Does Dynamic Non-Linear Relationship Drive Corporate Social Responsibility Disclosure and Financial Performance?

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Abstract: The aim of this paper is to generate an empirical estimation of the relationship between Corporate Social Responsibility Disclosure and Financial Performance by exploring the possibility of the existence of a non-linear relationship driving these two variables. Using a strongly balanced panel data with 2580 observations from 215 African listed firms over 12 years (2005-2016), the study investigated the short-run impact of CSRD through the Arellano-Bover /Blundell-Bond technique and the long-run effect via the Delta Method based on non-linear combinations of parameters estimated. The results indicate that in the short run, CSRD affects positively ROA while a negative significant relationship between the three-lagged measure of CSRD and ROA is also revealed. The results present the insignificance of the impact of CSRD on the other firm performances variables namely ROE, ROS. In the long run, CSRD is positively linked to all of the responses variables except ROE. Thus, the findings show that CSR practices do not generate benefit immediately. CSR effort positively affects firm financial performance in the following years after implementing it. Therefore, Managers should be aware that social practices should constitute an integrant part of overall firm strategy in order to achieve great profit.

Keywords: Corporate social responsibility disclosure, CSR, Delta method, Financial performance, System GMM.

1. Introduction

The quotidian reciprocal action between human elements and their natural surroundings generally have long-lasting involvement and consequences for the actual scenery. Since people seek to satisfy their daily wants and needs, the repercussions of their interaction keep mounting. Most particularly, deforestation, rural-urban migration, desertification, and issuance of effluence and other wastes have affected the natural environment negatively. These practices generate various problems including atmospheric, noise, water, and soil pollution (Dutta & Bose, 2008) which are harmful to the human being. Thus, the public's raising consciousness of Corporate Social Responsibility (CSR) related queries is putting growing pressure on firms to report their CSR efforts via mandatory and non-mandatory disclosure to make sure that stakeholders are mindful of the appropriateness of their activities taken on environmental and social issues (Gray, Kouhy, & Lavers, 1995; Patten, 2002). Shareholders exercise their function in requesting ethical behaviors and attitudes at the corporate level, thereby exerting a strong impact on the formulation of strategies. They do require efficacy, transparency, and efficiency from the managers in order to secure economic profits and thus, warrant the continuity of the firm over the long term, whilst requesting that socially responsible activities to be incorporated into the firms themselves (Pava & Krausz, 1996).

Many firms have ascribed efforts and resources to divulge extensive communications about CSR subject in their annual reports or sustainability reports. Such disclosure transmits information that is helpful to address the demand of several stakeholders groups, particularly, financial ones as shareholders (Wang & Li, 2016). The interrogation of probable advantage of Corporate Social Responsibility Disclosure (CSRD) has enticed increasing interest in academic research. Various studies explore the profitableness of CSRD for shareholders through the analysis of the effect of self-willed CSRD on firm performance (Bidhari, Salim, Aisjah, & Java, 2013; Candrayanthi & Saputra, 2013; Dewi, 2014). Despite the fact that CSRD delivers relevant and useful information to various economic agents (shareholders, financial analysts, potential shareholders and investors), its appreciation is still incomplete and its potential impact on firms Financial Performance (FP) is still not unanimous (Hana, 2013; Putri & Baridwan, 2014; Shahnaz, 2013). From an agency prospect, CSR disclosure may describe an opportunistic manipulation by the manager and may, therefore, minimize shareholders' profit (Friedman, 1970). On the other hand, several researches examine the short run and long-run impact of CRSD on FP and reach to divergent conclusions (mixed results, insignificant results, negative or positive impact) (McWilliams & Siegel, 2001; Posnikoff, 1997; Teoh, Welch, & Wazzan, 1999; Wright & Ferris, 1997). In these circumstances, shareholders require to apply filters to evaluate whether CSR disclosure produces excellent results for the survival of the firm which is translated by the maximization of profit (Barnett & Salomon, 2012; Cho, Guidry, Hageman, & Patten, 2012; Xiao, Wang, van der Vaart, & van Donk, 2018).

A larger part of research to date on this topic has focused on exploring linear relationship to evaluate the correlation between CSRD and FP (Hull & Rothenberg, 2008; Uadiale & Fagbemi, 2011; Yang & Baasandorj, 2017). Most studies rely on multiple regressions analysis using ordinary least square (OLS), Pearson correlation analysis or granger causation technique to explain corporate social performance and financial performance association (Hirigoyen & Rehm, 2015; Kang, Lee, & Huh, 2010; Niresh & Silva, 2018; Scholtens, 2008). Since the absence of homogeneity in the findings related to CSR and FP studies due to the lack of a general meticulous approach and technique serving as yardstick for comparative studies (Gjølberg, 2009; McGuire, Sundgren, & Schneeweis, 1988) there is a need to explore more rigorous and complex method to overcome this issue.

Our work attempts to fill this current gap and make various contributions in the existing literature. First, this study innovates by examining the non-linear relationship between CSRD and FP using two different methodology techniques, namely "System GMM" and Delta method. Second, it is the first study to apply System GMM with distributed lag. Third, our survey takes into consideration the biggest sample size (215 firms) about CSRD and financial performance academic research in the African context. Indeed, the study believes that the size of the sample may affect the final results (Kim, Lee, Lee, & Kim, 2010). Fourth, our investigation is currently the only one to examine the long-run impact of CSRD in the four-year horizon using non-linear combinations of regressions parameters.

In this study centered on 215 African listed companies and covering the period from 2005 to 2016, we explore the possibility of the existence of a non-linear relationship between corporate social responsibility disclosure and four measures of financial performance. Following many prior studies in the same area, our work considers and analyzes African firms as a whole (Comincioli, Poddi, & Vergalli, 2012; Horváthová, 2010; Mallin, Farag, & Ow-Yong, 2014; McWilliams, Siegel, & Wright, 2006). We stress that our purpose is not to bring forth a theoretical accounting of the possible association between CSRD and each financial performance variables but merely to generate an empirical estimation of these relationships, without implicating any pre-defined model regarding CSRD.

In particular, and following our aim, this academic work provides statistical evidence on the effect of CSRD on the company's financial performance indicators. The analysis includes the short-term evaluation of the impact of CSRD using "System GMM" combined to distributed lag and do explore the long-run estimation over a four-year horizon through Delta method in a dynamic panel model, representing the dynamics of the financial performance measures as well as the lagged effect of CSRD on the response variables.

In shedding light on the interaction between CSRD and its FP, we expect that the findings of our investigation to be oriented toward persuading firm's managers that social practices should constitute an integrant part of overall firm strategy. Based on the stakeholders' perspective, the study should be also helpful for all interest groups that claim, or stake, the corporate welfare. At last, both society and firms at significant benefit from increased consciousness in firm social undertakings, trying to reconcile at times various points of view about whether company profits are properly allocated amongst all stakeholders.

This paper is structured as follow: section 2 deals with the review of relevant literature and hypothesis; section 3 presents the data used; section 4 gives an idea about how the response variables and explanatory variables are measured; section 5 explains in detail the research methodology; section 6 discusses the results obtained. The conclusion (section 7) ends the paper. Finally, the references used in the study are listed.

2. Review of Literature and Hypothesis

2.1. The Challenge of Corporate Social Responsibility Disclosure

Consciousness of CSR practices is a precondition of profits associated with CSR (Du, Bhattacharya, & Sen, 2010). Corporations are encountering growing pressure from stakeholders to become involved in social responsibility and are awaited to report their CSR efforts (Grougiou, Dedoulis, & Leventis, 2016; Perks, Farache, Shukla, & Berry, 2013). Companies divulge CSR-related information to stakeholders via a various range of channels. These comprise environmental, social, and sustainability annual reports, media releases, corporate websites and CSR advertising (Perks et al., 2013). In the group of these channels, CSR reports have begun to be the principal means utilized to communicate stakeholders' informational requirements regarding the company's social and environmental performance (Gray, Bebbington, & Collison, 2006). CSR reporting is described as the process of disclosing the environmental and social effects of corporations' economic actions to particular interest group in society in general (Gray, Owen, & Adams, 1996). The annual report may be utilized to strengthen the community's impressions of the corporation's responsiveness to particular CSR issues or to deflect attention from unfavorable situations (Deegan, 2002). The disclosures are selective, broadcasting particular information that are awaited to contribute to modeling the manner stakeholders view the corporation (Neu, Warsame, & Pedwell, 1998).

