

ESG Disclosure and Sustainability Transition: A New Metric and Emerging Trends in Responsible Investments

Maurizio Pompella

School of Economics and Management
University of Siena
Sq. S. Francesco 7
Siena 53100, Italy
maurizio.pompella@unisi.it

Lorenzo Costantino

IDP European Consultants
Sq. Wiser 19
Brussels 1040, Belgium
l.costantino@idpeuropa.com

Abstract: Environmental sustainability, social engagement and robust governance gained growing attention from consumers and investors alike, leading to what we call 'ESG finance'. ESG criteria are now shaping the behaviour and choices of enterprises, investors and consumers. Indeed laudable, the increased importance of ESG finance could raise concerns about the robustness underneath this new set of financial products. Moreover, the reliability of ESG-related data and information shared by companies may also be challenged due to the ability of those indicators to shape the public profile of companies and their attractiveness for investors. A new breed of ESG rankings and ratings is widening the metrics that consumers and investors use to make informed decisions about their consumption and investment. Yet, such rankings and ratings hinge on the individual disclosure approaches of the interested companies. This article wishes to complement available data and information about specific emissions data released by companies with the ESG disclosure levels, in particular relating to the "environment" dimension. Based on these disclosure levels, the authors build a new metric with the purpose of reducing asymmetric information and promoting more responsible

investment. Starting from ESG-related data and publicly available information, a new disclosure-adjusted pollution index (namely, the GHG Scope-1 DAdj index) is developed. The second part of the article puts forward an empirical analysis on the basis of this new index, suggesting that the rush to ESG finance could be poised to generate leeway for new types of asymmetries and possible distortions in investment decision-making, also providing grounds for potentially reckless speculative attitudes, especially in the domain of product development of financial instruments that may generate new forms of risk for investors. Using the GHG Scope-1 DAdj index makes a few companies less environmentally friendly and interesting for investors who are seeking responsible and sustainable investment options. The innovative index and the empirical analysis lead the authors to suggest to “split the domains of ESG” to better gauge the relation between impact and compliance costs for companies as the individual components of environment, social engagement and governance are considered separately.

Keywords: *asymmetry of information, carbon-backed green products, ESG-finance, GHG Scope-1 Disclosure Adjusted Index, investors’ protection*

1. Introduction

In the last decade, sustainable finance gained considerable attention from financial intermediaries and institutional investors seeking investment approaches that considered metrics related to environmental sustainability and impact, social responsibility, and mechanisms of governance of invested companies. The increasing environmental and social concerns of retail investors contribute to generate momentum for the development of environmental, social and governance (ESG) finance, currently mainstream in financial and retail markets alike. Such growing interest sparked a persistent debate in literature about ESG disclosure (also putting forward the *greenwashing* theme) due to the self-regulatory approach and lack of defined and agreed guidelines for transparency and disclosure levels.

*ESG finance*¹ gained traction with regulatory bodies and the community of practice of finance, banking, and financial intermediation. Research and analysis of ESG dynamics is gaining centre-stage in the academic domain and community of practice thanks to the role of ESG in the investment process, corporate decision making, and consumers' behaviour. For investment professionals and financial intermediaries, ESG features are becoming an integral part of the investment decisions, together with metrics of financial and market analysis. Companies are becoming more concerned with their environmental impact, social role, and robust governance mechanisms that can build or reinforce their standing vis-à-vis public opinion, policy makers, and society at large. Citizens are greening their consumption and, in some instances, may prefer products and services that are considered sustainable and socially conscious. Those trends gradually converge towards increased attention for regulators and policy makers to engage in the ESG domain to provide for smooth intermediation, certainty, and transparency.

The up-take of ESG finance also triggered the development of ESG-related ratings, rankings and indexes with indicators to allow investors to make informed investment decisions on the basis of ESG-related criteria. A low degree of convergence among those indexes (Eccles & Strohle, 2018; McCahery, Pudschedl & Lopez-de-Silanes, 2020; Widyawati, 2020)² prevents consensus on reliability and comparability, those indexes continue to be used—and increasingly so—to back investment decisions globally. The indexes and ratings are tools that seek to provide evidence and corroborate ESG investment decisions. Such metrics and ratings facilitated the further development of innovative financial and investment products. Consequently, the process of financial product development has also raised concerns about the robustness and reliability of ESG financial products from the point of view of investors' protection.

Demand for ESG investments and financial products increased dramatically between 2016 and 2020 to 35 trillion dollars, a share of 36% of the total professionally managed assets, according to estimates from Global Sustainable Investment Alliance (GSIA) (2021).

Concerns also relate to the valuation procedure for ESG-compliant companies. The ambition of reaching a good ESG rating may generate

¹ 'Transition' (see below) and 'ESG finance' refer to strategic choices of businesses and to capital flows that support the transformation of economies in a sustainable way, with new products and new processes.

² Recent literature highlights how those ESG rating and rankings may be affected by low disclosure and convergence.

incentives to misbehave by inexperienced and unscrupulous intermediaries, investors, or companies that may tinker with the information disclosed, at times disclosing low quality data or choosing to provide excess amount of information to fog the rating process. Those approaches and mechanisms led to the emergence of new terms like 'bluewashing' and 'greenwashing' (IMF, 2021).³

The similarities between the current hype in ESG finance and past upheavals in the financial markets lead the authors to establish similitudes with financial bubbles that were triggered by lax regulatory supervision, inaccurate valuations and/or oversight, combined with euphoric intermediaries and investors, like the Internet Bubble in the 1990s, the Great Financial Crisis triggered by excessive securitization and current speculative trends in financial innovative products and services of the likes of cryptocurrencies and special purpose acquisition companies (SPACs).

In this context, there seems to be a rush to ESG finance and ESG compliance that could generate unjustified asymmetries or define new forms of financial risk. While certainly worthy, such transformation in the financial sector and development of new financial products still leads to concerns: the issue is that more sustainable and greener investments may be based on investment metrics that go beyond the financial robustness and business viability of companies.

Finance is upgrading its role of intermediation in support of this ESG transition, or transition to a sustainable economy,⁴ developing a series of innovative products (ESG investment) and processes (ESG ranking and rating). Moreover, the financial sector is proving instrumental to implement the green transition, providing investment and securing capital for new technology and for the adoption of more sustainable and greener products and services.

³ Greenwashing is becoming a common definition, now fully adopted also by regulators and financial authorities. The IMF also makes a direct reference to the term in the domain of ESG finance, where a concluding remark about ESG finance reports that "[f]urther improvements in data, disclosure, and sustainable finance classifications remain the key policy objectives in this area to facilitate the assessment of transition-related risks and prevent greenwashing."

⁴ More specifically, in this contribution we will refer to 'ESG transition costs' as the costs that the enterprises have to face in order to reach an adequate and satisfactory sustainability level, and—as far as regulated matters are concerned—compliance. 'Sustainability transition' is not a new issue in the literature, and it was already at the top in some research niches 10–15 years ago (see, e.g., Markard, Raven & Truffer, 2012).

Nonetheless, questions remain about the green and sustainability aspects of those investments. As ESG ratings apply to business processes and not to products, there is a potential paradox of ESG-virtuous companies that have sustainable processes to produce goods and deliver services that are not necessarily environmentally or socially desirable. This paradox materializes in companies with good ESG ratings that produce socially questionable products, like potentially harmful products (alcohol, tobacco, weapons) or environmentally unsustainable ones (fossil fuels, chemicals, oil, etc.).

