the gap between financial and non-financial transparency requirements, fully integrating sustainability into corporate management practices.

In particular, CSRD has significantly expanded its scope beyond large listed and unlisted companies to include listed small and medium-sized enterprises (SMEs) (excluding micro-enterprises) and certain non-EU companies operating in Europe. This expansion represents a democratization of sustainability reporting and responds to the needs of an increasingly interconnected landscape, particularly in terms of supply chains and social responsibility.

It also reaffirms the centrality of the principle of "dual materiality", which requires companies to report not only on the impact of their activities on environmental, social, and governance (ESG) factors but also on how these affect their business performance. This principle emphasizes the growing interdependence between sustainability and economic performance and provides a more comprehensive analytical framework for investors and stakeholders.

Another important change is the requirement for companies to prepare sustainability reports in accordance with the European Sustainability Reporting Standards (ESRS). This marks a significant shift towards a more harmonized reporting system that aims to ensure greater comparability and transparency. However, the issue of convergence between ESRS and other international standards, such as International Sustainability Standards Board (ISSB) and Global Reporting Initiative (GRI), remains unresolved.

The novelties in the legislation, above mentioned, pose some relevant challenges to the stakeholders. These include difficulties in collecting and processing the required data and information, as well as establishing the internal governance necessary to ensure the quality and compliance of such data.

Another unresolved issue is the logic and methods for using this new wealth of information to assess corporate performance. Paradoxically, this perspective has thus far remained secondary. The paradox is that the development of a clearer definition of corporate performance, its content, and related information necessary to make an informed judgment should have been the foundation for the study and regulation of sustainability information. Instead, the prevailing pragmatic "case study" approach has focused on classifying the sustainability information to be collected and exploring the collection methods, rather than establishing a logical framework for systematically organizing the information with a clear interpretive purpose.

A key issue in this regard is the recognition of the inextricable link between sustainability issues and financial factors — the traditional focus of business disciplines for many years. Research efforts and the development of operational practices have resulted in relatively mature tools for assessing and presenting financial profiles. However, in the realm of non-financial factors, where sustainability profiles are fully situated, the development remains much more nascent.

There is a growing need for interpretive models that express a firm's overall performance based on both financial and non-financial factors. This need cannot be met by simply combining data and information from both areas into a single document (such as the integrated report). The risk is creating overly complex, unstructured, and inconsistent documents (both over time and across contexts) that can confuse users and, in some cases, "paralyze" their ability to make informed decisions.

The aim of this paper is, therefore, to propose a model for representing a firm's overall or global performance, in which financial and non-financial factors (including sustainability) are integrated and linked. It is hoped that this will stimulate further progress, both in the creation of tools for collecting and presenting corporate data and information (both financial and non-financial) and in the development of operational methods for their effective use.

This work focuses on adopting a logical-systemic approach to examine the interrelationship between the best-known and historically most-analyzed factors of firm performance (financial) and the broader range of non-financial factors that also contribute to performance. These non-financial factors are inherently multiple, diverse, and heterogeneous, and their presence in firms varies widely in intensity. Among them, sustainability performance factors are fully included and often represent the dominant portion. For the purposes of this analysis, it is useful to retain the primary macro distinction mentioned earlier, recognizing that the proposed model is particularly relevant to aspects related to sustainability.

In consideration of the insights provided to date, the primary research question of the present paper is as follows:

RQ: Is it feasible to determine an accounting and analytical paradigm that decomposes the overall results of business operations within two distinct categories (financial and non-financial results)?

This is an attractive research question in our view, and the current paper is, to the best of our knowledge and with some antecedents limited, however, to social aspects only (the so-called social return on investments), the first to address the issue in a systematic and structured approach.

The paper is organized as follows: Section 2 assesses the main literature on the topic, whilst Sections 3 and 4 present and disentangle, the first in general and the second more with algebraic details, the model proposed; Section 5 concludes, with the limitations and the future venues of research.

