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## Article

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## Article

# Governance Vis-à-Vis Investment Efficiency: Substitutes or Complementary in Their Effects on Disclosure Practice

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**Abstract:** Prior studies provide evidence that both corporate governance and corporate investment efficiency affect corporate disclosure practice. In this paper, we examine their joint effect on disclosure. In particular, we examine whether corporate governance quality and corporate investment efficiency act as substitutes or complements in their impact on narrative disclosure. We collect disclosure scores from Lancaster University's Corporate Financial Information Environment (CFIE) website for a sample of non-financial UK companies for the period 2007–2014. We regress measures of corporate governance and corporate investment efficiency on two different proxies of disclosure practice (performance commentaries disclosure and the tone of narrative disclosure). Consistent with prior studies, we find that both governance and investment efficiency affect disclosure. We contribute to narrative disclosure studies in two crucial respects. First, we provide empirical evidence that governance and investment efficiency has a complementary effect on performance commentaries disclosure. Second, we contribute to the disclosure tone literature by providing empirical evidence that both governance and investment efficiency have a substitution effect on the tone of narrative disclosure.



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**Keywords:** corporate governance; corporate investment efficiency; narrative disclosure; disclosure tone

## 1. Introduction

We examine the impact of corporate investment efficiency and corporate governance on corporate narrative disclosure in the UK. The UK provides an interesting context for our study because most of the narrative sections of corporate annual reports are voluntary. Our paper complements the recent work of Elberry and Hussainey (2020) by considering the joint impact of corporate governance and investment efficiency on disclosure practice. We add corporate governance into the corporate efficiency-disclosure model because prior research shows that corporate governance is a common determinant for both corporate investment efficiency (Billett et al. 2011; Chen et al. 2011, 2019) and voluntary disclosure (Xiao et al. 2004; Samaha et al. 2015; Habbash et al. 2016).

The association between investment efficiency and voluntary disclosure are explained by either signaling theory (Foster 1986; Inchausti 1997; Ross 1977; Campbell et al. 2002) or proprietary costs theory (Verrecchia 1983; McKinnon 1984; Feltham and Xie 1992; Newman and Sansing 1993; Darrough 1993; Gigler et al. 1994). Agency, legitimacy, capital need, and stakeholder theories were used to explain how corporate governance mechanisms influence corporate voluntary disclosure (Xiao et al. 2004; Samaha et al. 2015; Habbash et al. 2016).

In our paper, we investigate the impact of corporate investment efficiency on voluntary disclosure in narrative sections of the annual reports and not vice versa. Considering investment efficiency as a determinant for disclosure is justified as follows. One of the pioneer disclosure studies has examined the impact of top-management style on voluntary

disclosure (Bamber et al. 2010). They find that managers' demographic characteristics of their backgrounds (e.g., their finance and accounting knowledge) affect levels of voluntary disclosure. Baik et al. (2011, 2017) provide evidence that CEO ability improves earnings forecasts and the quality of firms' information environment. Using audit fees as a proxy for the quality of financial reporting, Gul et al. (2018) show that managerial ability affects financial reporting. Similarly, the work of Abernathy et al. (2018) shows that higher managerial ability improves financial reporting timeliness. These studies suggest that management style and ability affect financial reporting. Demerjian et al. (2012) develop a measure of managerial ability, which reflects the ability of companies to use their resources efficiently. Demerjian et al. (2013) argue that companies use inputs like COGS, selling and administrative expenses, net PP&E, net R&D, and purchased goodwill to generate outputs such as revenues or income. The literature (Habib and Hasan 2018; Lee et al. 2018) shows that corporate managers with higher ability could generate higher revenues from their resources than others in the same industry sector. In doing so, managers should be able to make efficient investment decisions. We, therefore, in our paper, use corporate investment efficiency as a proxy for managerial ability. We then test to see if investment efficiency has an impact on other corporate decisions (e.g., voluntary disclosure practice).

The association between corporate investment efficiency and different disclosure types has been investigated by many studies. To the best of our knowledge, the literature—except for Chen et al. (2019) and Elberry and Hussainey (2020)—investigates the effect of disclosure types or transparency on investment efficiency but not vice versa. For example, Cheng et al. (2013); Lai et al. (2014); Al-Hadi et al. (2016); Dutta and Nezlobin (2017); and Zhong and Gao (2017) provide empirical evidence that corporate disclosure improves corporate investment efficiency. Limited studies explore the bidirectional relation association between investment efficiency and disclosure (see for example Chen et al. 2019; Elberry and Hussainey 2020) and the findings are mixed. On one hand, Chen et al. (2019) find no impact of transparency on investment efficiency and their findings are not consistent with the literature (Biddle et al. 2009; Gomariz and Ballesta 2014). They also find that the relationship between investment efficiency and a company's transparency could be negative. They argue that managers investing inefficiently may disclose more information to justify their deviations from optimal investments and empire building. They believe that when managers engage in optimal investments, regulators and investors will demand less information from them. On the other hand, the recent evidence by Elberry and Hussainey (2020) finds that while disclosure positively affects investment efficiency, its tone has a negative impact. They also find a bidirectional relationship between disclosure and investment efficiency.

Following Elberry and Hussainey (2020), we examine the impact of corporate investment efficiency on different types of voluntary disclosure. Our paper is different from Chen et al. (2019) who explore investment transparency (e.g., capital expenditure announcements) as a proxy for disclosure for a sample of Australian companies. We use two measures of voluntary disclosure: performance-related disclosure and the tone of the disclosure. We test to see how these types of disclosure are affected by corporate investment efficiency for a sample of UK non-financial listed companies. We test two different scenarios. The first scenario is that corporate managers of a highly efficient investment strategy will be encouraged to disclose more information to reduce information asymmetry and to attract more stakeholders. The second scenario is that corporate managers will manage the tone of their disclosure in case of over-or- under-investment (Godfrey et al. 2003). Impression management literature shows that managers use narrative statements in their reports either to provide truthful explanations or to obfuscate the users of these reports (Al Lawati et al. 2020a). In our paper, we explore which of these scenarios is present in our sampled companies.

