

Article

The Drivers of Corporate Water Disclosure in Enhancing Information Transparency

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Received: 23 December 2019; Accepted: 31 December 2019; Published: 3 January 2020



Abstract: This paper explores drivers of corporate water disclosure (CWD) from an aspect of accountability. Based on legitimacy theory and stakeholder theory, we propose six potential drivers of CWD. First, this paper uses an independent sample *t*-test to analyze differences in CWD among US firms. Later, potential drivers on CWD were identified using ordinal logit regression. These hypotheses posit that debt ratio, blockholders' ownership ratio, inclusion in a capital market index (i.e., S&P500), and the status of belonging to a water-sensitive industry (WSensi) all have a positive effect on CWD. However, the relations of firm size and profitability on CWD are insignificant. This suggests that the supervision of blockholders and creditors can effectively improve the transparency of CWD.

Keywords: accountability; legitimacy theory; stakeholder theory; water-sensitive industry

1. Introduction

The worst environmental conditions caused by climate change are drought and flood [1]. These water-related disasters will exacerbate the uneven distribution of water resources in the world. For instance, while most regions have abundant water resources (e.g., Europe), there are some countries in the world, such as Mozambique, having no access to this basic human right [2]. This environmental phenomenon indicates the worsening of climate change and also highlights the importance of water resources. To be more specific, inadequate water resources management will pose a serious threat to the environment and human health and, in the worst condition, result in the death of all human beings [3]. It may also affect the operations of a firm and cause business failure [4,5]. Therefore, many companies have begun to pay attention to water resources and are faced with both risks and opportunities in water management. These companies have realized that water-related problems may affect profitability if they are not properly addressed. For instance, the financial impacts of water-related problems totaled more than US\$2.5 billion in 2015 [6].

Businesses can no longer use water resources with a “business as usual” mentality [7]. To ensure a stable supply of water resources, water stewardship is necessary [6]. In particular, water-sensitive industries (i.e., industries that are heavily dependent on use of freshwater, including industries with high generation of wastewater and pollution, such as apparel, automobile, drinks and beverages, biotech/pharmacy, chemical, forest product, food production, high-tech/electronics, metal/mining, oil refining, and public utilities [8–10]) are faced with stress from multiple sources. For example, in the supply aspect, they need the quality and quantity of water resources [4] to be stable and the prices be maintained at a reasonable level [11]. In the demand aspect, they are expected to demonstrate the

efficiency and effectiveness of their water stewardship [6,11,12] and implement the highest standards to minimize the company's environmental impacts [13].

Therefore, water stewardship is of high importance to corporations. As pointed out by Hart (1995) [14], water is one of the most important natural resources for corporations and is an essential element of business success [15]. Today, stakeholders are also paying attention to corporate water stewardship. According to Morrison et al. (2010) [16], water stewardship which used to be more internally focused is now focused on risks derived from the socio-political context, the environmental context, and suppliers. This switch of focus is associated with stakeholders' potential influence on corporate water use [17]. In fact, water stewardship has become a critical aspect that investment institutions look at in the evaluation of a firm's performance [6]. Through engagement in water stewardship, which involves identification of weaknesses and disclosure of information on water-related risks and opportunities [8], businesses can achieve sustainable water use [17] and be better prepared for sustainable development [18].

However, sustainable development is built upon legitimacy. As far as water resources are concerned, corporate acquisition of water resources is increasingly viewed as an act that may deprive people's basic human right to water [2,19]. If a business wastes water or its operations do harm to the local water quality, this business is likely to be said to have infringed on the fundamental human right to freshwater. Hence, a firm whose legitimacy is challenged (e.g., when infringing on a fundamental human right) is likely to be frustrated in pursuit of sustainable development. If the firm manages to comply with all regulations governing water use, it can make contributions to the society, establish a better reputation for itself [13], and also achieve sustainable development.