2. LITERATURE REVIEW

Sustainability reporting models are designed to communicate an organization's ESG performance but suffer from several key shortcomings that can undermine their effectiveness.

The literature has extensively highlighted the lack of standardization as a key driver of these issues (Pesci et al., 2023). Different frameworks (e.g. CSRD, GRI, among others) have different metrics and disclosure requirements, leading to inconsistent reporting. This inconsistency makes it difficult for stakeholders to compare performance across firms and industries (Aliyu, 2024).

In addition, the risk of greenwashing, where firms selectively report positive results or use vague language to improve their image without substantive action, undermines the credibility of sustainability reports and misleads stakeholders (Uyar et al., 2020).

Data quality and reliability also emerge as critical concerns, as social and environmental data are often incomplete, inaccurate, or based on estimates rather than verified measurements. In this context, poor data quality compromises the reliability of sustainability reports and undermines the decision-making of investors and regulators (Troshani & Rowbottom, 2024).

Furthermore, the limited scope and boundaries of frameworks such as CSRD and ESRS, which have yet to be fully interpreted in practice, often focus only on direct operations, excluding impacts from supply chains or product lifecycles. This narrow scope fails to capture the full environmental and social impacts of an organization (Antonini et al., 2020).

The aforementioned overabundance of information results in reports that can be lengthy and filled with technical jargon, making it difficult for non-expert stakeholders to interpret and extract relevant insights (Akpan et al., 2023).

At the same time, some reports emphasize annual achievements rather than long-term goals and strategies. This focus, rooted in the tradition of financial reporting, can obscure progress toward broader, long-term sustainability goals (Caglio & Quattrone, 2023).

In addition, developing comprehensive sustainability reports can be expensive and resource-intensive (Wagenhofer, 2024). SMEs may struggle to produce detailed reports, limiting their participation and the relevance of their disclosures (Andreoli et al., 2024).

Moreover, sustainability reports often focus on narrative rather than quantitative metrics, making it difficult to objectively assess performance and measure progress over time (Al-Shaer et al., 2022).

This paper builds on these observations and presents a novel approach to assessing a firm's global performance by integrating both non-financial and financial factors.

3. REFLECTIONS ON A POTENTIAL MODEL FOR ASSESSING GLOBAL FIRM PERFORMANCE

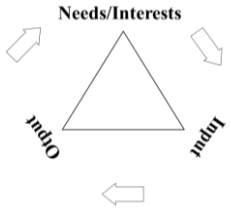
The results of a firm's activities are diverse in nature and scope. The main categories include financial results, competitive results, social results, and environmental results. These results, whether direct or indirect, at the individual or collective level, have different impacts on the firm's stakeholders.

Given this diversity, it is clear that stakeholders — who are the recipients, and thus passive subjects, of the firm's performance — are interested, albeit to varying degrees, in all of the above categories of results.

Moreover, to secure the necessary consensus for successful operations, the firm must structure its strategic proposal around all the types of results that its stakeholders are collectively concerned about. Indeed, based on the firm's strategic direction, stakeholders contribute resources, energy, and support.

Stakeholders engage with the firm in different capacities to meet their own needs and interests, which can vary widely. From this perspective, they provide "inputs" and expect returns, which we broadly define as "outputs"[1].

Figure 1. Needs/interests — Inputs — Outputs



On closer examination, these three elements (needs/interests, inputs, and outputs) serve as essential pillars in the process of evaluating global performance in relation to stakeholders (Figure 1).

If outputs are the results (both financial and non-financial) produced by the firm in relation to its stakeholders[2], then inputs represent the sacrifices made by these stakeholders (in terms of resource contributions, which can also be financial or non-financial) in anticipation of these outputs. On the other hand, needs/interests reflect the demands or desires that motivate these individuals or groups to contribute directly or indirectly to the firm.

[1] This article constitutes a development and expansion of a model originally constructed by one of the Authors (Borrè, 2003).