As both governance and investment efficiency affect voluntary disclosure, we contribute to the existing literature by examining their joint impact on disclosure. Following

Hussainey and Walker (2009); Enache and Hussainey (2020); and Haj-Salem et al. (2020), we expect four different scenarios.

First scenario:

Investment efficiency and corporate governance offer the same information. In this situation, the coefficient on *INEFF* will be equal to the coefficient on *CG*. Also, the coefficient on *INEFF\*CG* should be negative and equal in absolute value to the coefficients on *INEFF* or *CG*. Therefore, the total impact of both efficiency and governance should be calculated as shown in Equation (1):

$$INEFF + CG + INEFF*CG = INEFF \text{ or } CG \quad (1)$$

Second scenario:

Investment efficiency and governance provide unrelated information. In this case, the prediction is that the coefficient on *INEFF\*CG* should NOT be significantly different from zero. As a result, the total impact of both investment efficiency and corporate governance should be calculated as shown in Equation (2):

$$INEFF + CG - INEFF*CG = INEFF + CG \quad (2)$$

Third scenario:

Investment efficiency and governance offer related information, which is 'multiplicative or 'reinforcing'. In this case, the coefficient on *INEFF\*CG* should be significantly greater than zero. In other words, the sum of the coefficients on *INEFF*, *CG*, and *INEFF\*CG* should be significantly greater than the sum of the coefficients on *INEFF* and *CG*. In this case, Equation (3) expresses the inference is that both efficiency and governance are strictly complementary.

$$INEFF + CG + INEFF*CG \geq INEFF + CG \quad (3)$$

Fourth scenario:

Investment efficiency and governance provide related information, but some of the information is common to both, i.e., 'partially additive'. Therefore, there is an estimation that the coefficient on *INEFF\*CG* should be significantly lesser than zero (negative). In other words, the sum of the coefficients on *INEFF*, *CG*, and *INEFF\*CG* should be significantly less than the sum of the coefficients on *INEFF* and *CG*. In this case, Equation (4) clarifies the assumption that efficiency and *CG* are partial substitutes.

$$INEFF + CG + INEFF*CG < INEFF + CG \quad (4)$$

Following Hussainey and Walker (2009), the issue of which of these four logical possibilities is true is considered as a purely empirical question and no prior theoretical predictions as to which of these findings is the most likely are offered. Based on these arguments, we test which of these four possibilities is present. We, therefore, hypothesise that:

The joint impact of corporate investment efficiency and corporate governance on voluntary disclosure is additive.

## 2. Materials and Methods

We choose the UK context for our empirical analysis for several reasons. First, most of the narrative sections of the annual reports in the UK are voluntary, and so as a comparison with other countries such as the US and Canada. So, the litigation and regulatory costs are relatively low (La Porta et al. 2006; Aerts and Tarca 2010). Second, these narratives are not auditable and verifiable (Athanasakou and Hussainey 2014), so these narratives are subject to impression management (Clatworthy and Jones 2006). Therefore, we test to see whether both governance and corporate efficiency has an impact on this narrative disclosure practice.

Our sampling process started by collecting data for investment efficiency, corporate governance, and control variables for UK non-financial companies from Bloomberg for the years 2007–2014. This gives us a total of 534 company-year observations. Financial companies were excluded from our analysis because of their unique disclosure characteristics. Then, we collected our disclosure scores from the Corporate Financial Information Environment (CFIE) Online Database of Lancaster University (UK). CFIE provides open access to disclosure scores for years 2007–2014 for the FTSE all-share index. Of 534 company-year observations, we find disclosure scores for only 445 observations. In the results section, the final numbers of observations shown in the output are 334 and 350 for voluntary disclosure and disclosure tone respectively after excluding the outliers. The total number of companies reflected in the final sample was 139 from 9 industrial sectors as shown in Table 1.

**Table 1.** Sample Sector Categorization.

Sector	No. of Companies	%
Materials	13	9.35%
Consumer staples	12	8.63%
Energy	6	4.32%
Consumer discretionary	30	21.58%
Utilities	6	4.32%
Industrials	50	35.97%
Telecommunications	4	2.88%
Healthcare	5	3.6%
Information Technology	13	9.35%
<b>Total</b>	<b>139</b>	<b>100%</b>

We used two proxies for voluntary disclosure: performance commentaries disclosure and disclosure tone. The following subsections discuss these proxies.

### 2.1. First Proxy “Performance Commentaries Disclosure (*Wordcountsum*)”

To collect the disclosure scores, the study uses the CFIE Wmatrix-import web tool allowing for batch scoring of UK annual report narratives<sup>1</sup>. Unstructured annual reports are processed in an electronic format and word count frequencies are produced based on predetermined dictionaries by the Wmatrix (El-Haj et al. 2014, 2016, 2019a, 2019b; Pappas 2015; Salzedo et al. 2018; Lewis and Young 2019). Electronic versions of the UK reports are collected by the CFIE for the years from 2002 to 2014. In this paper, the sample period starts from 2007 and ends in 2014 due to the availability of disclosure scores at CFIE at the time of the analysis.

The *performance* commentaries are the sections considered of the UK annual reports. Aspects of operating activities and financial performance are discussed by these selected commentaries instead of the overall annual report. The performance commentaries reflect either investment efficiency or inefficiency practices of a firm than the overall voluntary disclosure since it is broader, for example; it includes CSR reports, remuneration reports, or governance statements.