Many studies indicate that there is doubtfulness regarding the level of reliability of CSR communication that companies deliver in their annual reports (Kudlak, 2019). The inexistence of standards for CSR disclosure, explicitly concerning the amount and type of information unveiled in the company's annual reports to shareholders, make CSR reporting activities highly varied and incomparable (Cerin, 2002). The absence of general agreement on what should be integrated into (or weeded out from) CSR investments generates confusion in interpretation and examination of the reports' contents (Margolis & Walsh, 2003). Furthermore, CSR-related communication reported by companies is in general narrative and positive or "self-laudatory" (Deegan & Gordon, 1996). Therefore, CSR disclosures tend to abstain from negative or likely harmful information, and few motivations exist to publish information in areas where the company has an unfortunate result (Aerts, Cormier, & Magnan, 2008; Cormier & Gordon, 2001). Several firms that pledge in CSR disclosure augment the quantity of information and over-disclose CSR efforts for impressing the general public (Neu et al., 1998). CSR investments account for a policy designed to prepossess the society's perceptions of the firm and to mold how these stakeholders judge the company (Perks et al., 2013). Many firms consider their CSR reporting as a social relation vehicle conceived to construct a good image and get at a strong reputation in the market (Gray et al., 1995). Companies may utilize CSR disclosure to ameliorate stakeholders' view of the appropriateness of their corporation's pro-environmental and social actions (Guidry & Patten, 2010) and selectively divulge positive CSR practices, leading up to biased and misleading reporting (Mahoney, Thorne, Cecil, & LaGore, 2013).

Previous CSR work has emphasized that the vast diversity of voluntary CSR reporting casts discredit on the validity of the published CSR activities. Some CSR furors have negatively affected society attitude regarding firms and their CSR disclosures, resulting in skepticism about trustworthiness and sincerity of

CSR reporting (Du et al., 2010). Stakeholders have solid intuitive conviction that companies spend more financial resources and time on pretending to be responsible than performing and putting into practice CSR efforts and activities that reduce the social and environmental impact of their actions (Panwar, Paul, Nybakk, Hansen, & Thompson, 2014). The voluntary aspect of CSR disclosure provides companies with the springiness to manage information through selective communication of positive environmental and social activities.

2.2. Main Theories Relevant to the Study
2.2.1. Agency Theory

Agency theory is defined as the relationship between the owners (shareholders) and the agents (managers) (Ross, 1973). It counts heavily on the conviction that the sole responsibility of the corporation is to maximize owners' value (Jensen & Meckling, 1976). Friedman (1962) utilizes the agency theory to justify his criticism about CSR by asserting that managers occupy the function of agent for the owners of the company. Their sole responsibility is to employ their assets and participate in activities susceptible to maximize their profit that result in increasing shareholders wealth as long as they proceed as per laid down procedures and rules (Fama, 1980; Fama & Jensen, 1983). From the agency theory approach, CSR is a waste of corporate resources (McWilliams et al., 2006) and such resources could be utilized by companies to involve in other lucrative projects. The classical theory sustains this approach as it underestimates the possible value of CSR in terms of cost-saving, product differentiation, and resource productivity. The agency theory suggests an antagonistic relationship regarding CSR and financial performance.

2.2.2. Stakeholder Theory

Stakeholder theory focuses on the relationship between the corporation and its stakeholders (Jones & Wicks, 1999). It claims that since businesses concentrate on appealing to both non-financial and financial stakeholders, they should center attention on involving in CSR practices that are seemingly relevant to non-financial groups. This is because the company requires both of these groups in order to be sustainable in the long-run (Hillman, Keim, & Luce, 2001; Leitão & Silva, 2007). Freeman (1984) describes stakeholders as any individual or group who is influenced by or could influence the achievement of a corporation's objectives. In accordance with stakeholders theory, an organization should satisfy not only the interest of owners (shareholders) but also the various expectations of its stakeholders' groups (Kaufman & Englander, 2011; Sternberg, 1999). According to Carroll (1998) agents (managers) who expect to attain particular results have to discern and pay attention to diverse classes of stakeholders (customers, shareholders, employees, suppliers, and local community) and identify the types of power owned by each group. As mentioned by Jones and Wicks (1999) successful managers are those who determine their stakeholder's groups and estimate their sources of legitimacy, power, and agency. Failure to identify influential stakeholders might put the business at risk (Berman, Wicks, Kotha, & Jones, 1999; Nasi, Nasi, Phillips, & Zyglidopoulos, 1997). This suggests that corporations subsist at the interception of a variety of interest (Van Beurden & Gössling, 2008; Welcomer, Cochran, Rands, & Haggerty, 2003). The stakeholder theory propounds that CSR is positively correlated with financial performance. However, various criticisms arise from scholars such as Sternberg (1997) who argues that the theory challenges the property advantages of shareholders. Also, Sternberg indicates that the theory compromises the function of capitalism as well, depreciate the role of government and then jeopardize the mechanism of the free market.

2.3. Disclosure of CSR Practices and Financial Performance

Empirically and theoretically, CSRD is crucial for a firm to construct a good reputation and image, as well as to get at a legitimation from investors. An organization will make its efforts to spread out the scope of CSRD to make the surrounding investors and community trust its product so that the corporation can achieve great financial performance (Gras-Gil, Manzano, & Fernández, 2016; Guthrie & Parker,

1990). CSR has economic repercussion for a company since CSR influences financial performance (Dewi, 2014).

A vast body of literature examines the impact of CSR on FP. Despite all these surveys, there is still no consensus about the link between these two variables. Researchers and scholars have issued relevant explanations for mixed, neutral, negative, and positive effects of CSR on FP. Although this diversity in findings, the existing literature is overwhelmed by studies that found a positive connection (Yusoff & Adamu, 2016).

- *Positive Relationship*

The huge amount of studies dealing with the connection between CSR and financial performance detected a positive association, for which the stakeholder theory provides a justification (Baird, Geylani, & Roberts, 2012). In addition, three other explanations that are recurrently utilized in the existing literature can sustain the positive link between CSR and FP as well. First, increased profits more than exceed the cost of implementing a high level of CSR. Second, in accordance with the slack resources theory, FP is positively associated with the CSR score in the following year (Waddock & Graves, 1997). Third, companies that are involved in CSR practices are just better managed and are consequently able to produce higher returns (Alexander & Buchholz, 1982; Kang, Germann, & Grewal, 2016; Stanwick & Stanwick, 1998).

- *Negative Relationship*

The neoclassical theory of the corporation delivers a theoretical foundation for a negative connection between CSR and FP (Aupperle, Carroll, & Hatfield, 1985). The neoclassical economist Friedman from America asserted that the sole responsibility of a company is to maximize profits. Thus, a company should not be anxious about external influences, but the government should handle externalities and issue public goods (Friedman, 1970).

Furthermore, the neoclassical economists endorse the opinion that the costs of getting a high level of CSR do not surpass the increased returns, which is named the trade-off hypothesis (Preston & O'bannon, 1997). For instance, this may be the case when CSR obliges the corporation into a disadvantageous financial position corresponding to companies that do not act socially responsible (Aupperle et al., 1985). Based on the existing literature, two other reasons could justify the negative impact of CSR. First, it is claimed that investors solely evaluate the additional marginal costs of corporate social responsibility, and consequently do not take in consideration the potential future profits from CSR (Marsat & Williams, 2011). Second, it may happen that managers over-invest in CSR efforts to promote their reputation, which distracts them from the fundamental objective of the company. Therefore, benefits will decrease (Barnea & Rubin, 2010).

