KPIs Reporting and Financial Performance in the Transition to Mandatory Disclosure: The Case of Italy

Salvatore Loprevite [1,*] ![ORCID], **Domenico Raucci** [2] **and Daniela Rupo** [3] ![ORCID]

1   Department of Sciences of the Society and the Mediterranean Area Formation, University "Dante Alighieri" of Reggio Calabria, 89125 Reggio Calabria, RC, Italy
2   Department of Economic Studies, University "G. d'Annunzio" of Chieti-Pescara, 65127 Pescara, PE, Italy; domenico.raucci@unich.it
3   Department of Economics, University of Messina, 98122 Messina, ME, Italy; drupo@unime.it
*   Correspondence: loprevite@unistrada.it; Tel.: +39-0965-165-5160

Abstract: European companies of public interest requested to comply with the Directive 2014/95/EU on Non-Financial Information (NFI) are allowed to fulfil the regulatory obligation following the Global Reporting Initiative (GRI) guidelines, which constitute at present the most widely spread framework for sustainability reporting. Given such prevalence, this paper examines the level of disclosure on Key Performance Indicators (KPIs) and its relationship with financial performance over the period 2016–2018 for Italian-listed companies adopting GRI guidelines to convey NFI under the Decree 254/2016. The research applies content analysis of the annual and sustainability reports to measure the disclosure index on KPIs, and Data Envelopment Analysis (DEA) to estimate the financial performance. A Tobit-regression model explores the nexus between financial performance and companies' disclosure. Findings show a decrease in the disclosure levels in the early adoption of mandatory NFI and a significant association with the financial performance of the sampled companies. The study, assuming a comprehensive view of the financial indicators, improves our knowledge of the relationship between sustainability disclosure and financial performance and adds to the literature on the evolution of NFI in the transition from voluntary to mandatory regime.

1. Introduction

This study investigates the use of Key Performance Indicators (KPIs) in communicating companies' commitment to sustainable development and the relationship between the disclosure level and financial performance in the Italian case. More precisely, we aim to analyze the Global Reporting Initiative (GRI) indicators adopted in Non-Financial Reporting (NFR) following the 254/2016 Legislative Decree, issued to implement the EU Directive (2014/95/EU) on Non-Financial Information (NFI) and verify if there is a significant association between the level of disclosure and the financial performance of companies listed on the Italian Stock Exchange.

The discussion regarding the relationship between financial and non-financial reporting, together with the search for an association between the two respective performance indicators, has existed since the idea of Corporate Social Responsibility (CSR) [1–3] and the early adoption of voluntary reporting have begun to take place in the international debate. Over the last few decades, the general principles on CSR have gradually been assuming concrete shape in the definition of mission, policies and processes by companies [4], although there is a certain resistance from those who claimed the

primacy of profit on all social objectives and the existence of an unavoidable trade-off between the two impacts of economic action [5,6].

In this process, a key role is attributable to the theme of sustainable development [7–9], a revolutionary concept able to shift the focus from economic to ethical issues, contrasting traditional models of growth, given the limited capacity of natural resources to bear the consequences of anthropic activities in the long run, and the introduction of the "triple bottom line" principle in business strategy [10–12].

Considerable research efforts and increasing institutional pressure, which peaked in the definition of the Sustainable Development Goals, set up by the *2030 UN Agenda* [13–15], have been fueling, especially in the last decade, the enforcement of models based on the adoption of an integrated approach [16–19] to both decision-making processes and external reporting, to encompass NFI in management tools and to overcome the limitations of accounting systems in the evaluation of the company's overall performance.

Within this almost boundless area of interest, a recent stream of research has been initiated to investigate the evolution of corporate reporting practices and how NFR is impacting on companies' disclosure, in terms of quantity and quality of information [20–24].

At the crossroad of ideas on the usefulness of NFI for internal and external users and the urgency to assure reliability and comparability of information provided in annual reports and voluntary reports, we state that, according to our interpretation:

- The development of standards for social and sustainability reporting aimed to establish convergence toward the use of a common set of information/indicators by the adopters of corporate social and environmental/sustainable reports [25,26];
- The production of specific legal provisions aimed to extend the content of mandatory reporting to social and environmental impacts of business, with the definition of a minimum level of disclosure for large companies.

In light of the above, the transposition of the EU Directive 2014/95 on NFI [27] by the member states in response to the harmonization principle is steadily impressing a change in mandatory reporting for large companies, who are requested to include relevant NFI in a specific section of their annual report [28–32].As a result of this regulation, we can observe a path of convergence between voluntary and mandatory reporting, for those firms that had already experimented with the adoption of social or sustainability reporting, given that the European Commission has acknowledged some national, EU-based and international frameworks as appropriate for complying with the directive [33–36].

Among guidelines and standards for voluntary reporting aimed to improve the transparency, credibility and comparability of CSR reporting [37,38], Global Reporting Initiative (GRI) guidelines, issued for the preparation of the Sustainability Report (SR) have been given much prevalence in use at the international level [39].

The presence of KPIs built to show the company's economic, social and environmental performance is the main characteristic of GRI guidelines, periodically updated, in the latest version (GRI-S) [40] containing an extensive set of indicators, grouped in distinct categories, referred to as environmental, economic and social aspects.

In confirmation of such prevalence, earlier studies on the first application of the EU Directive on NFI have highlighted that the GRI standards and guidelines have become the widespread standards used for mandatory NFI in different countries, including Italy [30,32,41–43].

The main aim of the study is to explore the potential effects of the mandatory requirement to convey NFI after the transposition of the EU Directive in the Italian context, with reference to companies of public interest already oriented toward sustainability reporting on a voluntary basis before the issue of a specific regulation. Moreover, the research intends to investigate the relationship between the level of Non-Financial Disclosure (NFD) and the financial performance in the investigated companies. In other terms, as regards this nexus, the design of the study is addressed to verify if there is a significant statistical association between the financial results and the level of sustainability disclosure.

The study adds to previous literature on this issue because: (a) it assumes a longitudinal analysis of disclosure in the period of transition (2016–2018, pre and post) the entrance in force of the Decree 254/2016, and (b) it performs multidimensional analysis of the financial ratios, through the elaboration of an aggregate variable of financial performance based on the DEA method.