The measurement used is the total number of words of a section “s” in an annual report identified as *wordcountsum*. Thus, the disclosure scores obtained as data collected were the word count for the collective performance commentary recognized as *wordcountsum\_Perfom*. The performance-related keywords (as indicated by the Wmatrix) are: sales, revenue, revenues, turnover, trading, cost, costs, expense, expenses, income, earnings, profits, loss, profitability, margin, results, losses, profit, result, margins, and EPS.

<sup>1</sup> The CFIE Wmatrix web import tool is available at <https://cfie.lancaster.ac.uk:8443/>.

## 2.2. Second Proxy “Disclosure Tone”

Disclosure tone refers to the use of a more optimistic, pessimistic, or neutral language in the narrative sections of the corporate annual reports. (Sydserff and Weetman 1999). Net tone performance is used as the second proxy for our disclosure measure. It is calculated as the net positive keywords divided by positive plus negative keywords for the performance commentary. Firms could have fluctuations in their levels of investment efficiencies, and such fluctuations’ impact could be discussed in the form of being good or bad news about the firms. The negativity and positivity related keywords as searched for by Wmatrix are available at the CFIE website.

In our models, we use two main independent variables. The first independent variable is corporate investment efficiency. We use two measures of corporate investment efficiency following prior research (Biddle et al. 2009; Chen et al. 2011). The second independent variable is a score of the quality of corporate governance (Billett et al. 2011; Alhazaimeh et al. 2014; Martikainen et al. 2016). We also consider several control variables following prior research (Barako et al. 2006; Lan et al. 2013; Ressa and Hussainey 2014; Habbash et al. 2016; Aly et al. 2018; Al Lawati and Hussainey 2020; Al Lawati et al. 2020b).

## 2.3. Investment Efficiency’s First Proxy

Following, Hubbard (1998) and Chen et al. (2011), investment efficiency is considered as deviations from estimated investments. They use a model that forecasts investment as a function of sales growth as shown in Equation (5):

$$Invest_{i,t} = \alpha_0 + \alpha_1 NEG_{i,t-1} + \alpha_2 SalesGrowth_{i,t-1} + \alpha_3 NEG * SalesGrowth_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

where  $Invest_{i,t}$  is the total investment of company  $i$  in year  $t$ . It is calculated by the net increase in tangible and intangible assets scaled by lagged total assets.  $SalesGrowth_{i,t-1}$  is the annual sales revenue growth rate for company in year  $t - 1$  and  $NEG_{i,t-1}$  is an indicator variable equals 1 for negative sales revenue growth and 0 otherwise (Gomariz and Ballesta 2014).

The absolute residuals’ value is multiplied by  $-1$  to compute investment efficiency or inefficiency as either over or under investment is not a good indication of a firm’s investment efficiency level. When firms are making investments at a higher rate than expected according to the sales growth, this is shown by a positive residual. On the contrary, underinvestment is reflected by a negative residual when the real investment is less than expected.

## 2.4. Investment Efficiency’s Second Proxy

Richardson (2006) and Biddle et al. (2009) proxy is the most commonly used one for calculating investment efficiency. A firm’s total investment for a certain year is shown in Equation (6), known by *Investment (I)*, which is measured as the sum of R&D, capital expenditures, and acquisition expenditures minus the cash receipts from the sales of PP&E multiplied by 100 and scaled by average total assets:

$$I_t = RD_t + CAPEX_t + Acquisitions_t - SalePPE_t \quad (6)$$

This proxy considers various investment items by including capital expenditures, acquisitions, sales of assets, and R&D and so it is differentiated from other proxies. These components were discussed and studied individually in prior researches; thereof incorporating these investment types is of considerable importance nowadays. Over or underinvestment is determined by the residuals in the error term which are used as measurements for investment inefficiencies. Investment inefficiency takes values between zero and one, where underinvestment is represented by values of zero or values close to zero, whereas overinvestment is specified by values of one or close to one (Biddle et al. 2009).



## 2.5. Corporate Governance

Our measure of corporate governance quality is measured through the Environmental, Social, and Governance (ESG) index from Bloomberg. This measurement was selected due to various reasons. First, each of the corporate governance attributes including ownership structure, the board of directors, and audit characteristics provide mixed results concerning their impact on voluntary disclosure and disclosure tone. Second, the ESG index is dependent upon and trusted by investors, analysts and other stakeholders. Third, the information included in the index is collected from firms' disclosures. Fourth, 'G' in the ESG index measures the quality of corporate governance disclosure and we use this variable as a proxy for governance quality.

## 2.6. Control Variables for the First Measure of Disclosure

Following prior research (e.g., [Elberry and Hussainey 2020](#)), we use several control variables. We control for company size (measured by the natural logarithm of assets); firm's leverage (measured by the book value of debt to total assets ratio); profitability (measured by ROA); liquidity (measured by the current ratio); growth rate (measured by sales growth over years); and firm's age (measured by the natural logarithm of the number of years' since a company is established).

## 2.7. Control Variables for the Second Measure of Disclosure

Following [Elberry and Hussainey \(2020\)](#), we use a number of control variables. We control for company size (measured by the natural logarithm of assets); firm's leverage (measured by the book value of debt to total assets ratio); profitability (measured by ROA); firm-loss status (measured by a dummy variable equals to 1 if a firm is making losses and 0 otherwise); growth rate (measured by sales growth over years); market-to-book ratio; dividend payments, and firm's age (measured by the natural logarithm of the number of years' since a company is established).