ESG is a trending phenomenon that is gaining traction with investors (retail and institutional), hence generating pressure for compliance—or at the very least, adherence—on the part of companies, particularly listed international companies.

There are different forms and shapes in which ESG compliance manifests in different corporate, industry and geographical contexts, sometimes even going under the framework of corporate social responsibility (CSR). Whichever form ESG takes, this article identifies a weak link in the chain of the ESG domain, namely in the aspects relating to “disclosure”. Any ESG rating, ranking or assessment could not ignore, or prescind from, the level, depth, and rate of disclosure: the lower a company discloses, the higher the ESG rating could be.

In addition to potential failures of the ESG mechanism due to disclosure, some elements of the ESG may still appear counterintuitive and raise questions on how a high-polluting company, such as an oil and gas corporation, could score highly in an ESG ranking. The debate about ESG was recently revamped when, in late May 2022, Standards & Poor Global announced that Tesla, an electric vehicle company, would no longer be included in the S&P ESG Index due to unclear performance in the social aspects of ESG. Reportedly,⁵ despite its commitment to greening the planet by promoting the adoption of electric vehicles, Tesla has had mixed results in the ranking due to working conditions in its US-based factory and overall *lack of a low-carbon strategy*.⁶

Specific literature on disclosure in ESG reporting is relatively scarce due to the novelty of the topic and the approach undertaken in this research. Nonetheless, the following paragraphs provide a synopsis of key findings and most relevant literature over the past five years.

⁵ The announcement from S&P 500 of the revision of the ESG Index (Dorn, 2022).

⁶ Such a move triggered a controversial reaction from Tesla’s Chief Executive Officer, who dubbed ESG as a “scam [...] weaponized by phony social justice warriors” (Sorkin et al., 2022).

2. ESG disclosure literature, key findings

The risk inherent in those “disclosure mechanisms” or strategies, with related doubt on the transparency of ESG compliance metrics and indicators, and the asymmetries backing bad practices, calls for a brief survey of main findings in the field, looking at the latest literature on ESG disclosure, particularly its relationship with sustainability performance and enterprise value.

The first is that the best disclosure is related to governance, while the lowest—and predictably so—is associated with environment and the footprint of companies’ behaviour (Tamimi & Sebastianelli, 2021). Enhancing G-compliance (e.g., by increasing gender parity or opening the board of directors to under-represented groups) is easier and faster than working to reduce emissions.

Conversely, most of the volatility in ESG disclosure depends on firm-specific characters (see Yu & Van Luu, 2021), more than on country-specific factors. This is corroborated, to a certain extent, by the results of our analysis when sectoral differentiation is considered. Another valuable example of how non-financial peculiar factors may affect disclosure is the relationship between the length of management’s tenure and the reduced variability of disclosure itself (McBrayer, 2018). Companies have a considerable degree of freedom in their disclosure, leading to low levels of transparency due to low levels of regulation. This leads to a strident comparison between “traditional financial reporting” and “ESG reporting”: the former being highly regulated and “relevant, reliable, comparable” while the latter in a relatively grey area (de Silva Lokuwaduge & De Silva, 2022).

From a different perspective, while a better quality of ESG reporting provides investors with a more accurate image of the company compliance and sustainability, ESG scores seem to be positively correlated with market value and prices (see Eng, Fikru & Vichitsarawong, 2022). Such correlation enhances the economic, environmental and social (EES) sustainability performance thanks to better governance (Alsayegh, Abdul Rahman & Hodayoun, 2020).

The above considerations can be summarized in a single sentence: a higher (voluntary?) level of disclosure, as far as non-financial information is concerned, is beneficial for (a) sustainability performance; (b) shareholders who benefit from enterprise value and cost of capital; (c) responsible

investors, who can rely on more discriminant elements; and (d) the company itself that enhances its reputation (Rezaee & Tuo, 2017).⁷

3. Research questions and methodology

3.1 Defining the scope

Against this backdrop, it is suggested that a more operational interpretation of ESG rankings, ratings, and indicators is provided from the perspective of a retail investor seeking information and data to make better informed investment decisions on the basis of ESG metrics. The approach is to develop a methodology that allows to more adequately discern data underpinning the ESG-related information that companies disclose and possibly distinguish between various ESG ratings and rankings.

The context of the research is hence ingrained in the dynamics of potential retail investors trying to gauge the relevance of the ESG in their investment decision-making process, ultimately trying to discern the weight of ESG as a complement to—or in some instance as a substitute for—financial and market analysis. The research question is whether there are venues to challenge the current ESG investing mechanisms and metrics, by debunking their modelling. The novelty of this contribution lies in the approach to question the suitability of current ESG ratings and rankings that do not sufficiently account for the disclosure rate of companies. The results may also reinforce the call for regulators and policy makers to monitor the evolutions of ESG finance more closely, by reinstating the fundamental principles of investor protection.

Accordingly, the purpose of this contribution is to cross-reference and complement available data and information on emissions declared by companies with their disclosure levels. Amongst the three variables of environment, social engagement and governance, the focus is on environment: this is mainly thanks to greater availability of data for this element of the ESG architecture, and also due to the fact that emissions are more directly related to environmental sustainability. The focus on the specific dimension of environment in the three-pronged ESG mechanism stems from the following factors. First, environment is where more data are available. Second, the environmental dimension may be more challenging for

⁷ Which suggests that something should be done on the way to the strict regulation of ESG reporting.

compliance: governance and social engagement can be more easily addressed through readily actionable measures, such as appointing minorities to the board or launching a social policy campaign.

Comparing and assessing data on emission against the disclosure level allows to build an innovative model to tackle, and potentially lower asymmetry of information while promoting better informed decision making for responsible investment. Hence the development of the GHG Scope-1 Disclosure Adjusted Index (GHG1_{adj}).

For data-analysis purposes, the Bloomberg® ESG solutions was identified as the source of information and data, in consideration of the wide coverage of economic sectors, indicators, and companies.⁸

Table 1 below lists the 20 companies representing five sectors that have been taken into account to carry out the analysis: Automotive, Finance and Banking, Consumer Goods, Technology and Energy. These sectors were identified as representative of products, goods, and services at various levels of technological sophistication. In addition, the selected sectors provide diversity in the sample, allowing to bundle sectors that include manufacturing, research and technological development, level of innovation and distribution. All the sectors are significantly regulated, albeit to varying extent.

All the companies are global players and have considerable size by staff, service, and product provision and market capitalisation. The sample includes traditional incumbents as well as newcomers to the sector, due to technological innovations that are poised to have a societal and/or environmental impact (i.e., broadening participation in the financial sector or promoting the adoption of greener products and services).

The companies selected provide for geographical coverage: all companies are multinational corporations, representing North American, European, and Asian companies. The sample is developed so as to include incumbents that are also transitioning to more environmentally friendly and sustainable development, production, and/or distribution. For instance, under 'Automotive', the sample includes well established companies such as Volkswagen and Ford, but also a company like Toyota which has been on the cutting edge of new technologies like electrical and hybrid vehicles, which the incumbents are increasingly adopting.

⁸ Reportedly, Bloomberg's ESG solutions give investors access to transparent, consistent, comparable data on more than 2,000 ESG fields and scores for over 11,800 global companies.

Table 1. List of selected companies.

Auto- motive	Finance & Banking	Consumer Goods	Technology	Energy
- BMW - Ford - Toyota - Volks- wagen	- Deutsche Bank - J. P. Morgan - PAYPAL - VISA	- Colgate Palmolive - Kraft Heinz - Nestlé - Procter & Gamble	- Amazon - Google - Intel - Microsoft	- Exxon Mobil - PetroChina - Renewable Energy Group Inc. - SunPower

By the same token, under ‘Energy,’ the sample includes extractive industry and fossil-fuel companies of the likes of PetroChina and Exxon Mobil, as well as companies specializing in alternative energy, which the incumbents are also considering to diversify operations.