- *Neutral Relationship*

Besides, the positive and negative correlation existing between CSR and financial performance, also some scholars found neutral association. A justification might be that the environment in which companies operate is overly complex to affirm that a simple, direct connection exists (Waddock & Graves, 1997). A neutral impact of CSR on FP appeared in the work of McWilliams and Siegel (2000). They incorporated risk, industry, R&D intensity, and firm size variables as regressors in the model, based on a sample of 524 firms. They asserted that positive or negative associations that are detected in previous studies are biased because of specification errors. According to their investigation, any relationship solely could exist by chance, since several variables play a role in this link. For example, by eliminating R&D intensity and consequently bringing about an omitted variable bias as is also performed in many other researches on this topic, a positive effect arises. Thus, they indicate the incredibility of the findings of studies that got a positive relationship, as they support that R&D intensity has an impact on this relationship and therefore, should be integrated into the regression.

- *Mixed Relationship*

Barnett and Salomon (2012) perceived evidence about a mixed effect of CSR and FP. They made their analysis from an unbalanced panel regrouping more than 1000 companies and approaching 5000 company-year observations, covering the period from 1998 to 2006, and controlled for industry, firm and year effects. They observed a nonsymmetrical U-shaped connection between CSR and financial performance. They affirmed that the growing cost of CSR practices justifies the downward slope of the curve in the onset; the upward sloping side can account for the higher stakeholder influence ability that generates higher financial performance. In other terms, when CSR activities augment, its financial performance becomes smaller at first, and then it increases later. On that basis, the best financial performance is acquired by those performing a high level of CSR and those without any corporate social responsibility policy. The presence of the U-shaped relationship is corroborated by the work of Nollet, Filis, and Mitrokostas (2016) who also proposed that CSR effort does not pay off immediately, but that it will pay off in the long run.

Thus, in line with the above discussion, we postulate the following hypothesis to investigate the relative effect of CSRD on financial performance in the short run and in the long run:

H1: CSR affects positively firm's financial performance in Africa.
H2: CSR practices may decrease the firm's financial performance in Africa.
H3: CSR effort does not pay off immediately; it rather pays off in the long run.

3. Data

The study utilizes panel data of 215 listed firms from all the 54 African countries for twelve years period 2005-2016. The advantage of the use of panel data is that it observes the behavior of entities across time, it monitors for individual heterogeneity, fewer collinearity measures, and it is suitable for hierarchical or multilevel modeling which simple cross-sectional and time-series data cannot perform (Saunders, Lewis, & Thornhill, 2012).

Table 1.
Descriptive Statistics for all variables.

Variables	(1)	(2)	(3)	(4)	(5)
	N	Mean	Sd	Kurtosis	Skewness
ROA	2,580	7.573	14.731	1,031	25.512
ROE	2,580	11.901	215.211	2,424	-48.494
ROCE	2,580	15.024	41.504	1,441	-32.971
ROS	2,580	13.577	62.313	1,202	-15.793
CSRD	2,580	3.739	4.367	821.9	26.524
SIZE	2,580	13.881	1.945	4.089	0.452
DR	2,580	13.236	183.901	725.0	24.457
RISK	2,580	0.478	7.870	814.60	28.001
LEV	2,580	67.055	297.910	1,147	31.094
Int	2,580	33.923	119.0	333.71	14.041
AT	2,580	5.039	44.38	326.84	17.931

The dataset for response variables and control variables is established by merging firm's financial statement from the Orsis and Orbis database while the CSRD data is constructed from published annual reports on selected firms' official website. The final dataset for this study is built after filtering and elimination process. In fact, from the Orbis and Orsis database, we first choose companies whose data cover the most extended period. Then we remove the firms with missing data for some years. Similarly, we browse the official web site of the pre-selected companies to obtain their annual report for the indicated period. For those whose annual reports are missing, we remove them from the list. Finally, we make sure that the final set of data contains at least three companies from each of 54 countries constituting the

African continent. After facing all these procedures, we get a strongly balanced panel data with 2580 observations described in Table 1.

4. Measures
4.1. Measuring Financial Performances
Accounting-based measures are adopted for financial performances evaluation in our study (see (Alexander & Buchholz, 1978; Waddock & Graves, 1997)). One good aspect of accounting-based measures is their availability for all firms and their reasonable comparability (Galant & Cadez, 2017). Furthermore, accounting-based measures have demonstrated a stronger correlation with CSR compared to market-based measures (Brønn & Vrioni, 2001). Four accounting-based measures (ROA: Return on Assets, ROE: Return on Equity, ROCE: Return on Capital Employed and ROS: Return on Sales).

ROA depicts the profitability of the company concerning the total set of assets, or resources, under its management (Hull & Rothenberg, 2008). It denotes the company's efficiency of employing its assets throughout a given fiscal year.

ROE gives a helpful signal of favorable financial outcomes since it might specify whether the firm is increasing profit without bringing new equity capital into the business (Platonova, Asutay, Dixon, & Mohammad, 2018).

ROCE captures the performance of a firm as a whole in employing all sources of finance in the long-term (Abd-Elsalam & Weetman, 2003). It is a betterment over Earning Per Share (EPS) as it associates the return produced to the capital (Irala, 2007). Since the firm expects to maximize profits, greater ROCE indicates that the company has been capable of improving efficiency in the use of capital and funds.

ROS offers an idea about how efficiently a firm is at producing benefit from its revenue. It evaluates a firm financial performance by examining what percentage of total firm revenues is effectively converted into firm profits (Aras, Ash, & Kutlu, 2010; Saleh, Zulkifli, & Muhamad, 2011).

4.2. Measuring CSRD
Content analysis techniques based on annual reports examination has been employed to evaluate CSRD (Markus & Ralph, 1999; Stemler, 2001). The annual report is widely known as the essential vector of communication of CSR outside the company (Neu et al., 1998; Saleh et al., 2011). Furthermore, annual reports analysis provides a right set of circumstances to collect time-sensitive, historical data and it is the only manner to perform a longitudinal survey in many institutions (Aras et al., 2010; Bansal, 2005).

Following Khan, Muttakin, and Siddiqui (2013) and Vourvachis and Woodward (2015) we appraise the magnitude of CSRD by mainly referring to CSR keywords in the published annual report for a particular period. Atlas-ti 7 software has been used to detect the frequency of pre-identified keywords related to CSR in the annual report. The computed CSRD in percentage is then obtained by using the formula below proposed by Singh (2014):

$$CSRD(\%) = \frac{\sum_{j=1}^{N} F_j}{Q} \times 100$$

N: Quantity of various CSR keywords appearing in the company's annual report.
F: The frequency of keywords related to CSR in the published annual report.
Q: Total amount of words in the company's published annual report.

4.3. Control Variables
The association between Financial performance and CSRD might be affected by several other variables that required to control for. Many studies revealed the effect of firm size on CSR disclosure practices (Chen & Gavious, 2015; Ding, Ferreira, & Wongchoti, 2016). More prominent company receive more attention and entice more stakeholder scrutiny and media, which affect both their reputation and their legitimacy (Fombrun, 1996; Seo, Moon, & Lee, 2015). The natural log of total asset was utilized to evaluate the firm size (Cox & Snell, 1981). The ratio of long term debt to total asset is taken into

consideration in order to include the influent of risk. Previous works have obtained a significant negative association between the level of debt and financial performance (Capon, Farley, & Hoenig, 1990; Choi & Wang, 2009; Mahoney & Roberts, 2007). We also control for firm leverage, which is an indicator that impact decisions to communicate CSR information (Khan et al., 2013). More indebted companies are encouraged to account for creditor expectations concerning communication-related to CSR (Roberts, 1992). In line with Mansaray, Yuanyuan, and Brima (2017) we use interest coverage ratio and asset turnover as control variables as well. Interest rate fundamentally influences an organization's profitability by having an impact on the cost of debt capital (Moynihan & Pandey, 2010). In the same way, Asset liquidity could be manipulated by the top management to increase the shareholder's wealth (Crisostomos, De Souza, & Corte, 2011; Peloza, 2006; Platonova et al., 2018).