Extensive attention is being paid to water resources, and many organizations [20] have called for corporate water disclosure (hereafter referred to as CWD). Various stakeholder groups are increasingly interested in and concerned about CWD. However, research of CWD is very limited, and research exploring the underlying drivers of CWD is even rarer. Moreover, US firms ranked 15th globally on water productivity in 2016 [21]. In the US, several water protection laws (e.g., Clean Water Act, Safe Drinking Water Act, and Coastal Zone Management Act) have been enacted. These facts manifest that water management is highly valued among both the government and firms in the US. What are the factors driving their disclosure of water-related information? The purpose of this paper is to find drivers of CWD among US-listed firms and empirically examine whether legitimacy pressure and stakeholder pressure have a positive effect on CWD. If stakeholder-related factors can influence water disclosure of corporate accountability, the high regulatory costs can be reduced for stakeholders (e.g., the government and environmental groups).

A recent study by Burritt et al. (2016) [13] explores drivers of corporate water-related disclosure among Japanese firms. Their methodology is based on the coding of water-related information published on corporate websites (1 for companies whose water-related information is disclosed, and 0 for companies whose water-related information is not disclosed). In this paper, we measure water disclosure by CDP's water disclosure rating results. Compared to Burritt et al.'s (2016) [13] method, CDP's water disclosure rating is more systematic and objective (see Method section for details).

This paper contributes to the literature in four aspects. The first contribution is also the most important one. The research is designed to classify CWD performance into several levels and then test the strength of each driver of CWD. This design is not common in literature, so the empirical findings can not only strengthen legitimacy theory and stakeholder theory but also broaden the scope of water disclosure research. Second, our evidence indicates that the debt ratio is positively related to the water disclosure level. Despite being inconsistent with the major conclusion in related literature [22,23], this finding supports Roberts' (1992) [24] argument. It is indeed a rare finding in environmental research. Third, our evidence shows that the presence of blockholders has a positive effect on water disclosure. This finding differs from the findings of previous research on environmental disclosure [13,22]. It suggests that in firms with blockholders have higher ownership of the company, blockholders have a stronger influence on the corporate manager, and the influence will propel the

manager to participate in the CDP survey and attain a higher water disclosure ranking. Kalu et al. (2016) [25] pointed out that separation of ownership and control usually creates information asymmetry, which if not adequately controlled, may be abused by the manager at the expense of shareholders. Therefore, blockholders' ownership ratio has been recognized as having a positive effect on the regulation of corporate responses to climate change. Blockholders' increased attention to water disclosure of the firm can drive the manager to respond to the informational need of stakeholders (shareholders). Their attention to water disclosure meets stakeholder expectations and can also help the firm establish legitimacy in society and achieve sustainable development. Finally, we use S&P500 inclusion as a proxy variable for high market visibility, which is a factor seldom considered in research of water disclosure. Our empirical evidence shows that firms listed in S&P500 are more motivated to disclose their water stewardship information. This seems to imply that there is a higher incentive for firms listed in a capital market index to disclose more environmental information and improve their information transparency for investors of socially responsible investment funds.

2. Theoretical Background

Stakeholder groups are demanding higher CWD. Over the last decade, investors and investment institutions have shown a higher willingness to invest more in firms dedicated to water disclosure [6,8,26]. This is because water disclosure has been recognized as a tool that assures that the company's profit is not created at the expense of the environment [27]. Besides, the Minerals Council of Australia [20] has adopted water disclosure as a means to convey a signal of being water and environmentally friendly to stakeholders. The Coca-Cola company uses water labeling to manifest their care for water resources and the fundamental right to drinking water for all [28]. These behaviors are associated with corporate legitimacy. If water stewardship engages stakeholder groups' attention, firms can use water disclosure to convey to the public that they are using water resources in a reasonable manner that safeguards people's right to water [19]. Therefore, we believe that for analysis of drivers of CWD, legitimacy theory and stakeholder theory can offer valuable insights. In the following paragraphs, we will introduce these two theories respectively.