Under ‘Finance & Banking,’ the sample includes traditional actors who are gradually innovating with financial processes and products, as well as companies that can be considered pioneers in fintech, which focuses on electronic payment systems and electronic financial intermediation.

The ‘Consumer Goods’ sample includes a more coherent and even group of companies that present similar markets, structures, and products.

In terms of the ‘Technology’ sector, the group includes chips manufacturing, technology services, and software development.

Before describing the methodology, a list of key terminology is provided in the box below to give a detailed description of the building blocks and the key terms of the methodology for the development of the GHG-Disclosure Adjusted Index. This taxonomy describes the variables of the model and their interrelation.

Key terminology

ESG

Acronym for environmental, social and governance principles, ESG is a set of non-financial goals that have inspired a new approach towards socio-economic development on the basis of the concept of ‘sustainability,’ also used to assess the ESG performance of organisations (ESG sustainability) and accommodate the sensibility of investors towards environmental issues.

Sustainable investment

Sustainable or responsible investment is a way of investing that is sensitive to ESG criteria and factors, taking into account the environmental, social and governance profiles of borrowing companies.

Greenwashing

Both a communication strategy and a marketing practice aimed at letting a company appear more responsible and environmentally friendly than it really is.

GHG-1

Following the Bloomberg@ ESG, direct greenhouse gas (GHG) emissions of a company are “those gases which contribute to the trapping of heat in the Earth’s atmosphere, including carbon dioxide (CO₂), methane, nitrous oxide, and others. Scope 1 emissions are those emitted from sources that are owned or controlled by the reporting entity.”

Environmental disclosure score

“Proprietary Bloomberg score based on the extent of a company’s environmental disclosure as part of environmental, social and governance (ESG) data [...]. The score ranges from 0.1 for companies that disclose a minimum amount of ESG data to 100 for those that disclose every data point collected by Bloomberg.” (Definition provided by the data provider Bloomberg@ ESG.)

GHG-Disclosure Adjusted Index

GHG1_{adj} index is an inductive indicator of real emissions, built ad hoc on the basis of the methodology described in ch. 3.2 below, combining and cross-referencing disclosure scores with GHG Scope 1 emissions.

Carbon-Backed green products

A new term coined on the basis of this research to emphasize the real nature of some ‘green finance products’ that are still based on carbon emissions and polluting processes, despite their declared ESG-friendliness.

The applied methodology may be described as follows. The analysis consists of two separate steps.

The first step is the core section (see ch. 3.2), where the GHG1_{adj} index is built, on the assumption that the lack of disclosure should suggest that real

emissions are, most probably, higher than those declared. This is the reason why of the weighting process, which assigns companies a higher score the lower their transparency. The results are shown in chapter 4.1 below.

The second step is based on the actual values of GHG1 and disclosure score, on the other hand, without any adjusting/weighting. We focus on the relationship between these two variables per se (ch. 4.2) by company and by sector.⁹

3.2 Building the GHG Scope-1 Disclosure Adjusted Index (GHG1_{adj})

To build our model, we first extrapolated data and information concerning the environmental element of the ESG family, giving preference to the “green” aspects of sustainability. In the segment ‘Environment,’ we took into account the indicators relating to Scope 1 GHG emissions, considered as the emissions related to sources directly owned and/or controlled by the reporting company.¹⁰

The choice to concentrate on Scope 1 GHG was driven by the greater availability of information and data for this indicator, compared to other indicators of the environmental pillar of ESG.

For each of the companies in the sample, we extrapolated data and information for the last five years, from 2017 to 2021. This timeline was considered because of the availability of data for the selected companies.

⁹ The analysis was performed by means of the standard features of a spreadsheet program (Excel@), and its statistical functions. The same does apply to graphs, even if they have been adapted to make them more friendly.

¹⁰ For the purposes of this study, we relied upon the definitions of the Environmental Protection Agency of the US Government (www.epa.gov). Scope 1 emissions are direct greenhouse gas (GHG) emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles). Scope 2 emissions are indirect GHG emissions, associated with the purchase of electricity, steam, heat, or cooling. Although Scope 2 emissions physically occur at the facility where they are generated, they are accounted for in an organization’s GHG inventory because they are a result of the organization’s energy use. Scope 3 emissions are the result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly impacts in its value chain. Scope 3 emissions include all sources not within an organization’s Scope 1 and 2 boundary. Scope 3 emissions for one organization are Scope 1 and 2 emissions of another organization. Scope 3 emissions, also referred to as value chain emissions, often represent the majority of an organization’s total GHG emissions.

Bloomberg’s definition is the following: “Scope 1/Direct Greenhouse Gas (GHG) Emissions of the company, in thousands of metric tonnes of carbon dioxide equivalent (CO₂e). Greenhouse gases are defined as those gases which contribute to the trapping of heat in the Earth’s atmosphere, including carbon dioxide (CO₂), methane, nitrous oxide, and others. Scope 1 emissions are those emitted from sources that are owned or controlled by the reporting entity.”

We then considered, amongst the many indicators available in the Bloomberg® ESG, the environmental disclosure score, which measures the amount of information and data publicly reported by companies.¹¹ The environmental disclosure score does not consider the financial performance of the disclosing company.

Our innovative model gives emphasis to the *environmental disclosure score*, insofar that the disclosure score becomes to some extent the key to interpret the environmental score of companies: hence the definition of $GHG1_{adj}$.

Starting from the five-year (2017–2021) average values of $GHG1$ and Disclosure Scores, the $GHG1_{adj}$ index was developed by standardizing pollution values (the $GHG1$ emissions) by company, and combining them with disclosure scores of the companies themselves, having transformed Bloomberg scores in their complement to unity. This is to have an indicator of the lack of transparency instead.

After that, both standardized $GHG1$ emissions and lack of transparency scores were weighted, giving back for each of the companies involved what we consider an “inductive indicator of real emissions.” We therefore assume that the lack of transparency should suggest that real emissions are, most probably, higher than those declared. Following various rounds of trials, we opted for a weighting of the index so that 60% of the scoring would hinge upon the amounts of GHG emissions declared, while 40% depends on the disclosure score.