The results of our research are useful to highlight how companies adopting the GRI framework are being changing their approach to disclosure after the adoption of mandatory NFR. The longitudinal analysis performed documents a decrease of the overall level of disclosure, measured via GRI indicators, that is evident in the first year in which the decree entered into force. Results contribute to research on this field offering useful insights for policy-makers and companies on the effects of law on corporate disclosure behaviors and reporting practices. It helps to better understand how the mandatory regime is impacting on the disclosure of NFI. Moreover, the study also adds to previous literature in that it also explores the nexus between disclosure and financial performance by considering a more comprehensive assessment of the financial performance through the use of DEA.

The remainder of the paper is structured as follows. Section 2 presents the theoretical framework and research questions. Section 3 sets out the research design: sample, data and statistical methods. Section 4 describes the results of the analysis. In Section 5, we discuss findings. Section 6 concludes the paper.

2. Background and Research Questions

Several studies explored various impacts of the sustainable profile of the companies on the different accounting and market-based dimensions of their financial performance [44–47], as well as regarding the country's financial development [48,49].

In research on this relationship, the multidimensional and complex nature of the CSR impacted on the same conceptualization of CSR performance and disclosure. These two aspects are strongly interrelated and often used as synonymous in different constructs, measurements and determinants of the adoption, extension and quality of CSR reporting [50–54]. Moreover, such ambiguity also contributes to increasing the inconclusive results concerning the relationship between CSR practices and financial performance [44,55–57].

Notably, in the research field on CSR performance, many studies have focused on CSR disclosure, investigating its relationship with financial performance under the voluntary approach to reporting. They tested the direction and strength of this relationship, producing contradictory results and different interpretative perspectives, which do not allow us to reach unequivocal conclusions.

Empirical analyses showing a neutral relationship between the extent of CSR disclosure and financial performance explained this result with the existence of many variables that prevent a direct linear relationship between the two dimensions [58–60].

Other results that highlighted a negative relationship identified in the additional costs and financial burdens required by the CSR activities the main deterrent for a greater commitment of companies [61–63]. These factors impact financial performance of firms, namely the main traditional objective of maximizing profit. Furthermore, the additional costs and excessive diversification of the objectives from the CSR perspective can create sources of competitive disadvantage for companies and risks for going concern.

As for the studies that found a positive association between CSR disclosure and financial performance [59,64–66], in light of the stakeholder theory, they firstly interpreted the results of considering all the positive social impacts arising from the satisfaction of the needs of the stakeholders.

Despite contrasting results on these relationships, empirical analysis on the CSR management and disclosure agree on the need to strengthen the adoption of integrated approaches to support the financial analysis of sustainability issues [17,19,67]. In particular, as observed by Romero-Castro & Pineiro-Chousa (2006) [19], integrated models need to recover a systematic application based on the awareness of cause-effect relationships between a series of relevant ratios that reflect the financial, environmental and social performance of the company.

Assuming that the role of sustainability reporting—as a tool for integrated corporate communication—is to support the investors' decision-making, other studies examined the quality of information and the usefulness of Integrated Reporting (IR) [68,69] by assessing the effects of its mandatory adoption on the market value of listed companies [70–81]. IR has defined as a "process founded on integrated thinking that results in a periodic integrated report by an organization about value creation over time and related communications regarding aspects of value creation" [82]. The role of IR has also been examined in-depth regarding its internal usefulness in promoting the adoption of integrated thinking [83–85] and in its relationships with the intellectual capital disclosure [80,86–88].

More recently, research is focusing on disclosure of KPIs in the annual reports of listed companies—representing the typical firms asked to comply with the EU Directive—and to investigate the nexus between the adoption of financial and non-financial indicators by companies that fulfil the regulatory obligation through the adoption of GRI guidelines [30–32,89–92].

Prior research on GRI-based reports, also in other international contexts, has tried to synthesize the level of voluntary disclosure by a content index (sometimes named 'compliance index'), testing for significance its relationship with some financial ratios. Most studies verified such a relationship considering the association of each selected financial ratio (leverage, ROI, ROA), and using some variables for size and sector to test if, as generally argued, the scale and type of activity tend to increase the level of firm's disclosure [65,93–100].

Restricting our analysis to empirical studies contemplating the transition of firms toward the mandatory regime on non-financial disclosure in Europe, it emerged that the regulation positively affects the level of NFI in compliance with the legal requirements [29,30,41]. In contrast, a general decrease of the disclosure index (DI) is found for companies already adopting GRI guidelines voluntarily after the Directive entered in force [42,43,101]. As for the relationship between DI and traditional financial indicators, previous studies provide diverging results [28,30,41]. In particular, in this latter perspective, early contributions seem to confirm the same controversial relationships between the broader CSR disclosure and the financial performance above mentioned. Hategan et al. (2018) [28], using logistics regressions to investigate on Romanian companies, find that companies with a higher commitment to CSR activities are more profitable. Mion & Louza Adaui (2019) [41], applying a qualitative content analysis on sustainability report of Italian and German listed companies, explore the determinants of the quality of NFI one year before (2016) and one year after (2017) the implementation of the Directive 2014/95/EU. Their findings reveal that the quality of information increased in both cases as a consequence of the mandatory requirement, which also seems to reduce differences in quality disclosure in the two countries. Instead, the study did not find a significant relationship between the determinants of NFD and profitability (measured only by ROA).

In the frame of this stream of research our study intends to focus attention, in the specific context of Italian nonfinancial listed companies, on the observable trend in the level of disclosure assuming a longitudinal perspective–*pre* (2016) and *post* (2017–2018) implementation of the EU Directive in Italy through the Decree 254/2016, and on the relationship between financial ratios and the level of sustainability disclosure. As regards the approaches to estimate the level of disclosure, we assume a quantitative index, similarly to most studies on this subject.

It is worth highlighting that in the literature there is a wide debate on the concepts of quality and quantity of non-financial disclosure. Some scholars identify quantity as a proxy of quality [102]; others do not clearly differentiate between quality and quantitative aspects of information [103]; finally, some researchers consider quality as a multidimensional concept [104,105], which cannot be analyzed only through the quantity of disclosed information [106]. Under another research lens, the quality and the intensity of disclosure are considered to have not negligible relationships with financial and sustainability performance, which can have an influence on sustainability disclosure [57]. From the various positions in the scientific debate, the complexity of the theme emerges, which highlights how variations in DI are not necessarily linked to variations of the same direction in the qualitative level of information. Moreover, the quantity and quality of information are to be attributed to different

significance whether sustainability reporting is voluntary or mandatory-based. In line with such a position, we adopt a quantitative approach to measure through a DI the level of sustainability disclosure, as it assures higher objectivity to the analysis. Hence, similarly to other recent contributions on the evolution of disclosure under the mandatory adoption of NFI [24,41,106,107], our study fits more directly into the field of research that investigates the quantitative aspects of the NFR. Nonetheless, the quantitative measurement constitutes the premise for further considerations on the assessment of the quality of information in a broader perspective.