2.1. Legitimacy

Legitimacy is one of the most influential concepts in the research of corporate environmental reporting [29]. For corporations, showing care for the environment is a cornerstone of legitimacy [30,31]. Hence, they manage to use education and data to influence social perceptions or describe their performances to shape corporate symbols and boost firm performance [32]. In any of the above behaviors, their goal is to convey a legitimacy image through engagement in environmental protection or compliance with regulations to ultimately minimize the legitimacy gap between actual performance and social expectation of the firm [32]. According to organization theory, legitimacy is pivotal to the long-term survival of an organization, and it is fundamentally determined by society.

Therefore, legitimacy theory suggests that organizations continually seek to ensure that they operate within the bounds and norms of their respective societies [33]. To this end, they will endeavor to make their business activities consistent with accepted behavioral norms in larger social systems [34]. Simply put, it is necessary for organizations to establish legitimacy within the bounds and the norms that are widely accepted in society [32]. Recent studies [18] have pointed out that environmental protection is an effective legitimization strategy. Corporations will use legitimacy as a signal or symbolic actions to communicate a "public image" [34] and then align their primary goals with the image to avoid causing social or environmental problems [35]. Environmental problems arising from climate change have posed a threat to corporate legitimacy (e.g., stakeholder groups are paying greater attention to corporate responsibility for the environment and water resources [18], and businesses may employ legitimization strategies [36] to achieve the primary goals, methods or outcomes of their operations). In fact, legitimacy has been recognized as a vital resource for organizations [34]. Therefore, businesses will use environmental protection initiatives or policies to solicit social support and enhance

their legitimacy [18]. Legitimacy can also lead to a higher reputation, higher profitability, more balanced policy development, and lower risks [37]. In a nutshell, legitimacy is an organization-society relationship that brings social support for the organization. It is also one of the incentives for businesses to disclose environmental information to stakeholders.

2.2. Stakeholder Theory

Stakeholder theory explains the relationship between stakeholders and the information they receive [38]. When communicating water stewardship practices with stakeholders, firms' disclosure of water-related information plays an important role. Gray et al. (1995) [39] stated that disclosure of information to stakeholders is likely to be viewed as a kind of corporate contribution to society. Stakeholders usually use water-related information disclosed by a firm as one of the measures of a firm's reliability and legitimacy.

Regarding corporate disclosure, two views of stakeholder theory have been developed, one is normative or ethical [40], and the other is managerial [41,42]. Both views stress the importance of sufficient disclosure of internal information to stakeholders. The major difference between the two views lies in the focus of the disclosure content. The normative or ethical view suggests that equality should be considered in the disclosure of any information [40]. The managerial view argues that stakeholders' responsibility is to ensure that the disclosure content is relevant to decisions [42]. To be more specific, the normative or ethical view suggests that businesses should endeavor to disclose detailed information on water stewardship to all stakeholder groups, while the managerial view suggests that disclosing water-related information that supports stakeholders' investment decisions is well enough. There is a certain degree of difficulty for a company to provide detailed information on water stewardship [13], and the cost-effectiveness of the disclosure should be usually considered. Firms may prefer to take the managerial view of stakeholder theory when dealing with the disclosure. Through disclosure of water stewardship information, they can communicate with stakeholders and develop a better relationship with them [43]. Firms' favor for the managerial view is also documented in previous research [44–48].

In addition, literature [49,50] has mentioned that pressure for water-related disclosure is related to a series of firm characteristics. In this paper, we will adopt the managerial view of stakeholder theory to discuss drivers of CWD, which include financial drivers (e.g., firm size, profitability), creditor driver (e.g., debt ratio), blockholder driver (e.g., degree of ownership concentration), market viability driver (e.g., inclusion in S&P500), and industry characteristic driver (e.g., water sensitivity). Our hypotheses will be developed based on these drivers as Figure 1.