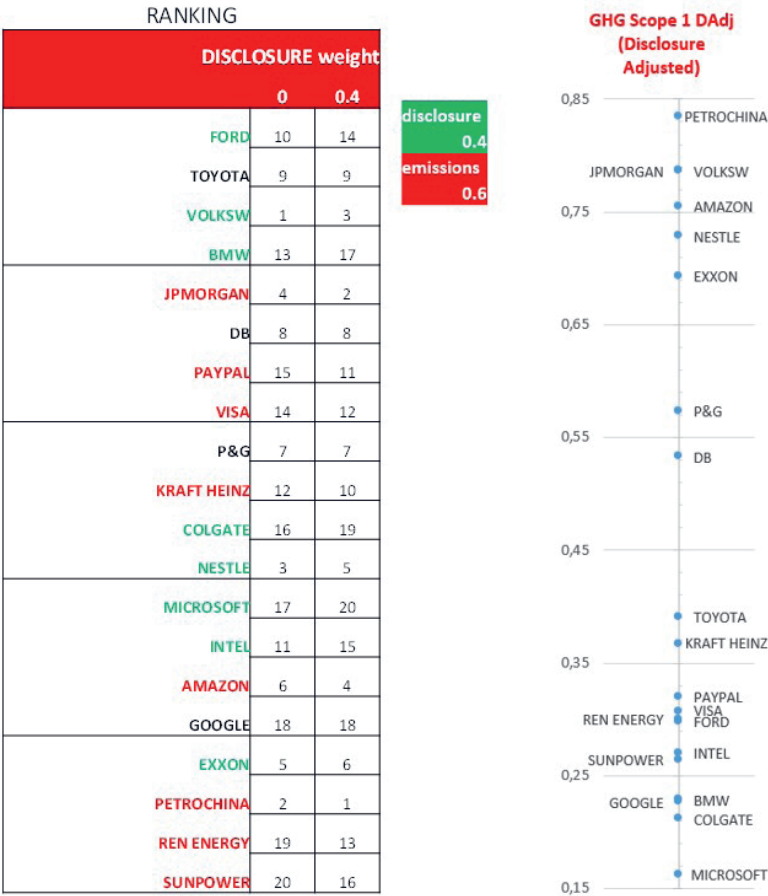
4. Main findings and results

4.1 The $GHG1_{adj}$ scores

The following graphs and figures present the outcome and results of the application of the adjusted index and the related analysis. In particular, the table under Figure 1 shows how the ranking changes by comparing the scenario of zero weight to disclosure with the opted one (weight = 0.4) plotted on the righter side.

¹¹ Namely, according to the data provider: “Proprietary Bloomberg score based on the extent of a company’s environmental disclosure as part of environmental, social and governance (ESG) data.”

Figure 1. Companies’ ranking according to the adjusted index.



The graph depicts companies of the sample distributed according to their $GHG1_{adj}$ index, as mentioned. Despite the fact that the companies are mixed and depicted in the same figure, it provides a clear differentiation between the sectors, with a clear distance between ‘Energy’ and ‘Technology.’

The caveat is to take into account that the levels of emissions have been standardized based on the sector. Even if a comparison of sectors can be made, the graph does not show the difference between the companies’ emission levels, and rather describes the relative effectiveness of control over their emissions.

Adjusting the emission level according to the disclosure creates a distance not only between companies, but also between sectors. Those companies

that might be considered virtuous by taking into account only the emissions levels are somehow penalized by this adjustment process. Giving the disclosure rates significant weight triggers an interesting dynamic: it lowers the position of environmental impact for some companies like BMW, Ford, and Intel, and adjusts to inductive higher ranks for others like PAYPAL, RenEnergy, and Sunpower.

4.2 From virtuous to unaware companies, looking for the best performer

The second part of this empirical analysis changes the perspective by focusing on the relation between GHG1 and the actual values of disclosure (emissions, standardized by sector, *versus* 5-year average disclosure). We did this for individual sectors separately and for the entire sample.

This process allowed us to define and distinguish between four separate areas in the graph (top-left, top-right, bottom-left, and bottom-right), having defined abscissa and ordinates mean values as thresholds. The four areas are presented in Figure 2.

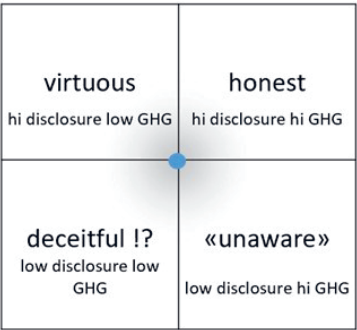
All the graphs and pictures presented below pivot around a shaded reference point that allows to build a quadrant with the four areas, each corresponding to a specific category that the authors branded as ‘virtuous,’ ‘honest,’ ‘unaware’ and ‘maybe deceitful’:

- i) *Virtuous* are those companies that present a low GHG emission combined with high disclosure rates, suggesting lower pollution and a higher degree of reliability of information. In principle, this category should include those companies that are both environmentally friendly and transparent, ideally also being an example to their peers;
- ii) *Honest* is the type of companies portraying high GHG emissions and a high disclosure rate, indicating those that pollute but that are also transparent and open. This type of company may display concerns about environmental compliance, potentially also trying to address the high pollution through processes and mechanisms of green transition that is poised to yield future results;
- iii) *Unaware* is the category grouping companies that feature high emissions together with low disclosure rates. Such a combination makes one wonder what the pollution levels could be if the disclosure was higher, or whether the company discloses only data and information on

pollution without disclosing other sets of information that could improve their ranking; and finally, the

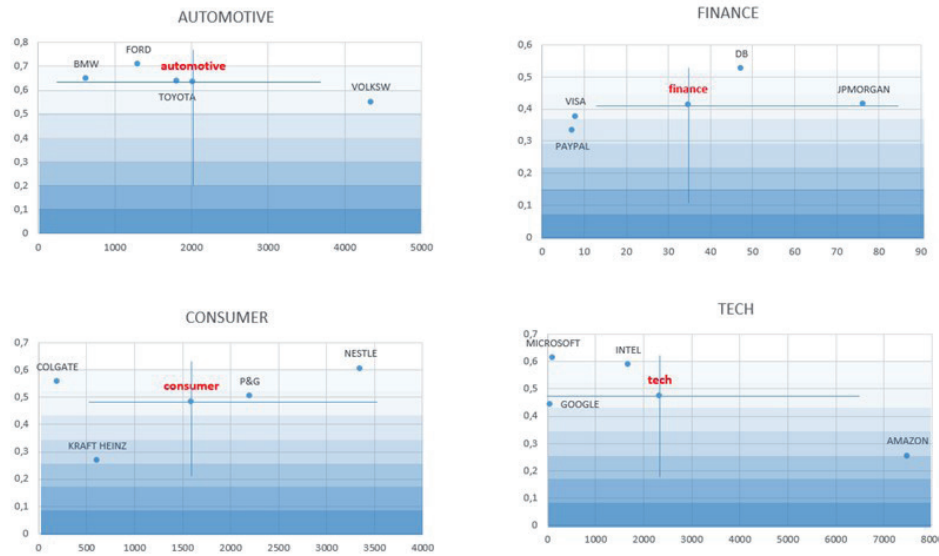
iv) *Maybe deceitful* group that includes those companies that display low emissions and low disclosure. This situation might provide room for a skeptical observer to question whether the low emissions are a function of low disclosure levels.

Figure 2. Four categories and their relative position against the “core” of the index.



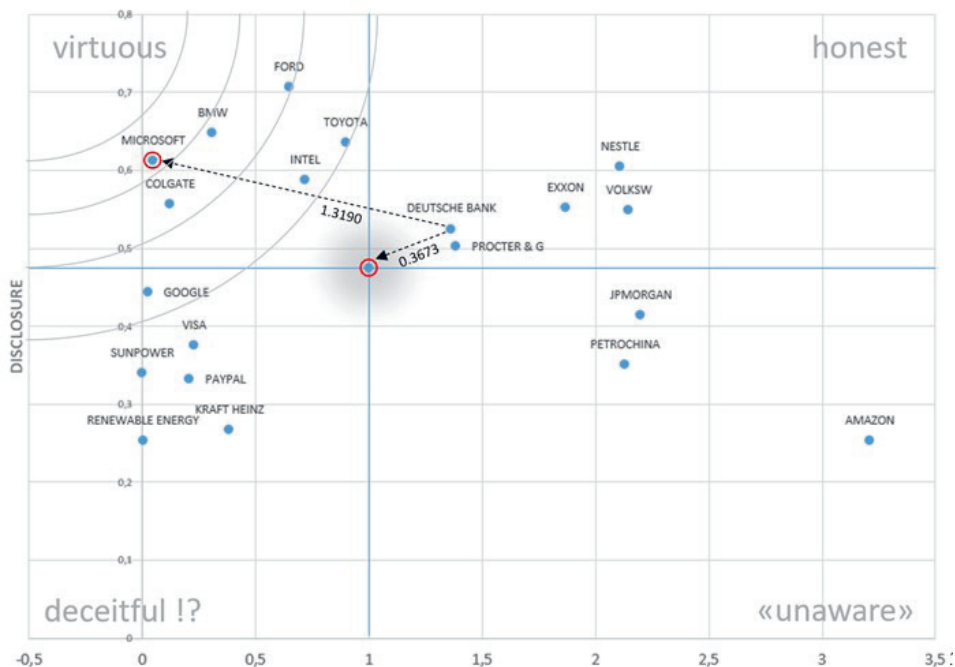
Individual representation for each sector is presented below (Fig. 3).