As regards financial performance, previous studies investigated the relationship mentioned above through the disaggregated use of significant financial ratios (i.e., ROA, Leverage, etc.). Adopting a different research lens, we consider it useful to select and analyze some financial ratios through the Data Envelopment Analysis (DEA), a research method able to combine the various indicators systemically, under the input/output logic of economic efficiency. The choice is motivated by the consideration that DEA enables us to overcome some disadvantages of traditional approaches (use of single financial ratios, multicriteria evaluation of variance, statistical-econometric methods) since it allows us to measure together and aggregate various factors impacting on economic efficiency [108]. In other words, DEA is coherent with the assumption that financial results are all embedded in the overall performance, and they deserve to be examined in a multidimensional view. For this reason, DEA was already intensively used for the evaluation of the companies economic efficiency [108–111], while there is still a shortage of studies applying this method to analyze the relationship between financial performance and disclosure index built on GRI indicators. Our research intends to fill this literature gap in order to support a more comprehensive assessment of financial performance in its relationship with sustainability disclosure.

To address the research aim, this study intends to answer the following research questions, with reference to the Italian context and more specifically to listed companies already adopting a GRI framework before the mandatory requirement of the 255/2016 Decree:

- RQ1—How has the transition to the mandatory regime of NFI impacted the level of disclosure of KPIs?
- RQ2—Is there a significant association between the level of disclosure and financial performance of the firms?

3. Methods and Data

3.1. Sample

The study is based on a longitudinal analysis [112] which covers the period 2016–2018. We refer to Italian listed companies continuously adopting the GRI Guidelines for sustainability reporting over the three years and operating in non-financial sectors. We exclude financial firms because they differ significantly in the structure of the financial statements as for the types of indicators (and their meaning) used to evaluate the performance [113]. Consistent with that, Table 1 describes the sample selection. This process selects 44 companies, with 132 company/year observations.

3.2. Variables of the Statistical Analyses and Data Sources

The statistical models used for the analysis involve many variables. We provide the details on these models in the next section.

Here, we present the list of all the variables and data sources, and explain the calculation process for the variables that are a result of our elaboration.

The variables used are the following:

(a) Overall Disclosure Index (DI);
(b) Scores obtained from DEA applied to financial ratios;
(c) Size and business sector of companies.

Table 1. Sample selection process.

A	Companies included in the FTSE Italia All-Share index (December 2019)	242	
B	Companies not listed throughout the three years period	−18	
C	Companies adopting a reporting standard different from GRI in at least one of the three years under consideration	−165	
D	Listed Companies adopting GRI guidelines over the period 2016/2018 (A-B-C)	**59**	
			% of D
E	Financial companies	−9	15.25%
D	Companies declaring to adopt the GRI Guidelines but whose report shows a partial application of the standard or lacks in GRI Index	−3	5.08%
G	Companies with data not available for all variables	−3	5.08%
H	**Total Sample Size**	**44**	**74.58%**

(a) Overall Disclosure Index

Many researchers used a disclosure index to study and analyze the CSR reporting. This index is also applied to studies examining the sustainability reports based on GRI guidelines, in which the KPIs play a central role in economic, social and environmental corporate communication [17,67,114]. As clarified in previous analyses, the indicators are deemed useful to transform some qualitative information into quantitative measures [25,41,96,115]. For these characteristics, the KPIs are a synthetic, structured and comparable tool to analyze the companies' reporting practices and the level of sustainability disclosure [42,116].

In a similar vein, this study adopts a Disclosure Index (DI), which refers to indicators required by GRI Guidelines, distinguishing between G4 and GRI Standard (GRI-S) versions (see Table 2).

Table 2. Categories of Indicators in Global Reporting Initiative (GRI) Guidelines version.

Categories of GRI Indicators	Number of Indicators	
	G4	GRI-S
1 • Economic (EC)	9	13
2 • Environmental (EN)	34	30
• Social		
3 - *Sub-Category: Labor Practices and Decent Work (LA)*	16	21
4 - *Sub-Category: Human Rights (HR)*	12	11
5 - *Sub-Category: Society (SO)*	11	6
6 - *Sub-Category: Product Responsibility (PR)*	9	7
Total	**91**	**88**

We calculate the *disclosure indexes* "*di*" referred to each category of SPIs and, based on these, the *Overall Disclosure Index* "*DI*", as respectively shown in Formulas (1) and (2).

$$di = \frac{1}{n} * \sum_{b=1}^{n} iu_b \tag{1}$$

$$DI = \frac{1}{6} * \sum_{c=1}^{6} di_c \tag{2}$$

where:

"*b*" = indicators (for each the category);
"*n*" = number of indicators (for each category);
"*iu*" = 1 if the company uses the indicator in the report (0 otherwise);
"*c*" = category of indicators.

Data on the use of KPIs were collected from sustainability reports published by the companies. For this, we used a content analysis [117,118] performed manually by each member of the research team. The inconsistencies in results were verified and solved at the end of the process.

(b)　Scores obtained from DEA applied to financial ratios

Differently from other studies on the *value relevance* of information [75,77,78,119–122], our research does not intend to examine the usefulness of NFI for investors. For this aim, as is known, the field of research on the *value relevance* aims to verify the existence, referring to different periods, of a positive association between accounting information or NFI and some market measures (i.e., Market Value, Tobin's q). If this association exists—under the condition that the capital market is efficient and adequately reflects the value of the company—it is possible to assume that investors use the information as a basis for their investment decisions (that is to say information is *value relevant*). On the contrary, we aim to verify whether the levels of financial performance influence the sustainability disclosure. For this aim, we do not use measures of the company's market value, but we refer to accounting indicators used to express financial performance. This approach is also in line with previous studies, which advocate that sustainability disclosure is more likely to have a strong correlation with accounting results than with investors returns [54,123,124].