In our models, we include measures of voluntary disclosure (the first proxy is "VOLDIS" and the second proxy "is DISTONE"), measures of corporate investment efficiency "INVEFF1" following [Chen et al. \(2011\)](#) and "INVEFF2" following [Biddle et al. \(2009\)](#), a measure for corporate governance (CG), a measure for the joint effect of both investment efficiency and corporate governance (INVEFF1\*CG and INVEFF2\*CG) and control variables. Model 1 shows the regression for the first measure of disclosure and the first measure of corporate investment efficiency, while Model 2 shows the regression for the first measure of disclosure and the second measure of corporate investment efficiency. The models are expressed as follows:

Model (1)

$$VOLDIS_{i,t} = \beta_0 + \beta_1 INVEFF1_{i,t} + \beta_2 CG_{i,t} + \beta_3 INVEFF1*CG_{i,t} + \beta_4 FS_{i,t} + \beta_5 LEV_{i,t} + \beta_6 PROF_{i,t} + \beta_7 LIQ_{i,t} + \beta_8 SG_{i,t} + \beta_9 AGE_{i,t} + \sum Industry\ dummies + \sum Year\ dummies + \varepsilon_{i,t}$$

Model (2)

$$VOLDIS_{i,t} = \beta_0 + \beta_1 INVEFF2_{i,t} + \beta_2 CG_{i,t} + \beta_3 INVEFF2*CG_{i,t} + \beta_4 FS_{i,t} + \beta_5 LEV_{i,t} + \beta_6 PROF_{i,t} + \beta_7 LIQ_{i,t} + \beta_8 SG_{i,t} + \beta_9 AGE_{i,t} + \sum Industry\ dummies + \sum Year\ dummies + \varepsilon_{i,t}$$

where

VOLDIS = Voluntary disclosure

INVEFF1 = Corporate investment efficiency ([Chen et al.'s 2011](#) measure)

INVEFF2 = Corporate investment efficiency ([Biddle et al.'s 2009](#) measure)

CG = Corporate Governance

INVEFF\*CG = Investment efficiency\*Corporate governance

FS = size

LEV = leverage

PROF = profitability

*LIQ* = liquidity

*SG* = sales growth

*AGE* = age

$\varepsilon$  = Error term

Model 3 shows the regression for the second measure of disclosure (e.g., disclosure tone) and the first measure of corporate investment efficiency, while Model 4 shows the regression for the second measure of disclosure (e.g., disclosure tone) and the second measure of corporate investment efficiency. The models are expressed as follows:

Model (3)

$$DISTONE_{i,t} = \beta_0 + \beta_1 INVEFF1_{i,t} + \beta_2 CG_{i,t} + \beta_3 INVEFF1 * CG_{i,t} + \beta_4 FS_{i,t} + \beta_5 LEV_{i,t} + \beta_6 PROF_{i,t} + \beta_7 LOSS_{i,t} + \beta_8 SG_{i,t} + \beta_9 MTB_{i,t} + \beta_{10} DIV_{i,t} + \beta_{11} AGE_{i,t} + \sum Industry\ dummies + \sum Year\ dummies + \varepsilon_{i,t}$$

Model (4)

$$DISTONE_{i,t} = \beta_0 + \beta_1 INVEFF2_{i,t} + \beta_2 CG_{i,t} + \beta_3 INVEFF1 * CG_{i,t} + \beta_4 FS_{i,t} + \beta_5 LEV_{i,t} + \beta_6 PROF_{i,t} + \beta_7 LOSS_{i,t} + \beta_8 SG_{i,t} + \beta_9 MTB_{i,t} + \beta_{10} DIV_{i,t} + \beta_{11} AGE_{i,t} + \sum Industry\ dummies + \sum Year\ dummies + \varepsilon_{i,t}$$

where

*DISTONE* = Disclosure tone

*INVEFF1* = Corporate investment efficiency (Chen et al.'s 2011 measure)

*INVEFF2* = Corporate investment efficiency (Biddle et al.'s 2009 measure)

*CG* = Corporate Governance

*INVEFF\*CG* = Investment efficiency\*Corporate governance

*FS* = size

*LEV* = leverage

*PROF* = profitability

*LOSS* = A binary variable (1 if a firm reported negative net income and 0 otherwise)

*SG* = sales growth

*MTB* = Market-to-book ratio

*DIV* = A binary variable (1 if a firm paid out dividends and 0 otherwise)

*AGE* = age

$\varepsilon$  = Error term

### 3. Results

Table 2 shows the descriptive analysis. It shows that corporate investment efficiency has an average of  $-0.705$  for the first model (*INVEFF1*) and  $-2.11$  for the second model (*INVEFF2*). The *INVEFF1* shows a better result than *INVEFF2*, as values that are closer to zero indicate higher investment efficiency levels (Gomariz and Ballesta 2014). The maximum levels show overinvestment by 9.04% and 21.57% for both models respectively, representing the extreme positive deviations from the expected investment levels. The minimum levels show underinvestment by  $-6.87\%$  and  $-16.05\%$  representing the extreme negative deviations from the anticipated investment levels.

Table 2 also shows that the mean corporate governance (*CG*) is 55.7. This is similar to the findings reported by Cheung et al. (2011). The maximum *CG* score is 71.4 and the minimum score is 42.8.

For both models, combining the effect of investment efficiency and corporate governance (*INVEFF1\*CG* and *INVEFF2\*CG*) has a wider and higher effect. Merging both variables gives a more negative mean reaching  $-33.65$  and  $-125.77$  respectively. A boost in the maximum results reaches 444.35 and 1117.16, recording the highest maximum results among other variables of the sample. It happens with the minimum, which shows the extreme decline to be  $-392.53$  and  $-859.67$ .

As for the dependent variables, Table 2 shows that voluntary disclosure (*VOLDIS*) has a mean of 4.006 which indicates that 10,049 of the performance-related keywords are disclosed by the sampled companies, a maximum of 4.53 (33,142 words), a minimum of



2.71 (518 words) and skewness of  $-0.720$  indicate that data are symmetric around the mean. Disclosure tone (DISTONE) has a mean of 0.335 which indicates that only 0.3% of the performance keywords include positive news and are disclosed by the firms of the sample, a maximum of 0.69 and a minimum of  $-0.06$  (indicating bad news disclosure) and skewness of  $-0.27$  indicating that data are symmetric around the mean.