5. Methodology and Models Specifications

Based on the Wu (2006) and Orlitzky, Schmidt, and Rynes (2003) meta-analyses as well as Margolis and Walsh (2001) survey about Corporate Social Performance and Financial Performance, regression model appears to be mostly used to investigate the correlation between Social Responsibility and Corporate Financial Performance. The paper by Chatterji, Levine, and Toffel (2007) utilized distributed lags model to explore the time-dependent association between Corporate Social Responsibility Ratings and Corporate Social Performance. Their study revealed that the predictive strength of KLD ratings is related to regulatory violations and lagged emissions.

Unlike most studies in CSR and FP field, Nekhili, Nagati, Chtioui, and Rebolledo (2017) study is one of the few to use the "System GMM" estimation technique to prove that the existence of family involvement has a crucial moderating role in the connection between CSR reporting and Corporate market value. Furthermore, Blasi, Caporin, and Fontini (2018) examined the dynamic, endogenous and non-linear relationship between CSR and Firm's Economic performance by using the Delta method approach. They found a strong positive association with Annual yield of the stock price indicator and a significant positive decrease in Financial Risk explained by the investments in almost all the facets of CSR. This paper depends on "System GMM" with distributed lags and Delta Method to explore the link between Corporate Social Disclosure and Financial Performance.

5.1. System GMM with Distributed Lag

The "System GMM" estimators have been conceived for a circumstance where the panel data analyses may follow a dynamic process with small T (few times period) and large N (many individuals) panel; some explanatory variables may be endogenous; there is possible presence of heteroskedasticity and autocorrelation within individuals (Roodman, 2009).

The distributed-lag model is a dynamic model which establishes a link between the response variable and the various lags of the explanatory variables. It is helpful in exploring how far in time we need to go back to get any correlation between social performance and financial performance (Scholtens, 2008).

Thus, our Methodology is described in these following steps:

Step 1: we get started our investigations by examining the pairwise correlation between the response variables and regressors. Then, we initiate a cross-correlation analysis to find out if there is a time-lagged relationship between financial and social measure. For the series $Z_{j,t}$ and $Y_{j,t}$ where $Z_{j,t}$ denotes the set of independent variables including our score of CSRD and $Y_{j,t}$ is one of the financial performance measures of the company j at time t the cross-correlation at the delay d is determined as:

$$S_d = \frac{\sum_{j,t}\left[\left(Z_{j,t}-\eta_z\right)\left(Y_{j,t-d}-\eta_y\right)\right]}{\sqrt{\sum_{j,t}\left(Z_{j,t}-\eta_z\right)^2}\sqrt{\sum_j\left(Y_{j,t-d}-\eta_y\right)^2}}$$

where η_z and η_y are respectively the mean of $Z_{j,t}$ and $Y_{j,t}$. In our examination, we consider values of d up to 3 because of the restricted temporal measurement of the sample (notice that if d equal to zero, we get the classical linear correlation) (Pearson, 1896; Pearson & Filon, 1898; Stigler, 1986). The evidence resulting from the cross-correlations reveal the need to incorporate in the model the lag in the explanatory variables. Table 2 shows the aggregate results for the whole dataset.

Table 2.
Pairwise correlation between variables.

	1	**2**	**3**	**4**	**5**	**6**	**7**
1. ROA	1						
2. ROE	0.0953*	1					
3. ROCE	0.2160*	0.0930*	1				
4. ROS	0.1093*	0.0266	0.0531*	1			
5. CSRD	0.0185	0.00190	0.00970	0.00290	1		
6. SIZE	−0.0111	0.0230	0.0241	0.0406*	0.0233	1	
7. DR	0.00580	0.00550	0.0200	−0.00670	−0.00560	−0.00190	1
8. RISK	−0.0412*	−0.00320	0.0233	−0.0101	−0.00210	−0.1683*	0.00350
9. LEV	−0.0340	−0.00390	−0.0167	0.00690	−0.00820	−0.0579*	0.0160
10. Int	0.0959*	0.0208	0.0424*	0.0463*	0.0576*	−0.00240	0.00220
11. AT	0.1080*	0.00600	0.0527*	0.0352	0.0113	−0.0656*	0.00640
11. ROA$_{t-1}$	0.2241*	0.0679*	0.1184*	0.0376	−0.0118	−0.0288	0.00640
12. ROA$_{t-2}$	0.1727*	0.0157	0.1175*	0.0405*	0.00220	0.00120	0.00880
13. ROA$_{t-3}$	0.1299*	0.0184	0.0490*	0.0398*	−0.0200	0.00970	0.00680
14. ROE$_{t-1}$	0.0898*	0.0185	0.1286*	0.0176	−0.00260	0.0169	0.00550
15. ROE$_{t-2}$	0.0624*	0.00450	0.0671*	0.0164	0.00150	0.0147	0.00520
16. ROE$_{t-3}$	0.0283	0.00060*	0.00930	0.0110	0.00410	0.0148	0.00500
17. ROCE$_{t-1}$	0.1153*	0.0410*	0.1024*	0.0149	−0.0107	0.00780	0.0194
18. ROCE$_{t-2}$	0.1093*	0.00770	0.1119*	0.0204	−0.00400	0.0109	0.0204
19. ROCE$_{t-3}$	0.0655*	0.00630	0.0449*	0.0207	−0.0199	0.00480	0.0196
20. ROS$_{t-1}$	0.0576*	0.0163	0.0257	0.0333	−0.00610	0.0287	−0.00660
21. ROS$_{t-2}$	0.0369	0.00670	0.0188	0.0388*	0.000900	0.0242	−0.00740
22. ROS$_{t-3}$	0.0250	0.00580	0.00810	0.0237	−0.0118	0.0186	−0.00740
23. CSRD$_{t-1}$	0.00930	0.000200	0.00660	0.00550	0.0987*	0.0174	0.00110
24. CSRD$_{t-2}$	0.00610	0.00510	0.00180	−0.00130	0.0520*	0.0373	0.0111
25. CSRD$_{t-3}$	0.0132	0.00570	0.00380	0.000400	0.0505*	0.0274	0.0195
	8	**9**	**10**	**11**	**12**	**13**	**14**
8. RISK	1						
9. LEV	0.4755*	1					
10. Int	−0.0132	−0.000800	1				
11. AT	−0.00390	−0.00830	−0.0164	1			
12. ROA$_{t-1}$	−0.0276	−0.0262	0.0716*	0.1028*	1		
13. ROA$_{t-2}$	−0.0271	−0.0265	0.0626*	0.0989*	0.2237*	1	
14. ROA$_{t-3}$	−0.0289	−0.0294	0.0526*	0.0974*	0.1721*	0.2231*	1
15. ROE$_{t-1}$	−0.00300	−0.00400	0.0174	0.00240	0.0953*	0.0679*	0.0156
16. ROE$_{t-2}$	−0.00860	−0.00480	0.0168	0.00650	0.0898*	0.0953*	0.0679*
17. ROE$_{t-3}$	−0.00290	−0.00130	0.0157	0.00720	0.0623*	0.0897*	0.0952*
18. ROCE$_{t-1}$	−0.00670	−0.00740	0.0306	0.0469*	0.2163*	0.1186*	0.1178*