As we explained in the introduction, previous studies on the relationship between sustainability disclosure and financial performance levels mainly use financial ratios suitable to catch specific aspects of the financial performance (profitability, solvency, liquidity, etc.). This solution does not allow you to get a complete view of financial performance by simultaneously taking into account the different factors that express it. We find it reductive to use single financial ratios as explanatory variables in the regression model, since it does not allow the necessary multidimensional analysis of the financial performance. For example, it is difficult to comment on the explanatory capacity of leverage, if not associated with the other aspects related to the capital structure of the business entity. Similarly, it is limited to comment on the explanatory capacity of ROA without considering the other aspects of profitability and economic efficiency of the firm.

Among the available statistical methods available to summarize the different aspects of financial performance, in this study, we apply DEA, deemed suitable to support a systematic approach of analysis on financial ratios, in view of the further investigation on their relation with disclosure. DEA overcomes limitations of the use of specific financial ratios, which is not available for identifying the simultaneous presence of several factors [108]. Compared to other econometric methods that are suitable for this purpose, DEA has among others the following advantages:

- It does not require respect for numerous assumptions on the distribution of variables and their relationships, as well as on the homogeneity of the variance/covariance matrices among the various groups surveyed [125,126];
- It reduces the subjectivity of using output measurements in relation to input [108], because one does not need to assume a priori the existence of a particular production function for weighting and aggregating inputs or outputs [127];
- It is an effective tool for evaluating the relative efficiency of DMUs in the presence of multiple performance measures [127]. This aspect, like the previous ones, is relevant in our case because the variables that we use to summarize the levels of financial performance, even if all ratios, express different aspects of the multidimensional financial performance.

For these characteristics, DEA was progressively applied for measuring efficiency in a perspective of comparison between different sample units [108–111]. In fact, it is a method which enables comparisons where units (Decision Making Unit-DMU) use multiple incommensurate resources (inputs) to deliver multiple incommensurate outcomes (outputs), to yield a single measure of overall performance. The efficiency of each DMU is measured with regard to the empirical efficient frontier (that is the frontier built on the data observed in the sample). The evaluation score obtained by each

DMU expresses its performance with respect to the best performance (Score of efficiency frontier = 1) observed in the sample. Since the original formulations were applied to the measurements of productive efficiency [128,129], this non-parametric method has been applied in many areas. It also helped the evaluation of the financial performance through financial ratios [99,118,119], and even the evaluation of corporate bankruptcy [125,126,130–132].

For this analysis, using a non-oriented model Slack-Based Measure of Efficiency (SBM) [133], we obtain two synthetic financial performance scores used as independent variables in the regression model (see next section). SBM models base the efficiency assessments on the measurement and evaluation of the slacks, attributing an efficiency score that is based on the sum of the input and output slacks. Compared to the additive models, of which they constitute an evolution, the SBM non-oriented models have the advantage of not requiring justification for the chosen orientation (to inputs or outputs) [134,135]. Another advantage of SBM models, which we consider useful to outline even if it is not material in our case, is that the results of the analysis are independent of the different units of measurement in which the model variables could be expressed. If DEA is applied to indices calculated both as financial ratios and margins, this is a relevant strength of the SBM models.

For data processing, we use the open-source software "OSDEA", selecting two sets of input/output variables to express the different dimensions of financial performance in two correspondent synthetic scores. Each set includes 4 financial ratios (2 outputs and 2 inputs) and provides a DEA score (see Table 3):

- The first is obtained from financial ratios related to the capital structure (Interest coverage ratio, Leverage ratio and Debt to Ebitda Ratio) and to liquidity (Current ratio). In the regression model this score is named "Pfin";
- The latter is obtained from financial ratios suitable to summarize the profitability and economic efficiency of the firm. In the regression model, this score is named "Pec".

Table 3. Output and input of Data Envelopment Analysis (DEA).

	Indicator	Formula	Type
Pfin	Current Ratio	Current Assets/Current Liabilities	Output
	Interest Coverage Ratio	Ebit/Interest Expense	Output
	Leverage Ratio (Debt Ratio)	Total Debt/Total Assets	Input
	Debt to Ebitda Ratio	Total Debt/Ebitda	Input
	Indicator	**Formula**	**Type**
Pec	Return on Assets (ROA)	Ebit/Total Assets	Output
	Return on Equity (ROE)	Net Income/Equity	Output
	Operating Ratio	Operating Expenses/Revenues	Input
	Ebit to Net Income Ratio	Ebit/Net Income	Input

The two scores are adopted as proxies for the overall firm's financial performance.

As regards the financial indicators, among the many potentially usable, we chose the most significant ones based on their specific informative function for catching the main aspects of financial performance.

For "Pfin" we use "Current ratio", which expresses the ability of the companies to pay its short-term debts (liquidity). To this indicator, we add "Leverage ratio" to consider the extent to which a company has depended upon borrowing to finance its operations, and "Interest Coverage Ratio" to take into account how the company can handle its interest payments. Finally, we apply "Debt to Ebitda Ratio", which measures a company's ability to pay off its incurred debt. Thus, by these four

ratios, we envelop the variables most directly related to the financial position, which are useful for expressing the Liquidity, Leverage, Solvency and Financial Structure of the companies.

For "Pec" we use ROA and ROE, which are the main ratios of profitability measure a company's capacity to generate income relative to revenue, operating costs and balance sheet assets. Moreover, we apply the "Operating Ratio" as a measure of the efficiency that shows the company's ability to keeping costs low in relation to revenue. Finally, we use "Ebit to Net Income Ratio" to consider the incidence of Non-Operating Expenses on Net Income. Then, we envelop, by these four ratios, the variables most directly related to the company's Profitability and Efficiency.

The choice of input and output variables for DEA is motivated by the operating logic of this method. As is well known, in constructing the efficiency frontiers, the variables of the model must be selected as follows:

- *output variables*. Financial ratios whose increase expresses a higher performance level;
- *input variables*. Financial ratios whose reduction expresses a higher performance level.

Accounting data useful to run the financial ratios were collected from the "Thomson Reuters Datastream Database", as shown in Table 4.

Table 4. Items used to calculate financial ratios and data source.

Values from Balance Sheet	Id Code Datastream	Values from Income Statement	Id Code Datastream
Current Assets	WC02201	Revenues	WC01001
Total Assets	WC02999	Operating expenses	WC01249
Current Liabilities	WC03101	Interest Expense	WC01075
Total Debt	WC03255	Ebitda	WC18198
Equity	WC03501	Ebit	WC18191
		Net Income	WC01706

(c)　Size and business sector of companies

As stated above, the size of the business and the type of sector (sensitive, non-sensitive) have been widely used in literature as explanatory variables in the regression models applied to the study of sustainability disclosure. In our regression model, we consider these two characteristics as control variables.