[2] It is important to note that outputs do not necessarily correspond to resource flows or impacts that directly affect stakeholders. Instead, they also include effects that accumulate within the firm but are still related to these stakeholders. For example, from a financial perspective, the generation of income flows within the firm can be considered an output attributable to stakeholders. This reflects the idea that while such results are retained by the firm, they ultimately benefit or are related to the interests of stakeholders through their relationship with the firm.

Within this framework, the outputs generated by the firm from a stakeholder perspective must take into account not only the overall effects of the firm's activities but also the sacrifices that stakeholders have been asked to make.

In particular, the comparison between inputs and outputs leads to a result whose structure forms a general concept of yield or "performance" (Figure 2).

Figure 2. Global performance: Input vs. output

Importantly, the concept of a firm's yield/performance as described above is not limited to the financial dimension but also includes non-financial aspects (both in terms of inputs and outputs). Therefore, a firm's global performance is assessed by indicators that take into account, on the one hand, the total energy/resources provided to the firm by its stakeholders (inputs) and, on the other hand, the total results (whether financial or non-financial) that the firm is able to achieve with these resources (outputs).

The study of the determinants of a firm's global performance, focusing on both the financial and non-financial components, can be facilitated and structured by developing an algebraic formalization of the performance model. The proposed model is outlined next.

4. GLOBAL PERFORMANCE AND ITS ARTICULATION

Based on the definition provided earlier, a firm's global performance (i.e., encompassing both financial and non-financial dimensions) can be expressed as follows:

$$P_g = \frac{O_g}{I_g} \tag{1}$$

where, P_g = global performance; O_g = global outputs; I_g = global inputs.

This formula captures the interrelationship between the firm's total results (outputs) and the total resources or efforts (inputs) provided by stakeholders.

If we consider that the inputs and outputs relevant from the stakeholders' perspective can be divided into two major categories — financial and non-financial — this formula can be further developed as follows:

$$P_g = \frac{O_g}{I_g} = \frac{O_f + O_{nf}}{I_f + I_{nf}} \tag{2}$$

where, O_f = financial outputs; O_{nf} = non-financial outputs; I_f = financial inputs; I_{nf} = non-financial inputs.

This expanded formula provides a framework for analyzing the contribution of each category of inputs and outputs to global performance, reflecting the multidimensional nature of a firm's operations and its impact on stakeholders.

Developing the formula further looks as follows:

$$P_g = \frac{O_g}{I_g} = \frac{O_f + O_{nf}}{I_f + I_{nf}} = \frac{O_f}{I_f + I_{nf}} + \frac{O_{nf}}{I_f + I_{nf}} \tag{3}$$

As can be seen, the firm's global performance can be broken down into two components. The first component relates all the inputs provided to the firm (both financial and non-financial) to the financial outputs (O_f), and the second component relates the same inputs to the non-financial outputs (O_{nf}).

In particular, Eq. (3) does not express global performance (P_g) as a function of the ratio of only financial inputs. Instead, it takes into account, even in the first component, a part related to the firm's non-financial resources (I_{nf}, non-financial inputs).

Some algebraic transformations allow the demonstration that Eq. (3) can be further developed to highlight the relationship between strictly financial outputs and inputs, resulting in the following equation[3]:

$$P_g = \frac{O_f}{I_f + I_{nf}} + \frac{O_{nf}}{I_f + I_{nf}} = \frac{O_f}{I_f} \cdot \left[1 - \frac{\frac{I_{nf}}{I_f}}{1 + \frac{I_{nf}}{I_f}}\right] + \frac{O_{nf}}{I_f + I_{nf}} \tag{4}$$

It can now be observed that pure financial performance, ideally identifiable as the ratio between strictly financial outputs (O_f) and inputs of the same type (I_f), does not constitute an independent component of the firm's global performance (P_g). Instead, it still depends on the following multiplicative factor:

$$\left[1 - \frac{\frac{I_{nf}}{I_f}}{1 + \frac{I_{nf}}{I_f}}\right] \text{ equivalent to}^{4}: \quad \frac{I_f}{I_f + I_{nf}}, \text{ both factors} \leq 1 \tag{5}$$

which also includes non-financial inputs (I_{nf}). As can be seen more clearly from the second formulation, this is a multiplicative coefficient derived from the ratio of financial inputs (I_f) to total inputs. Therefore, it is always less than or equal to 1.