Figure 3. Map of companies by sector (disclosure on the ordinates and emissions on the abscissae).



On the other hand, plotting of all the companies together without differentiating by sector provides an interesting overview.

Figure 4. Emission levels by sector (standardized) v. 5-year mean disclosure.



The process of standardizing the data only allows comparisons of the companies within the reference sector: there are different physiological levels of pollution between sectors (as described in the section introducing the methodology, the 'Technology' sector is by default less polluting than the 'Energy' sector). Nevertheless, the "clustering" effect of the graph illustrates how companies belonging to different sectors can still be grouped in the same area and position of the graph, despite different emission levels.

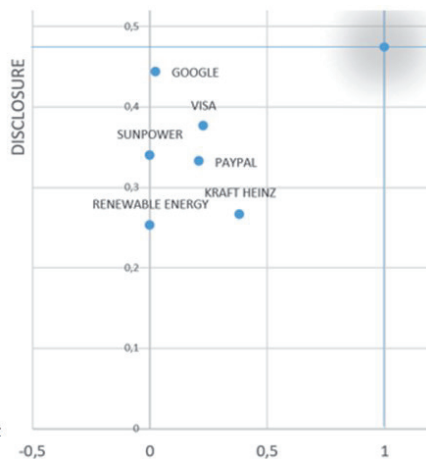
Just as an example, the map in Figure 4 also shows the distance between Deutsche Bank and the "benchmark"/ the best performer. Also, as a next step, Euclidean distances are calculated as follows:

Table 2. Standardized emissions v. disclosure:
five-year means and Euclidean distance.

DISTANCE from	Benchmark	Best
Ford	0.4226	0.6061
Toyota	0.1907	0.8491
Volkswagen	1.1491	2.0998
BMW	0.7112	0.2647
J. P. Morgan	1.2016	2.1613
Deutsche Bank	0.3673	1.3190
PayPal	0.8054	0.3229
Visa	0.7779	0.2982
Procter & Gamble	0.3844	1.3402
Kraft Heinz	0.6500	0.4825
Colgate	0.8808	0.0936
Nestle	1.1167	2.0614
Microsoft	0.9620	0.0000
Intel	0.3034	0.6708
Amazon	2.2217	3.1830
Google	0.9770	0.1707
Exxon	0.8711	1.8208
PetroChina	1.1370	2.0986
Renewable Energy	1.0223	0.3626
SunPower	1.0092	0.2770

The bottom-left area in the graph presented in Figure 5 groups a series of companies whose declared low emissions may be hardly “validated” due to the lack of transparency—a significant one in some instances.

Figure 5. Companies displaying considerable low transparency and GHG1 emissions.



Two additional graphs are presented in the conclusion of this analysis: an exhibit with a series of ellipsoids that incorporate all the companies for each sector (Fig. 6), and an exhibit with ellipsoids that group closer companies by sector (Fig. 7).

Figure 6. Standardized emission levels by sector v. five-year mean disclosure, grouped by sector.

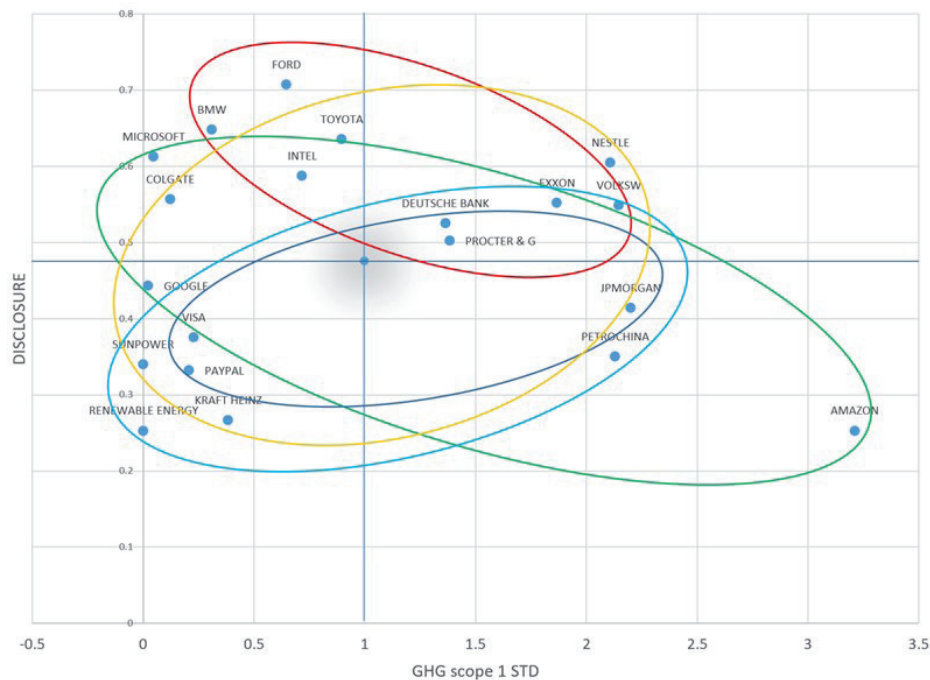
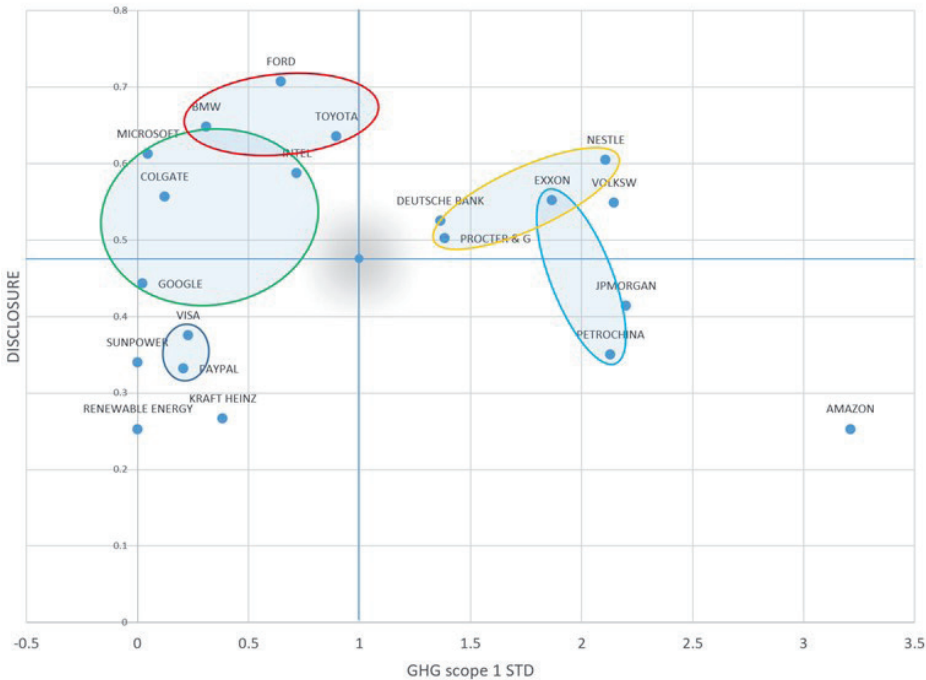


Figure 7. Standardized emission levels by sector v. 5-year mean disclosure, grouped by sector performance.