Different variables express the size of the company: total assets, revenues, equity, number of employees, etc. In many studies on the value relevance of accounting information [77,136,137], the variable adopted is total assets, frequently used also in studies strictly related to sustainability disclosure [138–140]. In our analysis, we adopt the natural logarithm of "total assets" (id code datastream WC02999, Table 4) as a proxy of size.

As regards the business sector, several studies highlighted that the company's affiliation within the "sensitive" sectors (with high socio-environmental impact) is a variable capable of influencing CSR disclosure [52,74,104,105].

More specifically, it emerged that these companies tend to disclose a higher number and type of GRI indicators than companies operating in "non-sensitive" sectors [95,96,101,141]. In our analysis, we use a dummy variable to distinguish "sensitive" companies from "non-sensitive" ones (Table 5).

Table 5. Sensitive and non-sensitive sectors.

Sector (According to Industry Classification on the Italian Stock Exchange)	Coding		Dummy Variable
Industrial	(IND)	Sensitive	1
Utilities	(UTL)	Sensitive	1
Basic Materials	(BM)	Sensitive	1
Oil and Gas	(OG)	Sensitive	1
Consumer Services	(CS)	Non-sensitive	0
Consumer Goods	(CG)	Non-sensitive	0
Health Care	(HC)	Non-sensitive	0
Technology	(TEC)	Non-sensitive	0
Telecommunications	(TEL)	Non-sensitive	0

3.3. Statistical Methods

In order to answer the research questions, the research adopts various statistical methods.

For RQ1, we use descriptive statistics tools to examine the evolution of sustainability disclosure—for "D.I." (overall) and "di" (each category of KPIs)—in the transition from voluntary (2016) to mandatory adoption (2017–2018).

For RQ2, in order to investigate if any association exists between "*DI*" (dependent variable) and the explanatory variables (ad discussed in the previous section), a regression model is used.

Taking into account nature "Panel" of data, which refer to 44 companies observed over the three years (2016–2018), and the characteristics of the variable *DI*, that is within range 0–1, we choose a *Panel Data Tobit Model* [142,143] with left-censored dependent variable and random effects.

The *Panel Data Tobit Model* with random effects is defined by the Formula (3)

$$y_{it}^* = \beta' x_{it} + v_{it} + \varepsilon_{it} \tag{3}$$

where:

v_i represents random effects

$$v_i \sim NID\left(0, \sigma_v^2\right) ; \ \varepsilon_{it} \sim NID\left(0, \sigma_\varepsilon^2\right)$$

and the dependent variable is

$$y_{it} = \begin{cases} y_{it}^* \ if \ y_{it}^* > 0 \\ 0 \ otherwise \end{cases}$$

Therefore, in this analysis the Formula (3) assumes the following functional form:

$$DI_{it} = \alpha_{it} + \beta_1 Pfin_{it} + \beta_2 Pec_{it} + \beta_3 Size_{it} + \beta_4 Sector_{it} + u_{it} \tag{4}$$

where:

$t = 1, \ldots, 3$;

$i = 1, \ldots, 44$;

$u_{it} = v_{it} + \varepsilon_{it}$. With reference to u_{it}, we highlight that, theoretically, it could be correlated over time. However, in our model it is divided in a random effect invariant over time (v_{it}) and a random error variable over time (ε_{it});

y is left-censored, so $y_{it} \leq y_{it}^*$ for values of the variable $DI \leq 0.2$ and the correct estimates of the model are obtained by the Maximum Likelihood Estimation (MLE) method.

4. Results

4.1. Research Questions 1

For RQ1, as already mentioned, we use descriptive statistics tools.
Table 6 shows the correlation matrix for each variable and year of the analysis.

Table 6. Correlation matrix per year.

	2016				
	DI	*Pfin*	*Pec*	*Size*	*Sector*
DI	1				
Pfin	−0.35205	1			
Pec	−0.02449	0.490348	1		
Size	0.490838	−0.22749	0.056131	1	
Sector	0.149851	−0.06646	0.012986	0.33471	1
	2017				
	DI	*Pfin*	*Pec*	*Size*	*Sector*
DI	1				
Pfin	−0.14406	1			
Pec	−0.01069	0.62785	1		
Size	0.558431	−0.11489	0.172165	1	
Sector	−0.02061	−0.10119	0.087151	0.335798	1
	2018				
	DI	*Pfin*	*Pec*	*Size*	*Sector*
DI	1				
Pfin	−0.20149	1			
Pec	−0.00283	0.563111	1		
Size	0.498535	−0.35141	−0.12842	1	
Sector	−0.0556	−0.29611	−0.27865	0.337904	1

Table 7 shows mean, median, first quartile and third quartile of the frequency distributions of "DI" and "di".

Table 7. Disclosure indexes "DI" and "di": summary statistics.

Disclosure Indexes	2016				2017				2018			
	1st Quartile	Median	3rd Quartile	Mean	1st Quartile	Median	3rd Quartile	Mean	1st Quartile	Median	3rd Quartile	Mean
Overall (DI)	0.282	0.406	0.595	0.456	0.234	0.302	0.489	0.393	0.264	0.334	0.445	0.407
EC	0.288	0.444	0.714	0.506	0.231	0.385	0.635	0.432	0.231	0.385	0.692	0.437
EN	0.265	0.423	0.529	0.448	0.235	0.333	0.468	0.398	0.233	0.350	0.500	0.407
LA	0.375	0.500	0.688	0.540	0.286	0.375	0.619	0.418	0.286	0.381	0.619	0.461
HR	0.000	0.216	0.511	0.324	0.083	0.182	0.426	0.298	0.091	0.182	0.386	0.300
SO	0.273	0.455	0.659	0.462	0.182	0.364	0.534	0.406	0.167	0.333	0.542	0.424
PR	0.194	0.437	0.694	0.456	0.143	0.333	0.560	0.404	0.143	0.429	0.571	0.412

Results highlight a low value for all the disclosure indexes. They confirm findings of similar recent studies led on the same topic by other scholars [60,144] on the European context. Indeed, the Overall Disclosure Index presents a mean value 0.456 for the year 2016, in line with the results obtained for the previous year (2015) by Venturelli et al. [144] on a more extensive sample including financial firms and non-sensitive sectors operating in Italy.