Finally, the table shows that the mean size for UK firms is 1,799,360,000 (3.26) billion GBP as the value of firm assets, with a maximum of 50.781 (4.71) billion GBP, and a minimum assets' value of 97.96 (1.99) billion. Financial leverage (LEV) has a mean of 19.6% indicating that the sample firms are not highly leveraged. The maximum mean of the leverage is 57% and the minimum is 0% show a large dispersion in firms' debt ratios (Habbash et al. 2016). Profitability (PROF) has a mean of 0.059, with a maximum value of 0.18, minimum  $-0.09$  and a standard deviation of 0.043, and skewness of 0.287. Firm liquidity (LIQ) has a mean of 1.342, with a maximum value of 4.09, minimum of 0.40, a standard deviation of 0.634, and skewness of 1.465. Sales growth (SG) has a mean of 5.379 similar to Hassanein and Hussainey's (2015) findings, while a dispersion shows the maximum growth of firms by 49.61 and least (minimum) growing firms of  $-31.9$  showing a deterioration. The average firm age is 66 years (as the table shows the natural logarithm of the age figures), with a maximum age of 255 years (2.41) and minimum age of less than a year, and a standard deviation of 0.36 and skewness of  $-0.66$ .

**Table 2.** Descriptive Statistics.

Variables	Mean	Maximum	Minimum	Standard Deviation	Skewness
VOLDIS	4.006	4.53	2.71	0.229	$-0.720$
DISTONE	0.335	0.69	$-0.06$	0.146	$-0.27$
INVEFF1	$-0.705$	9.04	$-6.87$	2.677	1.120
INVEFF2	$-2.11$	21.57	$-16.05$	5.71	1.369
CG	55.7	71.4	42.8	6.00	0.67
INVEFF1*CG	$-33.65$	444.35	$-392.53$	147.70	1.019
INVEFF2*CG	$-125.77$	1117.16	$-859.67$	317.66	1.200
FS (LOG)	3.26	4.71	1.99	0.574	0.366
LEV	0.196	0.57	0.00	0.127	0.717
PROF	0.059	0.18	$-0.09$	0.043	0.287
LIQ	1.342	4.09	0.40	0.634	1.465
SG	5.379	49.61	$-31.9$	10.79	0.266
AGE (LOG)	1.82	2.41	0.85	0.36	$-0.66$
LOSS	0.057	1.00	0.00	0.232	3.839
MTB	1.574	3.84	0.71	0.578	1.242
DIV	0.937	1.00	0.00	0.243	$-3.624$

VOLDIS is the performance-related disclosure score; DISTONE is the disclosure tone score; INVEFF1 is the first investment efficiency proxy (Equation (5)); INVEFF2 is the second investment efficiency proxy (Equation (6)); CG is the corporate governance score; INVEFF1\*CG is the interaction between corporate governance and the first proxy of investment efficiency; INVEFF2\*CG is the interaction between corporate governance and the second proxy of investment efficiency; FS is the log firm size measured by total assets; LEV is firm leverage; PROF is firm profitability; LIQ is firm liquidity; SG is sales growth; AGE is the log of firm age; LOSS is a dummy variable equals 1 for loss-making companies and 0 otherwise; MTB is market-to-book ratio; DIV is a dummy variable equals to 1 for firms pay dividends in year  $t$  and 0 otherwise.

Tables 3 and 4 show the correlation analyses. Table 3 shows the correlations for the variables included in Models 1 and 2; while Table 4 shows correlations for the variables included in Models 3 and 4. The tables show that investment efficiency (INVEFF1 and INVEFF2) have an insignificant correlations with voluntary disclosure (VOLDIS) and disclosure tone (DISTONE). The corporate governance (CG) indicated a positive highly sig-

nificant correlation with VOLDIS, while a negative insignificant correlation with DISTONE. The interacted variables of CG and investment efficiency ( $INVEFF1*CG$  and  $INVEFF2*CG$ ) have an insignificant correlation with VOLDIS and DISTONE. The tables also show that FS shows a positive significant correlation with VOLDIS having a 99% confidence level while an insignificant correlation with DISTONE. LEV and AGE have an insignificant correlation with both VOLDIS and DISTONE. LIQ also has a highly significant but negative correlation with VOLDIS with a confidence level of 99%. However, PROF and SG have a negative and insignificant correlation with VOLDIS and a positive highly significant correlation (99% confidence level) with DISTONE. MTB has a positive and highly significant correlation (99% confidence level) with DISTONE, and LOSS correlation with DISTONE has the same strength but with a negative direction. DIV has insignificant correlation with DISTONE.

**Table 3.** Pearson's Correlation Matrix: Voluntary Disclosure Score.

Variables	VOLDIS	INVEFF1	INVEFF2	CG	INVEFF1*CG	INVEFF2*CG	FS	LEV	PROF	LIQ	SG	AGE
VOLDIS	1	−0.101	−0.036	0.308 **	−0.099	−0.054	0.445 **	0.101	−0.075	−0.168 **	−0.038	0.086
INVEFF1		1	0.331 **	0.002	0.994 **	0.330 **	−0.012	0.194 **	0.061	−0.064	−0.021	0.172 **
INVEFF2			1	−0.073	0.330 **	0.994 **	−0.142 **	−0.029	0.082	−0.059	−0.100	0.026
CG				1	−0.023	−0.115 *	0.480 **	0.109 *	−0.067	−0.203 **	−0.098	0.035
INVEFF1*CG					1	0.334 **	−0.012	0.199 **	0.06	−0.048	−0.022	0.162 **
INVEFF2*CG						1	−0.155 **	−0.029	0.083	−0.045	−0.103	0.026
FS							1	0.193 **	−0.188 **	−0.261 **	−0.058	0.155 **
LEV								1	−0.267 **	−0.220 **	−0.016	−0.002
PROF									1	0.169 **	0.256 **	0.045
LIQ										1	−0.042	0.127 *
SG											1	0.072
AGE												1