Here the discounting of the outliers is worth noting: companies appear to cluster by sector, which may suggest that the automotive sector may offer convincing ESG-investment rationale with robust levels of credibility. The technology sector also appears to be well-positioned with levels of emission and credibility that would imply a higher degree of reliability than the companies represented in the group of consumer goods. Overall, the financial sector is the one that seems to be affected by a low level of disclosure.

5. The consequences of low disclosure and ESG vagueness: splitting the domains

The literature review, coupled with the results of the research and analysis of the ESG, lead the way to a series of relevant considerations.

First, ESG metrics and indicators take into account the “process” of any given company, not the “product.” Thus, a company that operates in a highly polluting sector and produces potentially or even clearly harmful products

may still rank high in an ESG rating provided that it scores well on social and governance indicators. This focus on “process” and not on product or impact of the product (i.e., the ultimate social, economic, and environmental impact of using a product or service) may give rise to bizarre interpretations of what ESG is, or should be. The weapons and armament lobby in Europe is now keen on having weapons included in ESG because of their social relevance in supporting Ukraine in its fight against Russian aggression.¹²

Second, ESG is a vaguely defined domain and the lack of a standardized set of indicators and metrics undermines the credibility of the ESG. The absence of universally accepted definitions prevents the mainstreaming of ESG finance, currently left to the initiative of institutional investors and rating agencies that operate in uncharted territory. There is the intrinsic value of leaving the sector define the ESG domains, facets and indicators: such an approach leads to innovation, demand-driven, and market-based results. Nonetheless, the public good of protecting investors and consumers should also lead to regulatory intervention, at the very least to establish the threshold of common sense.

Third, as a consequence, ESG provides ample room for information asymmetry and exotic product development that may potentially damage the industry, the reputation of financial intermediaries as well as undermine sound financial decision making of retail investors and ultimately expose them to unnecessary risks.

Finally, the bundling of different domains into one ranking may undermine the viability of ESG. At its infancy, grouping environment, social, and governance might have been reasonable. When building a model, there is room for experimenting with options. Nonetheless, now that ESG is gaining maturity, the list of indicators is expanding, together with an increase in the awareness of investors—at times lured by the insistence of intermediaries.

In an effort to reinforce the reputation of “responsible finance,” an option could be to diversify the categories. The bundling may alter the rating, making it possible for a polluting company to rank high owing to a diverse composition of its board of directors. The “social value” of producing weapons may not be so evident, and for ESG to be credible, there should be a substantial dose of objectivity. Irrespective of the role of armament to provide defensive systems

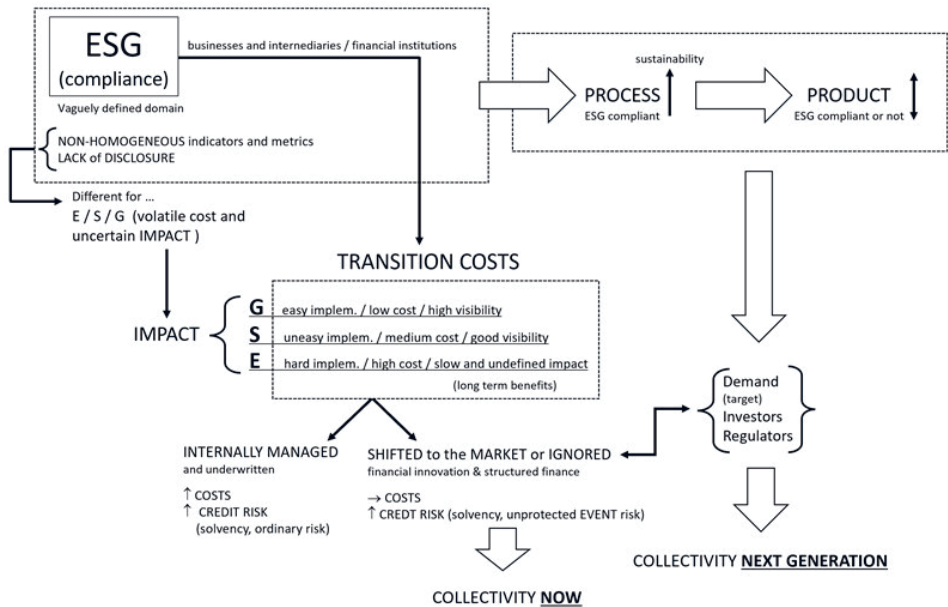
¹² The chief executive of the German Association of Security and Defense Industries (BDSV) explicitly called for the European Commission to “recognize the defense industry as a positive contributor to social sustainability within the ESG taxonomy” (Pladson, 2022; Ainger & Arons, 2022).

and deter hostility, weapons are built to kill people. The contribution of the defense industry to social sustainability might not be so easy to portray. By the same token, oil is extracted to be burned in a highly polluting combustion process.

The rush to ESG may be poised to generate new forms of “transition costs” and “ESG-related risks.” The transition costs are represented by the investments and costs associated with the measures that companies need to take to adopt ESG and comply with ESG ratings. The “ESG-related risks” are those business, financial and operational risks that companies might face due to increased environmental and social pressures emerging from a changing world.

Environment-related costs and risks are inevitably associated with climate change, both mitigation and adaptation to it. Social-related costs and risks relate to civic/social unrest that may affect labor relations, supply chains, and demand for goods and services. Governance-related costs and risks may be associated with the cost of financing (i.e., would it be ESG-compliant for a startup to accept funding from a venture capital fund associated with an unfriendly country) or operations.

Figure 8. ESG-related risks and costs: transferring both to present and future consumers.



This new category of costs and risks associated with ESG will require companies, financial intermediaries, and regulators to identify innovative means for risk identification, management, and supervision. While the costs are likely to be passed on to consumers and investors, the financial and operational risks should find credible mechanisms that sustain robustness of the economy.

Moreover, splitting the three domains could also overcome any possible attempt of altering the final score by tinkering with the indicators and/or elements of the different dimensions. In fact, the building blocks of ESG can be differentiated depending on their inherent cost (of compliance and reporting) and potential impact (of image building and ranking). Figure 8 shows the whole framework of ESG-related risks and costs for both businesses and financial institutions (together with their perspective impact on collectivity), and how difficult/costly the transition for E, S, and G separately can be.

The governance domain may be relatively easy to implement and low-cost to comply with, while generating high returns in terms of the positive impact on the overall ESG rating and visibility for the company. The overall rating of a company could be dramatically and almost instantly positively impacted even by merely cosmetic measures, such as enforcing gender balance in senior management or ensuring diversity in the board.

The social dimension of the ESG could be described as medium-cost to implement and comply with, but still associated with considerable “visibility” benefits and impact on the overall rating. It would suffice for a company to develop a work-life balance program or to define an internal diversity and inclusion policy to have a significant impact on its ESG rating. By the same token, any company can achieve a good rating by launching a volunteering program within the community or financing other socially relevant activities. The medium cost is identified in the need to build units to develop, manage, and operate such programs.