However, the perspective here adopted allows us to examine the evolution of the phenomenon over time. Moreover, our study observes the transition from the last period of voluntary (2016) to the

early years (2017 and 2018) of the mandatory regime in Italy. This longitudinal analysis allows for consideration of the possible influence of the mandatory regime on indicators' disclosure.

Figure 1 graphically displays the trend of the statistics measures in Table 7 over the three years under investigation.
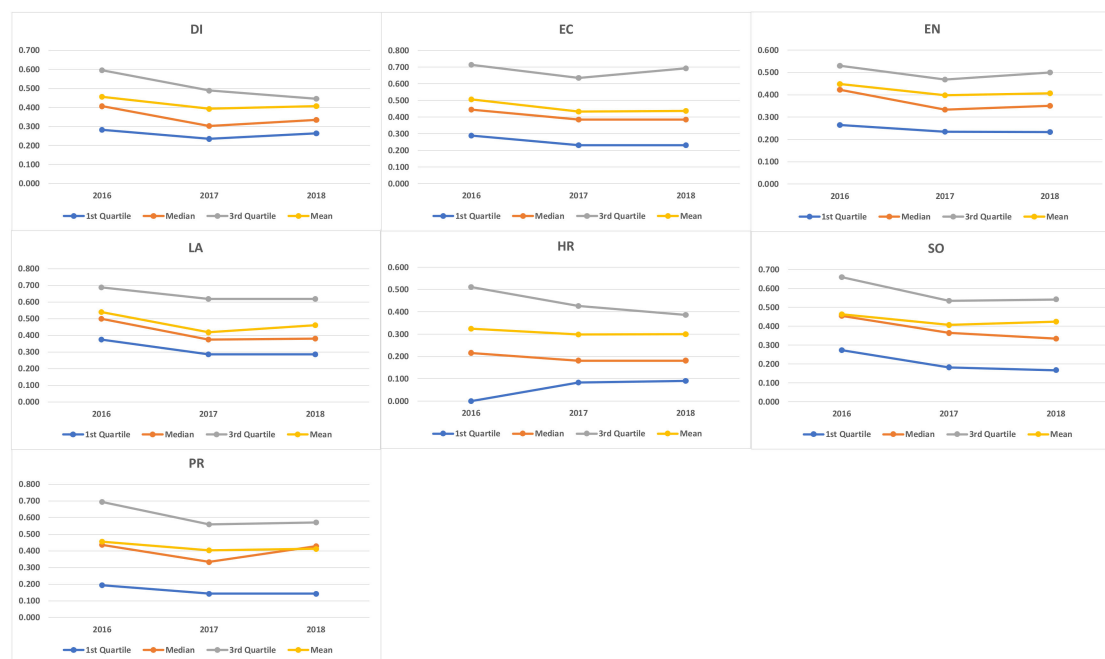

Figure 1. Trend analysis of disclosure indexes.

Two clear trends emerge.

The first trend is that all observed statistical values, with the only exception of the first quartile referred to "di" for Human Rights (HR), show variously significant reductions from the last financial year of voluntary reporting (2016) to the early year (2017) of the mandatory regime.

As can be seen from Table 8, the nonparametric tests used confirm that both variables ("Pfin" and "Pec") for the two reference years (2016 and 2017) were extracted from populations having the same median. In order to confirm the test result of the medians, we run the Mann-Whitney test, which takes its cue from the Wilcoxon test and fully uses the information of the ranks. Furthermore, considering that these two tests allow comparing two sets of data by intercepting only the differences in the location rather than in the form of the two distributions, the Kolmogorov-Smirnov test was also used to verify the shape of the sample distributions. Even this last test confirms that the null hypothesis (H0) cannot be rejected. Therefore, there is no discrepancy between the two sample distributions. In conclusion, it is possible to affirm that, for the "Pfin" variable, as well as for the "Pec" variable there are no differences between the years 2016 and 2017 due to central tendency, dispersion, symmetry and, to a certain extent, kurtosis.

The second trend which lies ahead is that the disclosure indexes—with a few exceptions—tend to stabilize in 2018 compared to the previous year.

We will comment on these empirical findings in the next section dedicated to discussion and conclusion.

Table 8. Nonparametric tests on the distributions of "Pfin" and "Pec" (significance level of 0.05).

Median Test		
- H0: Me1 = Me2 (The two groups of observations belong to two populations with the same median)		
	Pearson chi2	*p*-value
"Pfin"	0.7273	0.394
"Pec"	0.0455	0.831
Wilcoxon-Mann-Whitney Test		
- H0: Me1 = Me2 (the two groups of observations belong to two populations with the same median)		
	Test z	Prob > |z|
"Pfin"	1.161	0.2458
"Pec"	−0.067	0.9466
Kolmogorov-Smirnov Test		
- H0: The two samples follow the same distribution		
	D	*p*-value
"Pfin"	0.091	0.961
"Pec"	0.182	0.423

4.2. Research Questions 2

As clarified in Section 3.3, for RQ2 we use a Panel Data Tobit Model with left-censored dependent variable and random effects. The results of our regression model are shown in Table 9.

Table 9. Panel Data Tobit Model results.

Random-Effects Tobit Regression Group Variable: Company Random Effects u_i~Gaussian					Number of Obs. = 132 Number of Groups = 44	
Integration Method: Mvaghermite					Integration Pts. = 12	
Log Likelihood = 12.332014					Wald chi2 (4) = 31.74 Prob > chi2 = 0.0000	
DI	**Coef.**	**Std. Err.**	**z**	**P > |z|**	**[95% Conf. Interval]**	
Pfin	0.1348	0.0254	5.30	0.000	0.0849	0.1846
Pec	−0.1385	0.0599	−2.31	0.021	−0.2560	−0.0209
Size	0.1482	0.0266	5.56	0.000	0.0959	0.2004
Sector	−0.0568	0.0401	−1.42	0.156	−0.1355	0.0217
Cons	−0.4890	0.1712	−2.86	0.004	−0.8246	−0.1535
/sigma_u	0.0863	0.0260	3.31	0.001	0.0352	0.1374
/sigma_e	0.1823	0.0145	12.51	0.000	0.1537	0.2108
rho	0.1832	0.1018		0.048	0.4401	
LR test of sigma u = 0: chibar2 (01) = 3.67				Prob ≥ chibar2 = 0.028		
12 left-censored observations						

From the observation of the results, in statistical terms we can highlight that:

- All coefficients are different from zero, therefore the model can be considered acceptable (Wald chi2(4) = 31.74 with *p*_value = 0.000);
- The variables "Pfin" and "Size" are significant at the 0.01 level and the variable "Pec" is significant at 0.05 level;
- The intraclass correlation coefficient (rho) suggests that 18.3% of the variance is due to the differences between panels.