\* Correlation is significant at the 0.05 level (2-tailed). VOLDIS is the performance related disclosure score;  $INVEFF1$  is the first investment efficiency proxy (Equation (5));  $INVEFF2$  is the second investment efficiency proxy (Equation (6)); CG is the corporate governance score;  $INVEFF1*CG$  is the interaction between corporate governance and the first proxy of investment efficiency;  $INVEFF2*CG$  is the interaction between corporate governance and the second proxy of investment efficiency; FS is the log of firm size measured by total assets; LEV is firm leverage; PROF is firm profitability; LIQ is firm liquidity; SG is sales growth; AGE is the log of firm age; LOSS is a dummy variable equals 1 for loss-making companies and 0 otherwise; MTB is market-to-book ratio; DIV is a dummy variable (1 for firms pay dividends and 0 otherwise). \*\* Correlation is significant at the 0.01 level (2-tailed).

**Table 4.** Pearson's Correlation Matrix: Disclosure Tone Score.

Variables	DISTONE	INVEFF1	INVEFF2	CG	INVEFF1*CG	INVEFF2*CG	FS	LEV	PROF	LOSS	SG	MTB	DIV	AGE
DISTONE	1	0.048	−0.038	−0.064	0.047	−0.047	−0.011	−0.020	0.241 **	−0.188 **	0.163 **	0.252 **	0.076	−0.024
INVEFF1		1	0.364 **	−0.014	0.994 **	0.363 **	−0.012	0.196 **	0.085	−0.070	−0.040	0.074	0.139 **	0.155 **
INVEFF2			1	−0.079	0.363 **	0.994 **	−0.159 **	−0.001	0.120 *	−0.031	−0.125 *	0.240 **	0.051	0.013
CG				1	−0.039	−0.118 *	0.480 **	0.077	−0.060	0.001	−0.092	0.062	−0.006	0.042
INVEFF1*CG					1	0.367 **	−0.010	0.203 **	0.081	−0.062	−0.041	0.069	0.139 **	0.144 **
INVEFF2*CG						1	−0.168 **	0.002	0.122 *	−0.023	−0.128 *	0.241 **	0.047	0.015
FS							1	0.191 **	−0.157 **	0.025	−0.050	−0.200 **	−0.084	−0.157 **
LEV								1	−0.241 **	0.087	−0.017	−0.134 *	0.036	0.003
PROF									1	−0.477 **	0.258 **	0.674 **	0.215 **	0.040
LOSS										1	−0.157 **	−0.162 **	−0.241 **	−0.023
SG											1	0.158 **	0.156 **	0.083
MTB												1	0.137 *	0.006
DIV													1	0.073
AGE														1

\* Correlation is significant at the 0.05 level (2-tailed). DISTONE is the disclosure tone score;  $INVEFF1$  is the first investment efficiency proxy (Equation (5));  $INVEFF2$  is the second investment efficiency proxy (Equation (6)); CG is the corporate governance score;  $INVEFF1*CG$  is the interaction between corporate governance and the first proxy of investment efficiency;  $INVEFF2*CG$  is the interaction between corporate governance and the second proxy of investment efficiency; FS is the log of firm size measured by total assets; LEV is firm leverage; PROF is firm profitability; LIQ is firm liquidity; SG is sales growth; AGE is the log of firm age; LOSS is a dummy variable equals 1 for loss-making companies and 0 otherwise; MTB is market-to-book ratio; DIV is a dummy variable for dividend payments. \*\* Correlation is significant at the 0.01 level (2-tailed); \* Correlation is significant at the 0.05 level.

### Regression Analysis

The joint effect on corporate governance and investment efficiency on voluntary disclosure.

We introduce an interaction variables ( $INVEFF*CG$ ) in our regression models to examine the joint impact of governance and investment efficiency on disclosure. This study complements that of [Elberry and Hussainey \(2020\)](#).

Table 5 shows that after adding  $CG$ ,  $INVEFF1*CG$ , and  $INVEFF2*CG$ , the ANOVA test still reflects that both models are significant. The R-squared and adjusted R-squared values increased slightly by on average 2%, which indicates that  $CG$  and  $INVEFF*CG$  do contribute in explaining the change in the dependent variable  $VOLDIS$ .

**Table 5.** Investment efficiency and performance-related disclosure.

Variables	Model 1		Model 2		Predicted Sign
	Coefficients	Significance	Coefficients	Significance	
Constant	3.010	0.000	3.134	0.000	NA
$INVEFF$	−1.073	0.022	0.513	0.260	+
$CG$	0.121	0.036	0.061	0.311	+
$INVEFF*CG$	1.014	0.030	−0.501	0.275	+ / −
$FS$	0.451	0.000	0.499	0.000	+
$LEV$	0.028	0.605	0.023	0.668	+
$PROF$	0.071	0.159	0.065	0.203	+
$LIQ$	−0.055	0.291	−0.034	0.522	+ / −
$SG$	−0.015	0.762	−0.015	0.771	+
$AGE$	0.084	0.113	0.062	0.241	+
No. of observations	334		334		
$R^2$	37.3%		36.3%		
Adjusted $R^2$	32.4%		31.3%		
F Value	7.680		7.354		
ANOVA	0.000		0.000		
Year dummy	Yes		Yes		
Industry dummy	Yes		Yes		

The results show that the first model's independent variables  $INVEFF1$ ,  $CG$ , and  $INVEFF1*CG$  have a significant impact on  $VOLDIS$ , while the second model's independent variables  $INVEFF2$ ,  $CG$ , and  $INVEFF2*CG$  have an insignificant impact on  $VOLDIS$ .