[3] To demonstrate the statement, it is necessary to verify the following identity:

$$\frac{O_f}{I_f + I_{nf}} = \frac{O_f}{I_f} \cdot \left[1 - \frac{\frac{I_{nf}}{I_f}}{1 + \frac{I_{nf}}{I_f}}\right]$$

This verification can be achieved by developing the second comparison term as follows:

$$\frac{O_f}{I_f} \cdot \left[1 - \frac{\frac{I_{nf}}{I_f}}{1 + \frac{I_{nf}}{I_f}}\right] = \frac{O_f}{I_f} - \frac{\frac{I_{nf}}{I_f} \cdot \frac{O_f}{I_f}}{1 + \frac{I_{nf}}{I_f}} = \frac{O_f + O_f \frac{I_{nf}}{I_f} \cdot \frac{O_f}{I_f} - I_f \frac{O_f}{I_f} \cdot \frac{I_{nf}}{I_f}}{I_f + \frac{I_{nf}}{I_f} \cdot I_f} = \frac{O_f + O_f \frac{I_{nf}}{I_f} - O_f \frac{I_{nf}}{I_f}}{I_f + I_{nf}}$$
$$= \frac{O_f}{I_f + I_{nf}}$$

[4] It follows that:

$$1 - \frac{\frac{I_{nf}}{I_f}}{1 + \frac{I_{nf}}{I_f}} = 1 - \frac{\frac{I_{nf}}{I_f}}{\frac{I_f + I_{nf}}{I_f}} = \frac{I_f + I_{nf} - I_{nf}}{I_f + I_{nf}} = \frac{I_f}{I_f + I_{nf}}$$

$$\frac{O_f}{I_f} \cdot \left[1 - \frac{\frac{I_{nf}}{I_f}}{1+\frac{I_{nf}}{I_f}}\right] \quad (6)$$

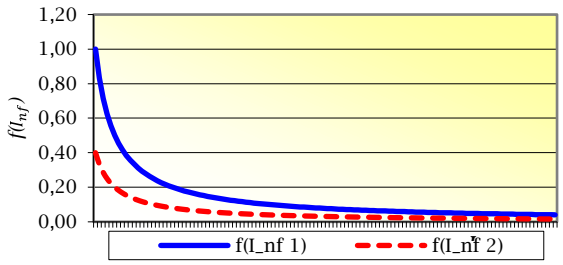
equivalent to: $\frac{O_f}{I_f} \cdot \frac{I_f}{I_f + I_{nf}}$

Given fixed values for (O_f) and (I_f), this expression shows a decreasing trend.

These dynamics are illustrated in Figure 3, where Eq. (5) and (6) are analyzed as functions of I_{nf} and identified as $f(I_{nf}1)$ and $f(I_{nf}2)$[5], respectively.

Figure 3 shows that both expressions vary with changes in non-financial inputs (I_{nf}), highlighting their decreasing trend as I_{nf} increases relative to I_f. The curves visually demonstrate the diminishing influence of pure financial performance relative to the increasing weight of total inputs.

Figure 3. Behavior of the functions $f(I_{nf}1)$ and $f(I_{nf}2)$



Assuming that the non-financial inputs (I_{nf}) are zero, the multiplicative factor equals one (at the intersection with the vertical axis), and the ratio $(O_f)/(I_f)$ is not reduced. On the other hand, for any other positive value of (I_{nf}), the above ratio is demultiplicative[6].