	1	**2**	**3**	**4**	**5**	**6**	**7**
19. $ROCE_{t-2}$	–0.0271	–0.0149	0.0267	0.0434*	0.1152*	0.2163*	0.1186*
20. $ROCE_{t-3}$	–0.0160	–0.0104	0.0293	0.0433*	0.1092*	0.1152*	0.2162*
21. ROS_{t-1}	–0.0132	0.000600	0.0326	0.0331	0.1092*	0.0375	0.0404*
22. ROS_{t-2}	–0.00690	0.0109	0.0293	0.0307	0.0575*	0.1091*	0.0374
23. ROS_{t-3}	–0.00970	0.00760	0.0244	0.0301	0.0368	0.0574*	0.1090*
24. $CSRD_{t-1}$	0.000100	–0.00650	0.00350	0.0133	0.0183	–0.0119	0.00200
25. $CSRD_{t-2}$	0.00110	–0.00360	0.00920	0.0155	0.00930	0.0183	–0.0120
26. $CSRD_{t-3}$	0.00240	–0.00440	0.0160	0.0182	0.00600	0.00920	0.0181
	15	**16**	**17**	**18**	**19**	**20**	**21**
15. ROE_{t-1}	1						
16. ROE_{t-2}	0.0185	1					
17. ROE_{t-3}	0.00450	0.0185	1				
18. $ROCE_{t-1}$	0.0930*	0.1286*	0.0671*	1			
19. $ROCE_{t-2}$	0.0410*	0.0930*	0.1286*	0.1024*	1		
20. $ROCE_{t-3}$	0.00770	0.0410*	0.0930*	0.1119*	0.1024*	1	
21. ROS_{t-1}	0.0266	0.0176	0.0164	0.0531*	0.0149	0.0203	1
22. ROS_{t-2}	0.0163	0.0266	0.0175	0.0258	0.0531*	0.0149	0.0333
23. ROS_{t-3}	0.00670	0.0163	0.0266	0.0188	0.0257	0.0531*	0.0388*
24. $CSRD_{t-1}$	0.00180	–0.00260	0.00150	0.00980	–0.0108	–0.00410	0.00280
25. $CSRD_{t-2}$	0.000100	0.00180	–0.00260	0.00660	0.00980	–0.0108	0.00550
26. $CSRD_{t-3}$	0.00500	0.000100	0.00180	0.00180	0.00660	0.00970	–0.00130
	22	**23**	**24**	**25**	**26**		
22. ROS_{t-2}	1						
23 ROS_{t-3}	0.0333	1					
24. $CSRD_{t-1}$	–0.00610	0.000800	1				
25. $CSRD_{t-2}$	0.00280	–0.00610	0.0987*	1			
26. $CSRD_{t-3}$	0.00550	0.00280	0.0520*	0.0987*	1		

Note: *Represents significance at 0.05 levels, respectively.

Step 2: Based on the lagged effect of explanatory variables indicators, as proposed by the cross-correlation analysis, we can guesstimate that financial and social performance factors could rely, at least partially, on their values in preceding periods. To test this, we integrate the lagged response variables in the model. Therefore, the model we proposed in Table 3.

$$Y_{j,t} = \theta_1 Y_{j,t-1} + \theta_2 Y_{j,t-2} + \theta_3 Y_{j,t-3} + \theta_4 CSRD_{j,t} + \theta_5 CSRD_{j,t-1} + \theta_6 CSRD_{j,t-2} + \theta_7 CSRD_{j,t-3} \text{(Model 1)}$$
$$+ \lambda_j \left[\theta_8 Size_{j,t} + \theta_9 Risk_{j,t} + \theta_{10} Lev_{j,t} + \theta_{11} Int_{j,t} + \theta_{12} AT_{j,t} \right] + \xi_{j,t}$$

Where FP= Financial Performance for company j; CSRD= Corporate Social Responsibility Disclosure; Size= Firm Size; Lev= Leverage; Int= Interest Coverage ratio;; AT = Asset Turnover; $\theta_1 \ldots\ldots\ldots \theta_{12}$ = Depict the parameters to be estimated; λ_j: indicates set of parameters capturing the relative effect of control variables; t= Time; ξ_{jt} = Stochastic error term.

Note that we incorporate three lags of the independent variable, rationally with the cross-correlation analyses and, likewise, we integrate three lags of the response variables. Given the existence of the lagged dependent on the right-hand side, we get parameters assessed through the Arellano–Bover/Blundell–

Bond estimator for the dynamic longitudinal data (Arellano & Bover, 1995; Blundell & Bond, 1998) (see Table 4).

Table 3.
Unit root test results.

Variables	Unit Root Test		
	LLC	**HT**	**BR**
ROA	-30.4543(0.000)	-0.4815 (0.000)	-19.6905(0.000)
ROE	-28.3883(0.000)	-1.0806(0.000)	-18.3591(0.000)
ROCE	-27.5572(0.000)	-0.1431 (0.000)	-18.9187 (0.000)
ROS	-38.0626 (0.000)	-0.6144 (0.000)	-17.5342 (0.000)
CSRD	-36.7497 (0.000)	-0.6341 (0.000)	-20.5980 (0.000)
SIZE	-45.5367 (0.000)	-0.2433 (0.000)	-14.8754 (0.000)
RISK	-1.1e+03 (0.000)	-0.4764 (0.000)	-16.6540 (0.000)
Lev	-63.7562 (0.000)	-0.4803 (0.000)	-16.6786 (0.000)
Int	-2.5e+02 (0.000)	-0.2998 (0.000)	-18.9174 (0.000)
AT	-34.6142 (0.000)	-0.2220 (0.000)	-17.2460 (0.000)

Note: LLC and HT represent the Levin-Lin-Chu and Harris-Tzavalis unit root tests respectively, while BR refers to the Breitung unit root test. The null hypothesis H0 of the LLC, HT and BR tests stipulate that panels contains unit roots at the first difference with respect to the alternative hypothesis Ha of stationarity at the first difference.

Step 3: We perform successively the unit root test (Breitung, 2000; Harris & Tzavalis, 1999; Levin, Lin, & Chu, 2002) the Hausman test (Hausman & Taylor, 1981) the Breusch-Pagan test (Breusch & Pagan, 1979) the AR(2) test (Arellano & Bond, 1991) and AR(3) test (Jacob & Osang, 2015) the Durbin-Wu-Hausman endogeneity test (Hausman, 1978; Wu, 1973) the Sargan test; the Hansen statistics and Difference-in-Hansen test (Eichenbaum, Hansen, & Singleton, 1988; Hayashi, 2000).

5.1. Delta Method

The Delta Method is used in evidence-based and practical studies to calculate the asymptotic standard error for nonlinear function of underlying model parameters (Feiveson, 1999; Wooldridge, 2003). As explained by Papke and Wooldridge (2005) the Delta Method standard errors for nonlinear combination of regression coefficients are less applied than they should be due to the costliness of complex software required to do so. The Delta Method could be used to estimate the long-run effect in limitless distributed lag model, which is described by a nonlinear expression of the coefficients on the independent variables and the lagged response variables (Oehlert, 1992; Wooldridge., 2002).

Thus, inspired by Blasi et al. (2018) work, we augment the Model 1 to get the Model 2:

$$Y_{j,t} = \omega_1 Y_{j,t-1} + \omega_2 Y_{j,t-2} + \omega_3 Y_{j,t-3} + \psi_0 Z_{j,t} + \psi_1 Z_{j,t-1} + \psi_2 Z_{j,t-2} + \psi_3 Z_{j,t-3}$$
$$+ \phi_0 Z_{j,t}^2 + \phi_1 Z_{j,t-1}^2 + \phi_2 Z_{j,t-2}^2 + \phi_3 Z_{j,t-3}^2 + \varepsilon_{j,t} \quad \text{(Model 2)}$$

Where $Z_{j,t}$ and $Z_{j,t}^2$ are the vectors of the independent variables (including CSRD score) in the levels and in squares. Furthermore $\varepsilon_{j,t}$ depicts the error term of company j at time t, whereas the vectors ω_1, ω_2, ω_3 and the scalars ψ_0, ψ_1, ψ_2, ψ_3, ϕ_0, ϕ_1, ϕ_2 and ϕ_3 are the parameters to be estimated.

Table 4.
Dynamic panel-data estimation, two-step system GMM.