According to the hypotheses developed for estimating the scenarios which can explain the impact of  $CG$  and the joint effect of  $INVEFF*CG$  on  $VOLDIS$  ([Hussainey and Walker 2009](#)), the first model's variables can justify which of these hypotheses are accepted and which are not.

Table 5 shows that the values of the coefficients for  $INVEFF1$ ,  $CG$ , and  $INVEFF1*CG$  are −1.073, 0.121, and 1.014 respectively, which consistent with the third scenario. The sum of the coefficients on  $INVEFF1$ ,  $CG$  and  $INVEFF1*CG$  is significantly greater than the sum of the coefficients on  $INVEFF1$  and  $CG$ , shown in the following equation:

$$INVEFF1 + CG + INVEFF1*CG \geq INVEFF1 + CG$$

$$-1.073 + 0.121 + 1.014 \geq -1.073 + 0.121$$

$$0.062 \geq -0.952$$

Therefore, the hypothesis is rejected and the third scenario applies which states that investment efficiency and corporate governance are complements. This complementary effect shows that investment efficiency and corporate governance provide related information and complete each other's' roles.

Considering the direction of the relationships, *INEFF* has a negative and significant impact on *VOLDIS* while *CG* and *INEFF\*CG* have a positive and significant impact. The negative association between *INEFF* and *VOLDIS* could be explained by the proprietary costs theory as when firms' investment efficiency rises, the cost of disclosing information increases by threatening their competitive advantage and position. And so, these firms tend to disclose less (Verrecchia 1983; McKinnon 1984; Feltham and Xie 1992; Newman and Sansing 1993; Darrough 1993; Gigler et al. 1994). The positive impact of corporate governance on *VOLDIS* is expected and supported by previous studies such as Samaha et al. (2015); Habbash et al. (2016); and El-Diftar et al. (2017). So, we can conclude that introducing the *CG* positive impact had reduced the negative impact of *INEFF* and this leads to a positive impact of *INEFF\*CG* on *VOLDIS*, indicating that when firms having strong corporate governance and investing efficiently, they tend to disclose more.

As for the control variables, concerning both models, *FS* shows a positive and significant relation with *VOLDIS* supporting the findings of Hassan et al. (2006) and Al-Hadi et al. (2016), while the remaining control variables show an insignificant association with *VOLDIS*.

*VOLDIS* is the performance related disclosure score; *INEFF* is investment efficiency; *CG* is the corporate governance score; *INEFF\*CG* is the interaction between corporate governance and investment efficiency; *FS* is the log of firm size measured by total assets; *LEV* is firm leverage; *PROF* is firm profitability; *LIQ* is firm liquidity; *SG* is sales growth; *AGE* is the log of firm age; *LOSS* is a dummy variable equals 1 for loss-making companies and 0 otherwise; *MTB* is market-to-book ratio; *DIV* is a dummy equals to 1 for firms pay dividend in year *i* and 0 otherwise.

The joint effect on corporate governance and investment efficiency on disclosure tone.

This section explains the joint impact of corporate governance and investment efficiency on disclosure tone, showing how the good and bad news information is affected by investment efficiency and corporate governance. This relationship was tested by introducing corporate governance (*CG*) and the combined variable (*INEFF\*CG*) to the regression models.

Table 6 shows that after adding *CG*, *INEFF1\*CG* and *INEFF2\*CG*, the ANOVA test still reflects that both models as a whole are significant. The R-squared and adjusted R-squared values increased slightly by on average 1.5%, which indicates that *CG* and *INEFF\*CG* do participate in explaining the change in the dependent variable *DISTONE*.

**Table 6.** Investment efficiency and disclosure tone.

Variables	Model 1		Model 2		Predicted Sign
	Coefficients	Significance	Coefficients	Significance	
<i>Constant</i>	0.518	0.000	0.566	0.000	NA
<i>INEFF</i>	0.132	0.788	0.991	0.039	+
<i>CG</i>	−0.133	0.031	−0.189	0.003	+
<i>INEFF*CG</i>	−0.174	0.725	−1.081	0.026	+ / −
<i>FS</i>	−0.008	0.902	0.010	0.876	+
<i>LEV</i>	0.102	0.067	0.100	0.063	+
<i>PROF</i>	0.010	0.898	−0.008	0.922	+
<i>LOSS</i>	−0.148	0.009	−0.144	0.011	+ / −
<i>SG</i>	0.151	0.004	0.118	0.028	+
<i>MTB</i>	0.192	0.009	0.238	0.002	+
<i>DIV</i>	0.000	0.993	−0.002	0.973	+ / −
<i>AGE</i>	−0.094	0.073	−0.092	0.073	+
<i>No. of observations</i>	350		350		
<i>R<sup>2</sup></i>	29.7%		31.0%		
<i>Adjusted R<sup>2</sup></i>	24.0%		25.5%		
<i>F Value</i>	5.260		5.604		
<i>ANOVA</i>	0.000		0.000		
<i>Year dummy</i>	Yes		Yes		
<i>Industry dummy</i>	Yes		Yes		

The results show that the second model's independent variables *INEFF2*, *CG*, and *INEFF2\*CG* have a significant impact on *DISTONE*, while the first model's independent variables *INEFF1* and *INEFF1\*CG* have an insignificant impact on *DISTONE* and *CG* has a negative significant impact.

According to the hypotheses developed for estimating the scenarios which can explain the impact of *CG* and the joint effect of *INEFF\*CG* on *DISTONE* (Hussainey and Walker 2009), the second model's variables can justify which of these hypotheses is accepted and which is not.