Thus, the evaluation of financial performance is inseparable from an evaluation of not financial outputs and inputs — (O_f) and (I_f) respectively — but also non-financial inputs (I_{nf}). This is logical given that different stakeholders expect returns proportional not only to their economic contributions but also to the "meta-economic" inputs and efforts they provide to the firm. If all the outputs produced by the firm were purely financial in nature — referring to the first component of Eq. (4) — these outputs would have to be large enough to adequately compensate for all stakeholder inputs, regardless of their nature.

In addition, non-financial inputs (I_{nf}) are by no means unrelated to the firm's financial production. On the contrary, these inputs are often critical and strategic resources for achieving favorable financial results. Therefore, relating (I_{nf}) to (O_f) not only follows from the algebraic framework discussed but also serves as a correct functional representation of how these variables are related.

In principle, all this leads us to consider that the more accurate general expression of the firm's financial performance (P_f) is not simply the ratio $\frac{O_f}{I_f}$ but rather the ratio[7]:

$$P_f = \frac{O_f}{I_f + I_{nf}} \quad (7a)$$

or, if preferred[8]:

$$P_f = \frac{O_f}{I_f} \cdot \left[1 - \frac{\frac{I_{nf}}{I_f}}{1+\frac{I_{nf}}{I_f}}\right] = \frac{O_f}{I_f} \cdot \frac{I_f}{I_f + I_{nf}} \quad (7b)$$

Of course, accepting such a conclusion also implies recognizing that the evaluation of financial performance from the perspective of stakeholders is only partially captured by conventional indicators based solely on financial variables. Specifically, these indicators become less reflective of the firm's true financial performance as the share of non-financial inputs (I_{nf}) in total inputs increases, or conversely, as the share of financial inputs (I_f) decreases.

At the same time, the considerations discussed highlight a particular complexity inherent in the performance evaluation process as understood here. This complexity arises from the fact that, contrary to what the algebraic formulations might suggest, the elements that comprise these formulations are heterogeneous in terms of units of measurement. In particular, non-financial inputs (I_{nf}) are difficult, if not impossible, to quantify in monetary terms, as is typically the case for financial inputs (I_f).

In addition, the contributions of the various stakeholders are not made through formal acts with external evidence (such as the transfer of ownership of certain assets). Instead, they are informal and leave no trace, not even in the firm's internal information system.

To date, the evaluation of this aspect has been practically overlooked, and financial performance indicators are mainly based on metrics derived from the ratio of (O_f) and (I_f). Given the arguments presented, such an approach is considered acceptable only if (I_{nf}) approaches zero. It is, therefore, desirable that any assessment of a firm's performance include a specific investigation to evaluate, at least qualitatively, the extent of potential non-financial contributions.

This underscores the importance of the significant efforts currently being made by European regulators to capture, evaluate, and present non-financial factors wherever possible.

However, the development of Eq. (4) remains incomplete and limited to the first component alone. In order to complete the analysis of this expression, it is, therefore, necessary to proceed with an examination of the second component.

In this respect, similar to the transition from Eq. (3) to (4), it can be shown that:

[5] For the purpose of graphical development, and specifically for the function $f(I_{nf}2)$, the parameters (O_f) and (I_f) have been assumed to be 2 and 5, respectively. Assuming different values for these parameters would not change the general trend of the curve, but would only affect its slope and position. This means that the qualitative behavior of the function, in particular its decreasing trend as I_{nf} increases, remains consistent regardless of the specific parameter values.

[6] Note that the non-financial inputs (I_{nf}) can only be positive or at most zero, but not negative.

[7] This formulation recognizes the combined impact of both financial inputs (I_f) and non-financial inputs (I_{nf}) on the firm's financial performance.