The building block of environment in the ESG finance is likely to be one that may represent a high cost for companies to implement, while generating uncertain impact on visibility and ESG rating. The high cost is associated with the costs directly related to the compliance with environmental sustainability, from retrofitting production facilities and office space to “greening the value chain.” Those interventions would entail considerable investments that would require time to yield benefits in terms of visibility and ranking.

Those features and differentiation between costs and impact of the three domains makes the overall ESG mechanism unbalanced and disproportionate. With relative ease, a company can increase its rating by appointing a representative of a minority to the board while continuing to pollute to produce weapons. Conversely, producing electric vehicles may provide a high score on the environmental dimension of ESG but should not discount the value of robust governance and social responsibility.

Figure 9. Current and target values of IMPACT / IMPLEMENTATION cost ratio.

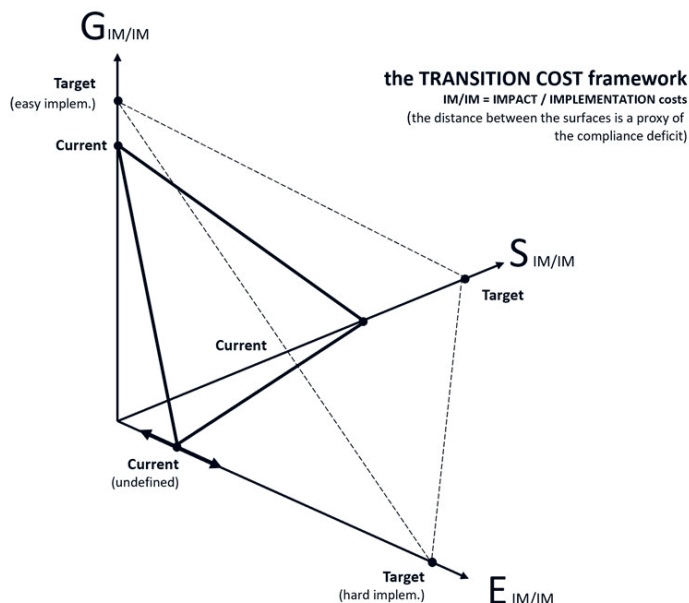


Figure 9 above intuitively depicts the “Impact over Implementation” of the ESG dimensions, providing also a frame of reference and a graphical representation of the “compliance deficit” depending on the domain of the ESG tridimensional matrix (with the varying difficulty of implementation of ESG-related measures to reach the target of full ESG compliance).¹³

As mentioned in the legend to Figure 9, the distance between the surfaces is to be intended as a proxy of the compliance deficit, which can be measured as a distance between A and B centroids (barycenters of the triangles). Assuming that appropriate actions can be taken to fill the deficit on both E and S, according to the red vectors (Fig. 10), such a distance would be minimized, by also rebalancing the deficit on the three dimensions (Fig. 11).

¹³ Figures 9 through 11 are the result of an original interpretive scheme we propose, the Transition Cost Framework, which imagines three metrically independent trajectories along which to ideally measure the effort that needs to be made to be compliant.

Figure 10. Actions to be taken to rebalance ESG deficits.

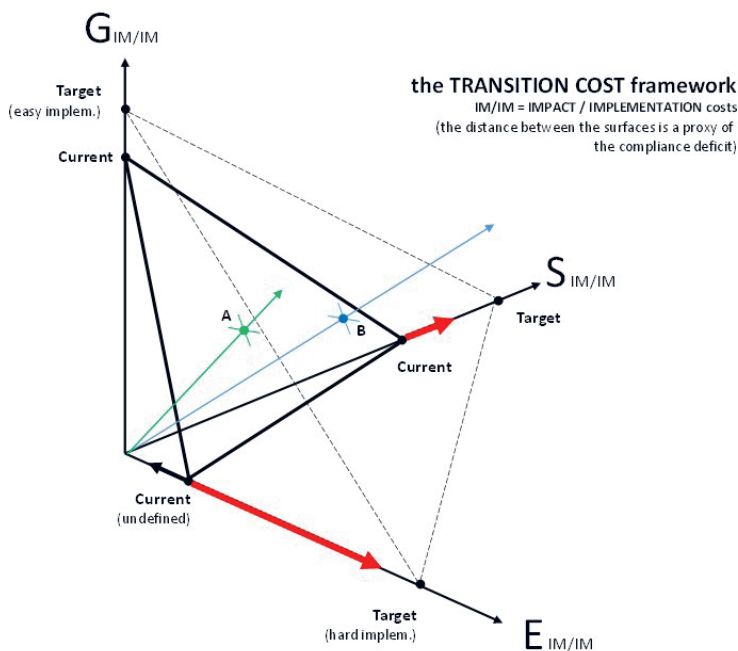
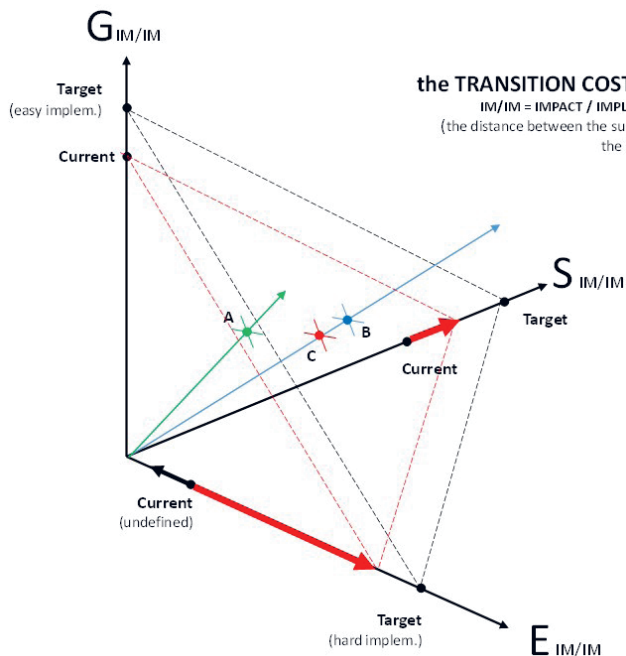


Figure 11. Measuring the global ESG deficit.



Distance B_C does represent the *suboptimal balanced equilibrium* between the three components, whereas $(B_C)/(B_A)$ tells the effectiveness of the strategy adopted to date to balance E, S, and G compliance (in the range 0 to 1).

6. Conclusions

Sustainable finance is a worthwhile development that should be encouraged and promoted. The growing focus on ESG finance is an encouraging sign that companies, investors and intermediaries, as well as consumers, are aiming towards a greener and more sustainable society. The emergence of ESG rankings and ratings is also a welcome part of such societal and economic transformation: these mechanisms can guide investors and steer investment decisions, ideally rewarding virtuous companies, investors, and consumers.

The purpose of this paper was to shed light on some of the shortcomings that may affect the reliability and of some indicators and ratings, also affecting the credibility of ESG finance. Such shortcomings make those ESG ratings and rankings a second-best solution that industry and/or regulators should address soon.

The starting point was the idea to verify whether in the domain of ESG the transition towards a more sustainable economy and responsible investments is materializing without the information asymmetries that caused many distortions during the previous financial crisis. The focus was precisely in gauging whether the traction of ESG investing and ESG finance creates scope for low transparency that could hamper financial intermediation.