The values of the coefficients for *INEFF2*, *CG*, and *INEFF2\*CG* are 0.991,  $-0.189$  and  $-1.081$  respectively, which applies to the fourth scenario explained before in the joint effect section. The sum of the coefficients on *INEFF2*, *CG*, and *INEFF2\*CG* is significantly less than the sum of the coefficients on *INEFF2* and *CG*, shown in the following equation:

$$INEFF2 + CG + INEFF2*CG < INEFF2 + CG$$

$$0.991 - 0.189 - 1.081 < 0.991 - 0.189$$

$$-0.279 < 0.802$$

Therefore, the hypothesis is rejected and the fourth scenario applies which states that investment efficiency and corporate governance are substitutes. This substitution effect shows that investment efficiency and corporate governance provide related information and can replace each other's roles (similar role).

Considering the direction of the relationships, *INEFF2* has a positive significant impact on *DISTONE* while *CG* and *INEFF2\*CG* have a negative significant one. The investment efficiency positive relation with disclosure tone is supported by the signaling theory, as Foster (1986) and Inchausti (1997) state that managers of profitable companies are encouraged to disclose more of this good news. Disclosure of such type of news is considered as a mechanism to attract investments, improve firms' reputation and justify directors' compensation (Ross 1977; Verrecchia 1983; Campbell et al. 2002). Investment efficiently is a sign of great performance and so disclosing such information would achieve the mentioned benefits. Contrary to the results of corporate governance (*CG*) and *VOLDIS* stated above, *CG* shows a negative impact on *DISTONE*. Firms having strong governance can be more inclined to voluntarily disclose more information (Samaha et al. 2015; Habbash et al. 2016) but not to disclose more good news in specific. Managers may prefer not to disclose good news as their firms' competitive advantage might be threatened. The proprietary costs theory can explain this relationship showing that the costs of disclosing such good news may exceed its potential benefits (Verrecchia 1983; McKinnon 1984; Feltham and Xie 1992; Newman and Sansing 1993; Darrough 1993; Gigler et al. 1994). So, it can be concluded that introducing *CG* negative impact had reduced *INEFF2* positive impact reflected in the joint effect of *INEFF2\*CG* which has a negative impact as well on *DISTONE*, indicating that even if firms have improved investment efficiency, strong corporate governance effect still has a say in the selection of the type of voluntarily disclosed information.

As for the control variables, *LEV*, *SG* and *MTB* show a positive and significant impact on *DISTONE* with confidence levels of 90% and 99%, respectively, supporting the findings of (Hussainey and Aal-Eisa 2009; Ressas and Hussainey 2014). *LOSS* and *AGE* have a negative and significant impact on *DISTONE* with confidence levels of 99% and 90% respectively supporting the findings of Rogers et al. (2011), while contradicting the findings of Aly et al. (2018). The remaining variables *FS*, *PROF*, and *DIV* all show insignificant relationships with *DISTONE*.

*DISTONE* is the disclosure tone score; *INEFF* is the investment efficiency; *CG* is the corporate governance score; *INEFF\*CG* is the interaction between corporate governance and investment efficiency; *FS* is the log of firm size measured by total assets; *LEV* is firm leverage; *PROF* is firm profitability; *LIQ* is firm liquidity; *SG* is sales growth; *AGE* is the log of firm age; *LOSS* is a dummy variable equals 1 for loss-making companies and 0

otherwise; MTB is market-to-book ratio; DIV is a dummy variable equals to 1 for firms paying dividends and 0 otherwise.

#### 4. Discussion and Conclusions

This study aimed to examine the joint effect of corporate investment efficiency and corporate governance on voluntary disclosure as an extension of the work by [Elberry and Hussainey \(2020\)](#). The sample was chosen from the FTSE all-share index for the timing from 2007 until 2014. After introducing the effect of corporate governance and the joint effect of investment efficiency and corporate governance into the regression models, we find that there is a complementary effect between governance and investment efficiency on voluntary disclosure and a substitution effect on disclosure tone ([Hussainey and Walker 2009](#)). A complementary effect means that investment efficiency and corporate governance complete each other's roles. When a firm has a strong corporate governance structure, more monitoring, and strict rules control the managers' actions and thereof limiting an overinvestment in negative NPV projects or under-investing by neglecting positive NPV ones. The substitutional effect reflects that investment efficiency and governance can act as substitutes. Disclosing good news is affected by the quality of the corporate governance system or by the high level of corporate investment efficiency.

These findings would have several implications on stakeholders; as shareholders will be attracted when transparency rise as it indicates the positive complementary effect of having strong governance and efficient investments. Disclosure calms down lenders as well by reflecting the firm's governance and investment position. Referring to the regulatory bodies, governments would act for the firm's benefit if transparency increases by providing subsidies or tax exemptions for encouraging good performance. Also, banks and other lenders would be encouraged to lend funds to firms with a high level of transparency and disclosure rather than firms that do not reveal their status. Also, customers and suppliers are willing to buy and sell on account for highly transparent firms.

There are three main limitations to our paper. First, we did not use all investment efficiency measurements. We just used the two common measures. Second, we focus on the UK context, so the findings might not be generalised to other contexts. Third, the restricted sample timing, since data are not available on CFIE post to 2014 at the time of our analysis.

In a recent study, [Gao and Yu \(2020\)](#) provide a comprehensive survey of investment efficiency measurement and the theories behind these measures (e.g., neoclassical, agency, and real option theories). Further research could examine other investment efficiency measures and investigate whether these measures are linked with different types of corporate disclosure. Also, further research could test to see if our conclusion is valid for other research contexts (e.g., in other developed or developing countries). It would be interesting to empirically examine the relationship between corporate investment efficiency and managerial ability and how this impacts corporate disclosure practice. Finally, further research could use a computer software package to measure different types of disclosure (i.e., R&D narrative disclosure) for a large number of firms over a longer period. This should allow for undertaking a large-scale study on the impact of investment efficiency on disclosure practice.

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