[8] This alternative formulation emphasizes the relationship between pure financial performance $(\frac{O_f}{I_f})$ and the proportional influence of non-financial inputs (I_{nf}) on global performance.

$$\frac{O_{nf}}{I_f + I_{nf}} = \frac{O_{nf}}{I_{nf}} \cdot \left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right] \quad (8)$$

and, therefore, Eq. (4) can be rewritten as[9]:

$$P_g = \frac{O_f}{I_f + I_{nf}} + \frac{O_{nf}}{I_f + I_{nf}} = \frac{O_f}{I_f} \cdot \left[1 - \frac{\frac{I_{nf}}{I_f}}{1 + \frac{I_{nf}}{I_f}}\right] + \frac{O_{nf}}{I_{nf}} \cdot \left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right] = \frac{O_f}{I_f \cdot \frac{I_{nf}}{I_f} + I_{nf}} + \frac{O_{nf}}{I_{nf}} \cdot \frac{I_{nf}}{I_f + I_{nf}} \quad (9)$$

Symmetrically to the discussion of Eq. (4), the second component of Eq. (9) expresses the measure of the firm's meta-economic performance. This performance is not simply the ratio between non-financial outputs (O_{nf}) and their respective contributions (I_{nf}), but rather the multiplication of this ratio by the following factor:

$$\left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right] \text{ or equivalently } \frac{I_{nf}}{I_f + I_{nf}} \quad (10)$$

Similar to the argument regarding the Eq. (6), it can be verified that the product:

$$\left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right] \text{ or equivalently } \frac{I_{nf}}{I_f + I_{nf}} \quad (10)$$

$$\frac{O_{nf}}{I_{nf}} \cdot \left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right] \text{ equivalent to: } \frac{O_{nf}}{I_{nf}} \cdot \frac{I_{nf}}{I_f + I_{nf}} \quad (11)$$

establishes an inverse relationship between the ratio based solely on non-financial variables — (O_{nf}) to (I_{nf}) — and the magnitude of the financial inputs (I_f)[10].

Thus, the earlier considerations regarding financial performance can also be applied in the context of meta-economic performance. In particular, it is inseparable from components of a financial nature, such as inputs (I_f). Furthermore, it should be noted that non-financial results are not only the product of inputs of the same type, but also (and often predominantly) of financial inputs (I_f)[11].

With all this in mind, a general formula for non-financial performance (P_{nf}) from the stakeholder's perspective can be appropriately expressed using one of the following formulas:

$$P_{nf} = \frac{O_{nf}}{I_f + I_{nf}} \quad (12a)$$

$$P_{nf} = \frac{O_{nf}}{I_{nf}} \cdot \left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right] = \frac{O_{nf}}{I_{nf}} \cdot \frac{I_{nf}}{I_f + I_{nf}} \quad (12b)$$

In conclusion, based on the arguments developed, the firm's global performance from the perspective of stakeholders can be divided into two components: its financial performance and its non-financial performance:

$$P_g = P_f + P_{nf} = \frac{O_f}{I_f + I_{nf}} + \frac{O_{nf}}{I_f + I_{nf}} = \frac{O_f}{I_f} \cdot \left[1 - \frac{\frac{I_{nf}}{I_f}}{1 + \frac{I_{nf}}{I_f}}\right] + \frac{O_{nf}}{I_{nf}} \cdot \left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right] == \frac{O_f}{I_f} \cdot \frac{I_f}{I_f + I_{nf}} + \frac{O_{nf}}{I_{nf}} \cdot \frac{I_{nf}}{I_f + I_{nf}} \quad (13)$$

Thus, given a certain level of financial inputs (I_f) and non-financial inputs (I_{nf}), the firm generates financial outputs (O_f) or non-financial outputs (O_{nf}) for its various stakeholders. However, there is not necessarily a proportional relationship between each type of output and the total output, nor between each type of input and the total input. In fact, it is generally reasonable to expect the opposite:

$$\frac{O_f}{O_f + O_{nf}} \neq \frac{I_f}{I_f + I_{nf}} \quad (14a)$$

and, therefore, also that:

$$\frac{O_{nf}}{O_f + O_{nf}} \neq \frac{I_{nf}}{I_f + I_{nf}} \quad (14b)$$

Finally, it should be noted that[12]:

$$\frac{I_{nf}}{I_f + I_{nf}} = 1 - \frac{I_{nf}}{I_f + I_{nf}} \quad (15)$$

and thus, defining:

$$\frac{I_f}{I_f + I_{nf}} = \vartheta$$

allows rewriting Eq. (13) as:

[9] In this case, the identity to verify is the following:

$$\frac{O_{nf}}{I_f + I_{nf}} = \frac{O_{nf}}{I_{nf}} \cdot \left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right]$$

Developing the second term for comparison, we obtain:

$$\frac{O_{nf}}{I_{nf}} \cdot \left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right] = \frac{O_{nf}}{I_{nf}} - \frac{\frac{I_f}{I_{nf}} \cdot \frac{O_{nf}}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}} = \frac{O_{nf} + O_{nf}\frac{I_f}{I_{nf}} - I_{nf}\frac{O_{nf}}{I_{nf}} \cdot \frac{I_f}{I_{nf}}}{I_{nf} + \frac{I_f}{I_{nf}} \cdot I_{nf}} = \frac{O_{nf} + O_{nf}\frac{I_f}{I_{nf}} - O_{nf}\frac{I_f}{I_{nf}}}{I_f + I_{nf}} = \frac{O_{nf}}{I_f + I_{nf}}$$

Furthermore, it can be demonstrated that:

$$1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}} = 1 - \frac{\frac{I_f}{I_{nf}}}{\frac{I_f + I_{nf}}{I_{nf}}} = \frac{I_{nf} + I_f - I_f}{I_f + I_{nf}} = \frac{I_{nf}}{I_f + I_{nf}}$$

[10] The behavior of the functions $f(I_f 1)$ and $f(I_f 2)$ — whose formulation is provided below — is similar to that represented in Figure 3 for the corresponding functions $f(I_{nf} 1)$ and $f(I_{nf} 2)$.

$$f(I_f 1) = \left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right]; \; f(I_f 2) = \frac{O_{nf}}{I_{nf}} \cdot \left[1 - \frac{\frac{I_f}{I_{nf}}}{1 + \frac{I_f}{I_{nf}}}\right]$$

[11] It is of course true that social, environmental, artistic, and similar types of performance of a given firm depend not only on contributions of qualitatively similar resources (social, environmental, artistic, etc.) but also on strictly economic resources.

[12] Indeed:

$$\frac{I_{nf}}{I_f + I_{nf}} = \frac{I_{nf} + I_f - I_{nf}}{I_f + I_{nf}} = 1 - \frac{I_{nf}}{I_f + I_{nf}}$$

$$P_g = \frac{O_f}{I_f} \cdot \vartheta + \frac{O_{nf}}{I_{nf}} \cdot (1 - \vartheta) \quad (16)$$

where, $0 \leq \vartheta \leq 1$.

The coefficient ϑ, therefore, depends on the qualitative and quantitative composition of the inputs available to the firm. More precisely, this coefficient is directly correlated with the financial inputs (I_f) — increasing as they grow — and inversely correlated with non-financial inputs (I_{nf}) — decreasing as they grow.

In the case where all inputs are exclusively financial, ϑ takes the value of 1. Conversely, in the case where all inputs are non-financial, it takes the value of 0.

Equation (16) indicates that the weighting coefficients for pure financial performance (O_f/I_f) and pure non-financial performance (O_{nf}/I_{nf}) — respectively ϑ and $1-\vartheta$ — are complements and add up to 1. Thus, the higher ϑ, the higher the weight of the financial performance component in Eq. (16) and, correspondingly, the lower the weight of the non-financial performance component.

Based on these considerations, the value of the coefficient ϑ — which reflects the composition of the inputs received by the firm — provides a measure of the relevance of financial performance indicators, particularly those based on the comparison of financial outputs and contributions (O_f and I_f, respectively), as commonly used in practice and theory.

While the analytical determination of ϑ faces unavoidable challenges, such as the quantification of inputs, especially non-financial inputs (I_{nf}), and reconciling their different units of measurement, its synthetic determination may be more practical. Specifically, after a preliminary analysis of the firm's characteristics and based on a qualitative assessment of the total inputs that benefit the firm, the evaluator may be able to make a reasonable, albeit partially subjective, estimate of ϑ.