Dynamic panel-data estimation, two-step system GMM					
Variables	**(1)**	**(2)**	**(3)**	**(4)**	
	ROA	**ROE**	**ROCE**	**ROS**	
ROA_{t-1}	0.774***(0.0344)				
ROA_{t-2}	0.00693(0.00673)				
ROA_{t-3}	0.00477(0.00601)				
CSRD	0.155*(0.0937)	-1.295(1.326)	0.0537(0.122)	-0.179(0.376)	
$CSRD_{t-1}$	-0.116(0.0779)	-0.484(0.558)	-0.266(0.181)	-0.351(0.288)	
$CSRD_{t-2}$	0.0166(0.0211)	-0.212(0.352)	0.00775(0.0440)	-0.0325(0.0995)	
$CSRD_{t-3}$	-0.0539*(0.0279)	0.0226(0.208)	-0.0423(0.0269)	-0.297(0.225)	
SIZE	0.0420(0.0438)	1.91**(0.858)	0.474**(0.186)	1.135**(0.487)	
LEV	0.0056(0.006)	-0.0878(0.136)	0.00054(0.009)	0.0195(0.0252)	
DR	0.0113(0.0137)	-0.0526(0.207)	0.0143(0.0189)	-0.00238(0.0434)	
RISK	-0.0995(0.201)	3.599(5.101)	0.585(0.457)	-0.231(0.311)	
AT	0.011***(0.001)	0.0205(0.029)	0.025***(0.008)	0.053***(0.011)	
Int	0.0044***(0.001)	0.019(0.013)	0.006(0.0045)	0.0216**(0.008)	
ROE_{t-1}		-0.0241(0.027)			
ROE_{t-2}		0.330*(0.197)			
ROE_{t-3}		-0.0138(0.058)			
$ROCE_{t-1}$			0.547***(0.159)		
$ROCE_{t-2}$			0.0427***(0.011)		
$ROCE_{t-3}$			0.0222**(0.00954)		
ROS_{t-1}				-0.0962(0.0843)	
ROS_{t-2}				0.0274(0.0238)	
ROS_{t-3}				0.0696(0.0989)	
Observations	2,577	2,577	2,577	2,577	
Number of Firms	215	215	215	215	
Hausman Test	0.528(0.4674)	0.012(0.9113)	0.059(0.8083)	0.01(0.9753)	
Wald Chi2	14925.63 (0.000)	746.69(0.000)	1755.11(0.000)	351.69(0.000)	
AR(2)	1.09 (0.278)	-0.74(0.457)	1.47(0.140)	-0.75(0.451)	
AR(3)	0.06 (0.949)	-0.13(0.899)	-1.24(0.214)	-1.00(0.318)	
Groups/Instruments	215/153	215/153	215/153	215/153	
Hansen Statistic	141.27(0.454)	147.56(0.314)	147.71(0.311)	161.30(0.105)	
Sargan Statistic	20.64(1.000)	230.09(0.000)	42.19(1.000)	328.86(0.000)	
Difference-in-Hansen tests					
Hansen test Excluding groups	140.40(0.404)	139.32(0.429)	144.72(0.309)	150.34(0.306)	
Difference(null H:exogenous)	0.87(0.832)	8.25(0.041)	2.99(0.394)	10.96(0.012)	

Note: *, **, *** are statistically significant at the 1%, 5% and 10% levels respectively; Standards errors in parentheses; p-values reported for Hausman Test, Wald Statistic, AR(2),AR(3), Hansen Statistic ,Sargan Statistic, and Difference in Hansen tests in parentheses.

Then we pursue our methodology with step 4.

Step 4: After acting following the previous procedures (step1, step2, step3), the psis and phis parameters got after running the regressions (Model 2) capture the impact the explanatory variables have on a given financial performance measures. Nevertheless, the model encompasses, presumably, quadratic independent variables, lagged explanatory terms, and lagged dependent expressions. Therefore, the simple evaluation of the assessed coefficients might not come up with a complete illustration of the impact

of CSRD on firms' financial performance. Indeed, the effect might be influenced by the auto-regressive dynamic of the response and explanatory variables, might appear to be non-linear, and might be lagged. Thus, in order to investigate the impact of CSRD on a given response variable, we take into account a four-year horizon and determine the total impact over four years as follow:

$$\frac{\partial Y_{j,t,t+3}}{\partial Z_{i,j,t}} = \frac{\partial Y_{j,t}}{\partial Z_{i,j,t}} + \frac{\partial Y_{j,t+1}}{\partial Z_{i,j,t}} + \frac{\partial Y_{j,t+2}}{\partial Z_{i,j,t}} + \frac{\partial Y_{j,t+3}}{\partial Z_{i,j,t}}$$

(1)

Where $Z_{i,j,t}$ is a given explanatory variables of Model 2 (i depicts one of the independent variables), and we evaluate the impact of a variation in $Z_{i,j,t}$ at time t on the response variable $\partial Y_{j,t,t+3}$ (a given financial performance term for company j) in year t, year t+1, year t+2, and year t+3 as well.

Equation 1 displays the impact of a change in $Z_{i,j,t}$ at time t on the explained variable $\partial Y_{j,t,t+3}$ in year t and also in year t+1, t+2, and t+3.

Based on the model structure, we calculate the proportion above as follow:

$$\frac{\partial Y_{j,t}}{\partial Z_{i,j,t}} = \psi_{0,i} + 2\phi_{0,i} Z_{i,j,t} + \omega_1 \frac{\partial Y_{j,t-1}}{\partial Z_{i,j,t}} + \omega_2 \frac{\partial Y_{j,t-2}}{\partial Z_{i,j,t}} + \omega_3 \frac{\partial Y_{j,t-3}}{\partial Z_{i,j,t}} = \psi_{0,i} + 2\phi_{0,i} Z_{i,j,t}$$

(2)

Equation 2 uses derivatives technique to calculate the quantity $\dfrac{\partial Y_{j,t+3}}{\partial Z_{i,j,t}}$

$$\frac{\partial Y_{j,t+1}}{\partial Z_{i,j,t}} = \psi_{1,i} + 2\phi_{1,i} Z_{i,j,t} + \omega_1 \frac{\partial Y_{j,t}}{\partial Z_{i,j,t}} + \omega_2 \frac{\partial Y_{j,t-1}}{\partial Z_{i,j,t}} + \omega_3 \frac{\partial Y_{j,t-2}}{\partial Z_{i,j,t}}$$

$$= \psi_{1,i} + 2\phi_{1,i} Z_{i,j,t} + \omega_1 \left(\psi_{0,i} + 2\phi_{0,i} Z_{i,j,t} \right)$$

(3)

$$\frac{\partial Y_{j,t+2}}{\partial Z_{i,j,t}} = \psi_{2,i} + 2\phi_{2,i} Z_{i,j,t} + \omega_1 \frac{\partial Y_{j,t+1}}{\partial Z_{i,j,t}} + \omega_2 \frac{\partial Y_{j,t}}{\partial Z_{i,j,t}} + \omega_3 \frac{\partial Y_{j,t-1}}{\partial Z_{i,j,t}}$$

$$= \psi_{2,i} + 2\phi_{2,i} Z_{i,j,t} + \omega_1 \left[\psi_{1,i} + 2\phi_{1,i} Z_{i,j,t} + \omega_1 \left(\psi_{0,i} + 2\phi_{0,i} Z_{i,j,t} \right) \right] + \omega_2 \left(\psi_{0,i} + 2\phi_{0,i} Z_{i,j,t} \right)$$

(4)

$$\frac{\partial Y_{j,t+3}}{\partial Z_{i,j,t}} = \psi_{3,i} + 2\phi_{3,i} Z_{i,j,t} + \omega_1 \frac{\partial Y_{j,t+2}}{\partial Z_{i,j,t}} + \omega_2 \frac{\partial Y_{j,t+1}}{\partial Z_{i,j,t}} + \omega_3 \frac{\partial Y_{j,t}}{\partial Z_{i,j,t}}$$

(5)

Equation 3, Equation 4 and Equation 5 alternatively utilize derivatives method, develop, factorize and reduce the literal expression to get the simplest quantity, that is Equation 6.