A likelihood-ratio test (LR test) compares the pooled estimator (Tobit) with the panel estimator. In this case, we reject the null hypothesis that there are no panel-level effects.

The partial regression coefficients β_i represent the average effect of the variables X_i on the dependent variable *DI*, when the X_i coefficients change over time and between companies.

As for RQ1, we will comment on the results of the regression model in the next section.

5. Discussion

In this section, we propose some considerations to discuss the results obtained from data processing separately for our two Research Question, in relation to prior studies on the same subject.

The descriptive statistics used to understand the evolution of the disclosure levels of KPIs in the transition from the voluntary to the mandatory regime, (RQ1) show two clear trends (see Section 4.1 and, in particular, Figure 1):

- A generalized reduction in the use of KPIs from the last year of voluntary (2016) to the early year (2017) of the mandatory regime;
- A tendential stabilization in the use of KPIs in 2018 compared to 2017.

We can explain changes in the use of the KPIs as a possible effect of variation in the materiality perimeter orienting the selection of indicators. However, it is unlikely that companies which continue to carry out the same activity from year to year, and that use the same framework for sustainability reporting (GRI) over time, show a significant reduction in the number of indicators deemed "material" in the specific phase of transition to the mandatory regime. This doubt is also confirmed by the tendential stabilization, in our sample, in the levels of disclosure from 2017 to 2018. On the other hand, one can presume that consistent with what argued in the literature about the transition toward mandatory CSR reporting [145], there is a general decrease of information and the pro-active behavior in experimenting social disclosure by companies falls sharply down.

Given such evidence, our findings can be interpreted in the light of the literature on the effect of mandatory NFI in modifying the company's behavior in response to the law.

Early studies on the transposition of Directive 2014/95/EU provide various results regarding the dynamic in the disclosure levels of NFI to convey in accordance to the new regulation.

Mion & Loza Adaui (2019) [41] observed that the quality of sustainability disclosure—assessed applying a quantitative scale to codified categories of information—increased in the Italian context more than in Germany after the introduction of mandatory NFD. Similar results are found in the study by Caputo et al. (2020) [29] referred to an extensive sample of large Italian companies, performing a nonfinancial score through content analysis of the annual report, integrated report and sustainability reports, comparing the year 2015 against 2017.

The outcomes of these studies lead authors to identify in regulation a factor that is sharply boosting standardization in sustainability reporting practices, as well as already observed in the studies on the process of accounting standardization induced by law [32,146]. They frame the results emerged by interpreting the approach of companies as aimed at being compliant with the law according to the "tick-box" method suggested by the literature [147,148].

Findings on the effects of the EU Directive are consistent with what emerged in preliminary critical analysis aimed to assess the information gap for large companies in view of the adoption of the transposition of the Directive, from which emerged that in the Italian case the gap to cover was on average higher than in other European countries [30,91,144].

Other studies focused on the use of KPIs in the sustainability reporting based on GRI guidelines found a reduction of DI in the transition from the voluntary to the mandatory regime (2015–2017) in the case of companies operating in sensitive sectors [101]. Another study [42], comparing the financial year 2017 against 2012, documented a reduction of the quantity of GRI indicators disclosed in each category between these two years and that companies seem to focus only on indicators considered more "relevant" according to the Directive. Similarly, a further study [43] conducted on a sample of Italian listed companies including financial services, based on a principal content analysis of NFR

and on descriptive statistics confirms the same decreasing trend in the first year of transition to the mandatory regime.

These preliminary studies highlight that the abovementioned lower degree of DI is directly linked to the legal requirement, and to the attitude toward compliance that drives firms to focus attention on some aspects in view to give an adequate response to the legal provision.

Our research confirms the existence of a generalized reduction in the use of KPIs in the first year (2017) the decree entered in force. Furthermore, it is one of the first studies extending the period of analysis on a longer trend, which also includes the second year (2018) of the mandatory regime. The comparison between the first two years of the compulsory reporting shows an apparent stabilization in the use of KPIs, similarly to Tarquinio et al. (2020) [43]. The longitudinal analysis provides a more robust demonstration of the conclusion that the legal requirements in the field of external reporting have been critical factors of the companies' behavior. The outcomes of this research are significant, especially considering that they concern companies already adopting the GRI guidelines well before the regulation requirements, thus witnessing to have a high level of orientation towards sustainable goals and expertise in this field.

The analysis of the complex and multifaced relationship between qualitative and quantitative aspects of information allows us to affirm that it has not to take for granted that a lower number of indicators (quantity decrease) means necessarily a lower reliability of information (quality decrease). On the contrary, in a contingent phase of transition, it is possible to reject the idea that the higher is the disclosure index, the better is the quality of information. Considering that the mandatory regime for sustainability reporting implies the mandatory assurance for KPIs, the assessment of information reliability gains more prominence, creating a prudent stance towards the disclosure of quantitative information. This situation may arise, likely, in the case when the information is not easy to quantify nor to verify. In general terms and line with previous studies, this confirms that making non-financial disclosure compulsory by law could affect the quality of reporting variously [107,145].

Therefore, we argue that such a conservative stance in the companies' communication can be reflected in the reliability of information disclosed, which is a relevant aspect of sustainability reporting [103]. In this perspective, the observed negative trend could be associated with an improvement of reliability, that is an important feature affecting the quality of the information, thus resulting in a positive effect of regulation.

For RQ2, our results show a negative relationship between the level of disclosure and the score of profitability and performance ratio ("Pec"), and a positive relationship between leverage and other financial ratios related to the capital structure ("Pfin") with disclosure (DI). These results are some way in line with previous findings, though they are not fully comparable to our study, in terms of the method used to synthesize the financial performance and of the context of the analysis [28,44,61–63,149].

Whether or not such results are consistent with rational behavior, and the selection of indicators follows a deliberate choice or is an emerging fact, the association found is significant and allows us to formulate some possible general explanations.