The interplay between financial and non-financial performance that we have highlighted is undoubtedly a highly complex element in the context of the arguments presented. In particular, non-financial factors pose the greatest challenge in terms of treatment due to their diversity, the fact that they are usually impossible to measure, and their heterogeneity compared to economic variables. Therefore, it can be said that the degree of difficulty of valuation increases as the magnitude of the components (O_{nf}) and (I_{nf}) grows.

5. CONCLUSION

From this perspective, one might question the extent to which significant efforts in the area of sustainability reporting have led to tangible progress in the assessment of a firm's global performance. In other words, does the extensive disclosure of non-financial (and thus sustainability-related) issues now required of firms really help to promote a systematic and rational approach to forming a judgment about the firm's overall impact on its stakeholders?

The impression gained from examining the current state of sustainability reporting is that we are still far from being able to systematically synthesize the information provided to produce comprehensive assessments of a firm's global performance. The maturity of the available information and assessment tools appears to be low, making them highly susceptible to significant levels of subjectivity and uncertainty.

The increasing volume of information contained in integrated reports, including sustainability disclosures, increases the risk that these documents will become too lengthy and difficult to use, even for expert readers. In addition, traditional financial reporting risks losing its effectiveness and usability, becoming diluted and partially obscured by the overwhelming amount of data on sustainability issues that are difficult to systematize.

Therefore, there is an urgent need for a model that not only outlines the scope of non-financial information that is considered useful but also defines the logic for its integration and use — alongside financial profiles — in the context of evaluating a firm's global performance. The responsibility for developing such a model and advancing the field lies with business research and academia.

This challenge cannot be met simply by applying statistical methods to describe business phenomena. What is needed today is a concerted effort to develop conceptual frameworks and methodologies that can overcome the current stagnation in the effective integration of non-financial and sustainability issues into the assessment of global corporate performance.

This paper develops, in this sense, a new specific framework that, moving from inputs and expected returns/"outputs", disentangles them in either financial or non-financial. Based on the definition provided earlier, a firm's global performance (i.e., encompassing both financial and non-financial dimensions) can be expressed as follows:

$$P_g = P_f + P_{nf} = \frac{O_f}{I_f+I_{nf}} + \frac{O_{nf}}{I_f+I_{nf}} = \frac{O_f}{I_f} \cdot \left[1 - \frac{\frac{I_{nf}}{I_f}}{1+\frac{I_{nf}}{I_f}}\right] + \frac{O_{nf}}{I_{nf}} \cdot \left[1 - \frac{\frac{I_f}{I_{nf}}}{1+\frac{I_f}{I_{nf}}}\right] == \frac{O_f}{I_f} \cdot \frac{I_f}{I_f+I_{nf}} + \frac{O_{nf}}{I_{nf}} \cdot \frac{I_{nf}}{I_f+I_{nf}} \quad (17)$$

where, P_g = global performance; P_f = financial performance; P_{nf} = non-financial performance; O_f = financial outputs; O_{nf} = non-financial outputs; I_f = financial inputs; I_{nf} = non-financial inputs.

The realisation that it is feasible to reduce to unity, through an overall algebraic formulation, both financial and non-financial performance (of which sustainability is a key but not the sole focus) appears to be an unavoidable component in order to be able to measure, with analytical and neutral tools, the overall performance of a company.

The strongly innovativeness contents of the present article and its distinctly conceptual and theoretical nature represent, at the same time, the main limitations and future research implications. The building of the theoretical framework is novel and may, therefore, in the future, be further supplemented by other

research and methodological approaches. Similarly, the theoretical model as developed in this paper may be verified through empirical analyses of actual examples. In turn, the experience of actual instances (in the form of case studies or structured statistical analyses) will enable the theoretical model to be further fine-tuned and to ignite new avenues of research.

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