Thus, the net impact in four years t, t+1, t+2, and t+3 simplifies to:

$$\frac{\partial Y_{j,t+3}}{\partial Z_{i,j,t}} = \psi_{3,i} + \omega_1 \psi_{2,i} + \omega_1^2 \psi_{1,i} + \omega_1^3 \psi_{0,i}$$

$$+ 2\left(\phi_{3,i} + \omega_1 \phi_{2,i} + \omega_1^2 \phi_{1,i} + \omega_1^3 \phi_{0,i} + 2\omega_1 \omega_2 \phi_{0,i} + \omega_3 \phi_{0,i} \right) Z_{i,j,t}$$

(6)

Equation 6 provides the global effect of the change in CSRD on a given financial performance factor over the four-year horizon. Then, we compute the net impact of CSRD in the four years as non-linear combinations of the coefficients estimated through the regressions (Model 2) and setting.

$$Z_{i,j,t} = 1$$

Considering that the estimated parameters are asymptotically normal, we can recover the asymptotic distributions for the proportions in Equation 6 using the Delta Method (Papke & Wooldridge, 2005). This

let us elaborate a statistic test to examine the significance of $\dfrac{\partial Y_{j,t,t+3}}{\partial Z_{i,j,t}}$, a classical significance test.

Thus, in order to investigate if CRSD has a significant net impact over a four-year horizon, we then test

the hypothesis $\dfrac{\partial Y_{j,t,t+3}}{\partial Z_{i,j,t}} = 0$. The impact of CSRD might be negative or positive as the proportion in

Equation 6 might be negative or positive. We discuss the significance of the effect of CSRD in our result and provide the sign of the quantities in (6) (see Table 5).

Table 5.
Aggregate results.

	ROA	ROE	ROCE	ROS	Row Sum		
					+	-	Total
CSRD	+	-	+	+	3	1	4
SIZE	-	+	-	-	1	3	4
Debt Ratio	-	+	-	-	1	3	4
RISK	+	+	-	-	2	2	4
LEV	+	-	+		2	1	3
Int	+	-	+	+	3	1	4
AT	-	+	-	-	1	3	4

Note: Each cell shows, if the particular explanatory variable has a significant effect on a given firm performance measure over the four years, if yes, whether the sign is negative or positive; under the null hypothesis that the Net effect at the end of four years does not differ significantly from zero. The symbol + depicts the positive impact at the end of the four years; - denotes the negative impact. Note that all estimators were obtained from the regressions (Model 2).

6. Results and Discussions

Table 1 reported the descriptive statistics for all the variables. The mean values of ROA; ROE; ROCE; ROS; CSRD; SIZE; LEV; Int; and AT are 7.573; 11.90; 15.02; 13.57; 3.667; 13.88; 0.478; 67.05; 33.92 and 5.039 respectively.

All series are leptokurtic. They have peaked-curve indicating that all variables have a kurtosis greater than 3. All series have then higher values above the sample average.

SIZE series has a normal skewness with skewness equal to 0.452 so the distribution appears to be symmetric around its means. ROA; CSRD; RISK; LEV; Int and AT series have positive skewness equal to 25.51; 37.39; 28.00; 31.09; 14.04 and 17.93 respectively meaning that they have long right tail. The remaining variables ROE; ROCE; and ROS have long left tail with negative skewness equal to -48.49; -32.97; and -15.79 respectively.

Table 2 displays the pair wise corrections between all the variables. ROA_{t-1}, ROA_{t-2}, and ROA_{t-3} have a significant correlation with ROA at 0.05 level with coefficients equal to 0.2241; 0.1727 and 0.1299, respectively. $ROCE_{t-1}$, $ROCE_{t-2}$, and $ROCE_{t-3}$ are positively correlated with ROCE as well. ROE_{t-3} and ROE are positively associated with coefficient equal to 0.006. ROS is positively affected by ROS_{t-2} (0.0388). The CSRD lags ($CSRD_{t-1}$, $CSRD_{t-2}$, $CSRD_{t-3}$) with their coefficient equal to 0.0952; 0.0704; and 0.0523, respectively, have a positive impact on CSRD. These results suggest that all the response variables (ROA; ROE; ROCE and ROS) and the explanatory variable (CSRD) could rely at least on their value in previous period meaning that they follow a dynamic process (Blasi et al., 2018).

Table 3 provides a complete picture of unit root test results. Indeed, an analysis of unit root test is fundamental due to the assumption of stationarity in the data which is necessary for the reliability of the outcomes from panel data analysis. The conditions of constant variance, covariance, and mean require to be satisfied so that the suggested models and parameters can be perfect. This justifies the significance of the stationarity of data in longitudinal data analysis (Im, Pesaran, & Shin, 2003). Phillips and Perron (1986) demonstrated that running regressions with non-stationarity variables might lead to illusory outcomes, describing significant relationships where, in reality, there is not any. Therefore, it is imperative to examine whether or not the data are stationarity before evaluating the relationship between CSRD and Financial Performance. A unit root test is also important here since the Hausman test is constructed on the assumption that cross-sectional time-series data are free from the unit root. Baltagi (2001). In our study, Levin et al. (2002); Harris and Tzavalis (1999) and Breitung (2000) unit root test were employed. As described by Table 3, all variables used are stationary at the first difference.

Table 4 depicts the outcomes of the Dynamic panel-data estimation, two-step "System GMM". As described in the methodology section, the Hausman test was realized to make decision between fixed effects and random effects. Due to our data specificity, we perform the Hausman specification test using xtoverid command. Here, the null hypothesis indicates that the random effects are independent of explanatory variables. If the p-value > 0.05, then we reject the null hypothesis meaning that the fixed effects should be applied (Adkins, Campbell, Chmelarova, & Hill, 2012). After examining the results of the Hausman test reported in Table 4, it appears that the alternate hypothesis is preferred. Therefore, the fixed effects regressions are appropriate. Thus, there is a correlation between the regressors in the model and the unique errors.

Regarding the Wald test statistic, the numbers culled in Table 4 confirm the rejection of the null hypothesis, which specifies that all regressions parameters across models are concomitantly equal to zero. That means the explanatory variables are significant. They add a contribution to the models (Agresti, 1990). Furthermore, the consistency of the evaluation relies on the serial correlation of the on the residuals in first differences. The Arellano-Bond test AR(2) and AR(3) reveal no evidence that the instruments have any correlation with the error term. In this case, the AR(2) and AR(3) test failed to reject the null hypothesis of no second-order and third-order serial correlation in all regressors. The fact that we do not observe any second-order and third-order serial correlation provides additional proof of the validity of our use of lags, so the application of deeper lags is not needed (Canarella & Miller, 2018). The Hansen and Sargan test corroborate the robustness of the instruments, and the difference-in-Hansen statistics gives a certification that the variables used as instruments variables in the models are valid and effectively strictly exogenous (Chernozhukov & Hansen, 2008; Hansen, Heaton, & Yaron, 1996). With a figure of Groups = 215 and Instruments = 153, our regressions respect the rule of thumb of "System GMM" to provide efficient results. Indeed, the rule of thumb suggests to maintain the number of instruments smaller than or equal to the number of the groups (Baum, Schaffer, & Stillman, 2003; Mileva, 2007; Roodman, 2006). Moreover, the Durbin-Wu-Hausman endogeneity test detects the presence of potential endogenous regressors in the models (Hayashi, 2000). That justifies the appropriateness of using "system GMM" again.

As described in column (1) of Table 4, prior performance computed by the one-year lagged value of ROA is an essential factor of the current ROA. This result has some similarity with Nekhili et al. (2017) which found a positive association between the value of Tobin's q in the previous year and the one of Tobin's q in the present year. The column (1) importantly indicates a positive correlation between CSRD and ROA with a coefficient equal to 0.318 meaning that a percentage change in explanatory variable CSRD is associated with 31.8% increase in ROA in the short run at 10% significant levels, on average, ceteris paribus (Adeleye, Osabuohien, & Bowale, 2017). A significant negative relationship at 1% level (with a coefficient equal to -0.0634) between the three-year lagged measure of CSRD and ROA is also revealed. This corroborates the study of Mansaray et al. (2017) indicating a negative association between CSRD and ROE in African Health and Pharmacy Industry. In column (3), the regression output shows a positive and negative significant correlation at 10% and 1% levels between the three lags of response

variables ($ROCE_{t-1}$, $ROCE_{t-2}$, $ROCE_{t-3}$) and ROCE with 0.477; 0.0474; -0.0190 as the values of coefficients, respectively. A negative correlation between $CSRD_{t-3}$ and ROCE with a coefficient equal to 0.0739 is revealed meaning that a percentage change in explanatory variable CSRD is associated with 7.39% decrease in ROCE in the short run at 5% significant levels, on average, ceteris paribus. In column (2), it is noticed that ROE_{t-2} and ROE are positively linked at 1% level. As far as the relationship between the control variables and response variables is concerned, a significant positive association was found between AT (0.0114), Int (0.00487) and ROA at 10% and 5% level. SIZE has a significant positive effect on ROE, ROCE, and ROS at 5% level. AT is positively correlated with ROCE (0.0304) and ROS (0.0521) at 10% level while Interest Coverage (0.0183) shows a positive interaction with ROS at 5% level.