The main conclusion is that there may be a generalized information gap along the three dimensions of environment, social and governance. Moreover, concerns relate to the quality of information underpinning ESG, mainly due to two considerations:

- 1) Information available about the disclosure level of companies relates primarily—if not solely—to the environment dimension of ESG, with somehow limited sources that can guarantee reliability of information. The longest time span of reporting is only available for the last five years. Both quantitative and time limitations therefore undermine the quality and reliability of data.

The empirical analysis (step one of this research) demonstrates that accounting for the disclosure level to correct the information alters, in most instances significantly, the ranking of companies. By adjusting the weighting of the disclosure level, the new disclosure-adjusted pollution index GHG Scope-1 D_{Adj} index allows to better understand the ESG positioning of a company. This confirms that there is a serious concern about disclosure that calls for regulatory intervention to facilitate—or even, impose?—reporting on the basis of accepted and homogeneous criteria along the three elements of ESG.

b) Coupled with low disclosure levels, the voluntary nature of disclosure is also a matter of concern. Step two of this article (ch. 4.2) identifies an asymmetry in the domain of ESG: while the categories depicted in the higher level of Figure 2 (the ‘virtuous’ and ‘honest’ groups) do not raise concerns, the positioning in the bottom of Figure 2 may be misleading. The ‘unaware’ with low disclosure and high environmental impact may be disclosing less, but the low disclosure associated with a negative ranking may convince of the reliability of information. The ‘maybe deceitful’ category is characterized by low disclosure and low environmental impact, leading to the interpretation of a “self-serving” low disclosure. Hence the asymmetry between these two classes.

This second step of the analysis also demonstrates how companies operating in seemingly less polluting sectors may have a significant environmental impact (the case in point is Amazon). Moreover, it shows how low disclosure levels undermine the credibility of companies whose mission is to green the planet, again due to the self-serving nature of the disclosure (the case of Sunpower and RenEnergy).

Weighing the relevance of the disclosure index reveals what can be deemed a self-serving mechanism of ESG reporting, in which part of the data and information relating to ESG originates directly from the companies wanting to be ranked. This makes the mechanism vulnerable to inefficiencies and exposes ESG to potential negligence.

Sustainable finance should rely upon trust and confidence secured by built-in mechanisms of transparency and reliability. Pivotal to establishing such trust is the depth and degree of disclosure of data and information in a standardized fashion. The data analysed in building the Disclosure Adjusted Index seem to suggest the self-serving nature of ESG, with disclosure rates at levels not adequate to build trust and confidence.

The pitfall may reside in the effort to accelerate the uptake of ESG finance by shortening the physiologic timing of adoption of and adherence to ESG standards by companies. There seems to be a sort of “operational shortcut” to facilitate compliance of companies with ESG requirements and guidelines.

Such a “rush to ESG” may give room to speculative approaches that could undermine the robustness of ESG finance and give leeway to attempts of “bad finance.” There may be temptation to take advantage of asymmetries of information and develop ESG financial products to lure informed investors into investments that are not necessarily grounded in ESG compliance nor corroborated by robust evidence and data.

This may also raise red flags for a renewed role of regulators and supervisory bodies to monitor more closely the development and adoption of ESG ratings, rankings, and metrics that are driving investment decisions that may be potentially flawed by low—or inaccurate—disclosure rates.

ESG ratings can not be a substitute for robust operational and financial information about companies for informed financial decision making. In addition, the shortcomings stemming from low disclosure should call for a more careful consideration of the ESG rankings and ratings that may not be reliable as the sole source of information for investment decisions. This is even more relevant for retail investors who could be more vulnerable to tinkering with ESG indicators.

There could be a considerable risk for retail investors to embrace the ESG philosophy, and perhaps to dismiss interest towards more profitable, traditional investments, while investing in what we ought to call *carbon-backed green products*, the ESG financial products that are in reality still engrained in not so sustainable assets and investments.

After having stressed how a lack of disclosure can threaten the void of value and undermine ESG statistics, and having attempted to adjust available information and data to obtain a more robust overview of ESG investing, the unforeseeable events of the conflict in Ukraine since February 2022 provided us the opportunity to integrate the outcome of our empirical analysis (and the related considerations) with some provoking thoughts, which are presented in the text box below.

The flames of the conflict stemming from the occupation of Ukraine expose the sore features of some financial products that are branded under ESG. The recent sanctions that have been imposed on Russia highlight (Schwartzkopff, 2022) how the ESG financial domain might be adversely affected by the potential Russian corporate and sovereign default. Allegedly, by the end of February 2022 more than 8 billion US dollars were held by international ESG funds in Russian assets. These positions included not only government bonds, but also holdings in large companies such as Gazprom, Rosneft and Sberbank, which have direct ties with the Kremlin entourage and/or the Russian government.

While these positions and holdings would not sound unusual for traditional investment funds seeking diversification, they may raise questions about the due diligence of Western ESG funds on the three pillars of ESG. Holding Russian assets and positions would have been relatively questionable for a conscious and socially concerned investor even before the aggression in Ukraine. Holdings in Russian state-owned enterprises may have raised questions on all of the three dimensions of ESG:

- 1) Russia's energy companies may not stand out for their transition towards greener technologies and alternative energy, as they are primarily based on fossil fuels and drilling.
- 2) From a social perspective, a skeptical reader might question the correctness of investing in corporate bonds of companies so closely associated with a government often branded as unreliable or even hostile by Western countries. The USA and the EU have always been vocal (at least in political statements) in condemning the 2008 aggression in Georgia, the 2014 annexation of Crimea, and the associated support for the Donetsk and Luhansk separatist movements. All of the above, in addition to the alleged continuous violations of civil liberties and human rights in Russia, the alleged tampering and interference in the elections of other countries (including the US presidential elections), and many other wrongdoings culminated with the invasion of Ukraine in spring 2022.
- 3) From the point of view of governance, any investment in a country that ranks lowest in the Corruption Perceptions Index (2021) of Transparency International (2021)¹⁴ should raise eyebrows even for the less concerned and scrupulous investor.

The above considerations might lead one to think that, in some instances, ESG is becoming a label to make traditional financial products and investments more appealing. In some cases, such an ESG label might be used to entice (less informed?) investors attracted by the idea of adequate financial returns associated with environmental and social accomplishment. Little did retail investors know that their governance conscious and socially responsible investment was instead funding military operations. The lack of donations to NGOs assisting refugees or victim-relief funds might alleviate such a strain for socially conscious investors.

¹⁴ Reportedly, Russia is the lowest rated European country, ranking 136th out of 180 countries.

Maurizio Pompella (BSc, MSc, PhD) is a full professor (*professore ordinario*) of financial intermediaries economics at the School of Economics and Management (SEM), University of Siena, Italy.

He has been a researcher, lecturer, senior lecturer, and associate professor since 1991. His areas of expertise and interest include financial intermediaries economics, banking, finance, insurance economics, fintech and blockchain, structured finance and innovation, ART, banking and monetary economics, ESG finance and sustainability transition.

Pompella has been teaching banking, finance, and insurance at graduate and post-graduate level in Italy, Eastern Europe, Latin America, the Middle East, the Russian Federation, and China.

Lorenzo Costantino has lived and worked in Europe, the USA and CIS (Russia and Central Asia) and has 25 years of international experience; his interest and expertise include competitiveness of small and medium-sized enterprises, innovation and finance.

Costantino is a partner at IDP European Consultants, a consulting company specialized in grant funding and project management, providing advisory and training services on EU funding programmes and financing instruments. At IDP European Consultants, Costantino is responsible for the preparation and management of international projects on a wide range of issues ranging from financial engineering to public policy for innovation and competitiveness.

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