Since the lower is the level of profitability and performance score, the higher is the level of disclosure, we can sustain that is realistic for those companies revealing good financial results that the need to add more information in compliance to the legal requirement is moderate. On the contrary, when performance and profitability ratios stay at a lower score, there is the risk to reduce returns expectations by investors, so that a higher degree of non-financial disclosure could play a key role, increasing the credibility of management and providing another lens to assess the business results. From those findings, we can argue that, if such interpretation is plausible, NFI confirms to be assigned an integrative function, increasing transparency and credibility of the firm.

On the other side, the positive relationship between the score of financial position and the level of disclosure seems to be confirmative of the idea, on which similar positions are found in abovementioned studies, that good conditions of Liquidity, Leverage and Solvency justify a larger amount of resources to allocate to CSR initiatives.

As regards the positive relationship between DI and the size of the sampled companies, our results confirm previous studies [41,150]. This relationship is likely associated with the link between the wider scale of business and the perimeter of materiality.

Contrary to other studies that found a positive association between the type of sector (sensitive vs. non-sensitive) [89,94,95,151] and DI, we cannot propose any consideration on this aspect, since the variable sector was shown not to be statistically significant in our model.

As for the analysis of the relationship between DI and financial performance (RQ2), we have to distinguish the considerations for "Pec" and "Pfin".

About the score through which we have summarized the aspects of the profitability and economic efficiency ("Pec"), our results showed a negative relationship with the level of disclosure. In a first approximation, we can say that these results are in line with evidence provided by Jennifer Ho et al. (2007) [62] and Prado-Lorenzo et al. (2009) [63], but they differ from those emerging in Sotorrío et al. (2010) [66], Chen et al. (2015) [100] and Hategan et al. (2018) [28], who recorded a positive relationship with profitability.

As for the score "Pfin"—which in our study envelops Liquidity, Leverage, Solvency and Financial Structure of the companies—our findings recorded its positive relationship with (DI), confirming similar results obtained in Clarkson et al. (2008) [149], but in contrast with those of Brammer and Pavelin (2006) [61].

However, it has to be stressed that our study, to achieve a more comprehensive assessment of financial performance in its relationship with sustainability disclosure, used systemic measures of financial performance levels provided by DEA. Therefore, our findings are not fully comparable with them of prior studies. On the one hand, this confirms the significant criticality already outlined in the literature that differences in methods adopted to measure the level of performance could be a non-negligible determinant of diverging empirical results [52,63,136,150].

6. Conclusions

In this research, we explored the effects on the disclosure level of NFR based on GRI guidelines by a longitudinal analysis covering a period *pre* (2016) and *post* (2017–2018) implementation of the EU Directive in the Italian context. Furthermore, using a Panel Data Tobit Model, we investigated the existence of a significant relationship between the disclosure level of NFI and financial performance in the sampled companies.

Findings allow us to draw some conclusions on how the transition to the mandatory regime of NFI impacted on the level of disclosure of KPIs for Italian listed companies adopting GRI Guidelines (RQ1), which contribute to the previous literature on the subject.

The study makes several theoretical and practical contributions with implications for researchers, management and policymakers.

Our results add to the literature on the effect of mandatory NFI, helping gain a better understanding of how the law can influence the company's stance and commitment to corporate communication. The study showed a decrease in the level of KPIs disclosure in the transition to the mandatory regime of NFI, supporting evidence found in previous research in this specific field. We think that companies already adopting a standardized model of reporting in advance of the compulsory regime constitute a suitable test bench to explore the effect of regulation on NFI, as generally, it is likely that they have a high commitment toward sustainable goals and expertise in this field. The research, based on longitudinal analysis, improves knowledge on the evolution of disclosure in the transition to mandatory NFI, enabling us to envisage a possible path of the process of institutionalization in sustainability reporting practices.

We commented on the decrease in KPIs disclosure, observing that the conservative approach in the companies' communication can be reflected in the reliability of the information, which is a relevant qualitative aspect of sustainability reporting. It is useful to point out this aspect since it can contribute to the research on the relationships between quality of reporting and disclosure levels,

which analyzed aspects such as disclosure credibility, reliability and comparability of information provided in mandatory as well in voluntary reports [25,41,79,106,138].

In addition, the outcomes of the study reduce a gap in the CSR management and reporting literature, as they shed light on the performance measurement process along with the usefulness and reliability of KPIs reporting, in coherence with the need to adopt an integrated approach in both decision-making and external communication.

The study also adds to previous literature on the relationship between DI and financial performance, in that it adopts DEA to summarize the financial performance from a multidimensional perspective.

As for the main implications for researchers, it would be useful to go deeper into the consequences of mandatory disclosure of nonfinancial information and its relationship with the financial performance of companies, extending the adoption of DEA. This model of analysis may increase the robustness of results, preventing distortions related to biases and errors in the selection of indicators, in the search for significant relations with disclosure. This point makes clear the opportunity to test the usefulness of this model in further research–together or in alternative to other methods–to assure higher comparability and significance to results.

From this study, there also emerges a positive association between the level of disclosure on KPIs and financial performance, giving evidence that larger amounts of financial resources affect the propensity positively toward the development of information systems. Moreover, the negative association found between the profitability performance and the level of disclosure seems to confirm that nonfinancial performance has a prominent role in providing supplementary information, whose relevance can be higher just when the economic performance appears to be more vulnerable. On the standpoint of managers, this study highlights what seems to be the dominant behavior in this field. As regards the effectiveness of such information, in terms of 'value relevance', specific studies are addressed to verify their usefulness for investors, taking in consideration the market value of companies investigated.

Findings of our study suggest to policymakers that in a globalized context, the enforcement on the use of KPIs could improve the transparency and the harmonization of NFI. The role of regulation, in this aspect, could go well beyond indicating a list of information that represents the minimum information content. The development of effective reporting practices could find an essential driver in the push towards more significant codification and standardization of the indicators for each area of information, following in the wake of the evolution marked in this field by the GRI.

There are certain limitations in this study, as with all other studies, which open the way to potential extensions of research. First, the empirical setting focuses on the case of Italy. Results may differ across other countries and may change depending on the main characteristics of the institutional contexts.

Besides, we assumed a quantitative perspective to estimate the level of disclosure on KPIs. Qualitative analysis of nonfinancial reports could provide further elements to test the evolution of disclosure and its relationship with financial performance.

Finally, our analysis allows us to appreciate the effect of the compulsory regime in the specific transition phase, and to glimpse through it a possible evolutionary path. Further studies could investigate in the long-term the evolution in mandatory reporting practices and specific features of institutionalization of compulsory NFI practices.

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