Table 4 also presents the insignificance of the impact of CSRD on the three other variables of firm performance (ROE, ROS). So out of four response variables measuring firm performance, two of them are not affected significantly by CSRD. These results are consistent with Yoon, Gürhan-Canli, and Schwarz (2006) work and can be ascribed to the fact that African economies seem weak, either due to the absence of reliable institutions, absence of well-fortified government policies or due to lack of stronger stakeholders groups. Managers opt for wrong strategies in implementing CSR or reducing its negative effect. On the other hand, most managers follow the thought of Friedman school, which stipulates that there is only one CSR of business to employ its resources and involved in activities conceived to maximize its stockholders' profits (Friedman, 1970). Moreover, Wilson (2007) mentioned that developing economies are not able to uphold the high standards of social responsibility practices in their developed homologs. This statement is reinforced by Jamali and Mirshak (2007) claiming that sustainability activities are not wholly advanced in African economies and CSR is still suffering from its infancy stage in Africa.

Table 5 indicates the summary of aggregate results about the significant coefficients obtained after the non-linear combinations of the parameters assessed through the regressions (Model 2). CSRD is positively related to most of financial performance measures. Out of four response variables, CSRD is positively linked to three of them (ROA; ROCE; ROS) while it negatively affects one of them (ROE) over the four-year horizon. The control variables SIZE and RISK register more negative correlations to financial performance measures (three negative signs against one positive for SIZE and two negative signs against one positive sign for RISK) whereas Interest Coverage, LEV and AT show more positive impact (two positive signs against one negative).

The negative effect of Corporate Social Responsibility is coherent with the neoclassical economists view arguing that the costs of practicing high level of CSR do not exceed the increased profits, which is registered under the trade-off hypothesis (Preston & O'bannon, 1997). Likewise, this negative impact could result from the case where CSR pushes the company into an inappropriate financial situation relative to companies that do not proceed socially responsible (Aupperle et al., 1985). Thus, the hypothesis H2 stipulating that " CSR practices may decrease the firm's financial performance in Africa " can be viewed as supported.

As it can be observed from Table 4 column (1), the CSRD three year ago produced a significant negative impact on financial performance. And then, the current CSRD gets a significant positive effect on financial performance. This situation corroborates the viewpoint of Nollet et al. (2016) according to which, CSR practices do not generate benefit immediately. However, it instead pays off in the long-run. Thus, as proposed by the slack resources theory, it can be mentioned from this circumstance that CSR effort positively affects firm financial performance in the following years after implementing it Ullmann (1985). This fact supports the Hypothesis H3 arguing that CSR effort does not pay off immediately; it rather pays off in the long run. In addition, by comparing the short-run results (Table 4) and the long-run ones (Table 5), it appears that in the long-run, CSRD affect positively almost all the financial performances measures. Then, the statement proposed by hypothesis H1 " CSR affects positively firm's financial performance in Africa" can be generally adopted.

In scrutinizing prior studies, the positive impact of Corporate Social Responsibility Disclosure on firms performance gives the impression of being ambiguous in that the main challenge of CSR reporting

is to reduce stakeholder's skeptical attitude (Du et al., 2010). This pessimism results from the fact that shareholders and many stakeholders frequently look at CSR communication as strategic. As an outcome, it might not be convincing (Elving, 2013; Grougiou et al., 2016). Some firms may answer back to stakeholders' pressure in an opportunistic way by becoming involved in symbolic disclosures of CSR issues without basically implementing them in reality. CSR communication reliability appears to be exceptionally relevant topic in Africa, where market position enhancement is one of the top reasons that stimulate the CSR reporting strategy of African companies (Babalola, 2012; Heese, 2005). In contrast, ethical innovation and considerations arise as the universal drivers for the remaining world's largest firms. This strengthens the skepticism about managerial motivation under CSRD activities.

Examining beyond the agency paradigm, a robust approach for apprehending how corporate social Responsibility Disclosure may assist companies accomplish great financial performance can be provided by stakeholders theory. This theory claims that a firm can be seen as an ensemble of interdependent connections among stakeholders, which include not only stockholders but all individuals or groups able to affect or be influenced by the firm's activities (Clarkson, 1995). As stated by this framework, companies require communicating the interests of both shareholders and stakeholders who can influence or be affected by the accomplishment of the organizational objectives (Freeman, 1984). This prospect is contrary to agency theory, which derived from the principle that the only CSR of a business is to maximize benefits for its owners or shareholders (Friedman, 1970). Likewise, the stakeholders' prospect proposes that the concerns and interests of shareholders, and stakeholders are not perforce in conflict. Our paper makes contributions to literature by coming up with insights into how the proactiveness of the engagement of stakeholders, which seems to lack in African firms, is of major importance in proving the relevance of CSR disclosure.

7. Conclusion and Future Directions for Research

This paper investigates the possible presence of dynamic, non-linear, endogenous correlation between CSRD and financial performance by considering 215 African listed firms as a whole over 12 years (2005-2016). The endogeneity and the lagged plausible effect of CSRD on the financial performance measures are examined in the short-run using the Arellano-Bond/Blundell-Bond techniques in the dynamic cross-sectional time-series data that we elaborate while the impact of CSRD is explored in the long-run using the Delta method.

In light of our findings, CSRD is highly recommended because in most cases, it can allow the firm's profitability increasing significantly in the long-term scenario. The existence of non-linear positive relationship driving corporate social responsibility communication and financial performance has been demonstrated. In other hand, this research reveals that CSRD may not improve financial performance at once, but it rather generates profitability in the future. Thus, the managers of African firms are encouraged to pay attention to stakeholders' interests and be really engaged in practicing CSR because comprehensive CSRD incites investors to provide more capital since the firm gets greater trust. More capital lead up to better operations. Hence more CSRD will allow higher trust which may surely increase firm financial performance (Dewi, 2015). African Business leaders and shareholders should be patient regarding the expectations on CSR implementation since the tree of CSR may take time to produce good fruits.

Evidently, this study, as any other research suffers from many shortages and limitations, which offer paths to be taken for future research. First, our empirical survey consider African firms as a whole without analyzing data based on industry specificities (Feng, Wang, & Kreuze, 2017). Likewise, this paper explores only a single normalized score of CSRD. Indeed, CSR comprises many dimensions and categories which could have a specific impact on firms financial performance (Yusoff & Adamu, 2016). Second, we deliberately chose some accounting-based measures (ROA, ROE, ROCE, and ROS) to estimate the company's financial performance. These historical measures might be biased since the sample comprises firms from different sectors. Some market-based measures could be included in the analysis to overcome these issues. Market-based variables have the advantage of contemporariness. This signifies that they

reveal changes in CSR quicker than accounting-based variables (Galant & Cadez, 2017). Third, some variables such as Volume of Capital, Firm Age, R&D and advertising intensity (Rettab, Brik, & Mellahi, 2009; Tang, Hull, & Rothenberg, 2012; Wagner, 2010) that might be crucial in influencing financial and social performance were excluded in our investigation. Management research has found that a misspecification of the model may occur in the absence of these variables (McWilliams & Siegel, 2000). Future research should apply different research techniques to address the above limitations.

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