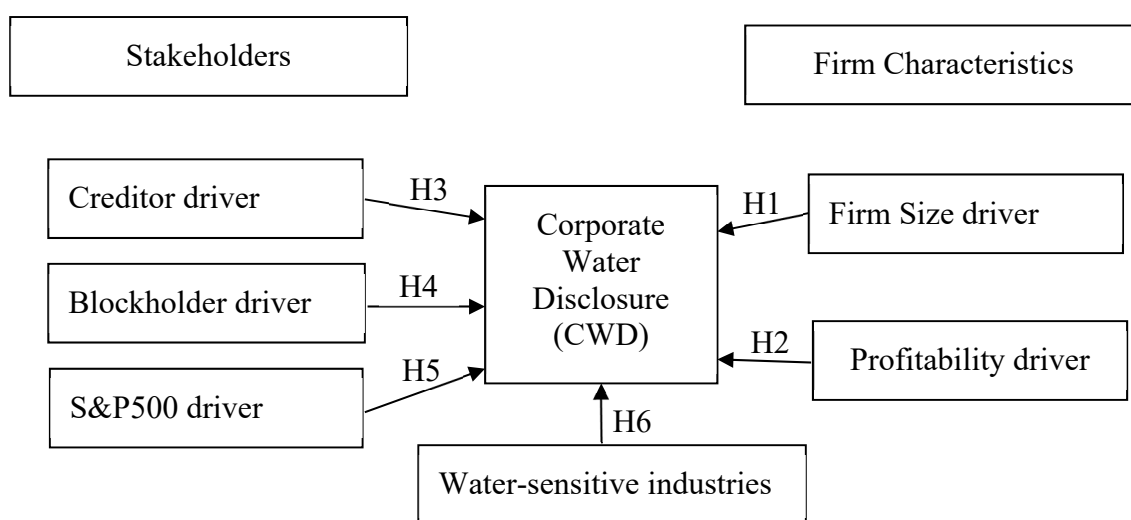


Figure 1. Theoretical framework with hypotheses.

Financial drivers: In this paper, we evaluate only the effects of firm size, profitability, and debt ratio. Larger firms invite public attention more easily, and their operations generally involve the interests of a wider range of stakeholder groups [51]. Larger firms are also more likely to become the subject of tight scrutiny by the government or special stakeholders (e.g., consumers with hostility or radical employees) [27]. Therefore, larger firms are usually more willing to disclose water-related information to reduce negative attention [22], maintain their legitimacy [18], and also prevent consumers' boycott of their products. This argument has been supported in many empirical studies. For instance, the empirical evidence in Huang and Kung (2010) [52], Kuo and Yu (2017) [53], and Marquis and Qian (2014) [54] have confirmed that firm size is positively related to environmental reporting. Therefore, we propose the following hypothesis:

Hypothesis 1. *Larger firms release more information on CWD.*

Logsdon (1985) [55] found that environmental policy is sensitive to profitability. This is because profitability provides firms with abundant resources and the agility needed for coping with stakeholder concerns [23,56]. Firms are also under pressure from stakeholder expectations. They need to ensure that their activities comply with social norms and regulations [49,57]. The correlation between profitability and environmental disclosure has been confirmed in empirical research of stakeholder theory. However, some studies [22,53] have offered a different insight which suggests that profitability is not related to environmental disclosure. To test whether profitability is also a driver of CWD, we propose the following hypothesis:

Hypothesis 2. *Firms with a higher profitability release more information on CWD.*

Creditor driver: Creditors are the provider of corporate loans. For corporations, creditors are important and powerful stakeholders, because they (creditors) are capable of influencing corporate disclosure actions [23]. Previous research [22] has found that when firms have a low degree of leverage, their creditor stakeholders will exert less pressure to constrain the manager's discretion over disclosure. In other words, the disclosure level is negatively related to leverage. However, Roberts (1992) [24] argued that when firms have a higher degree of leverage, they are expected to have more responses to issues concerned by stakeholders (e.g., environmental and social issues). A recent water stewardship report [6] shows that water shortage will cause a tremendous loss of firms. Hence, we propose the following hypothesis:

Hypothesis 3. *Firms with a higher leverage ratio release more information on CWD.*

Blockholder driver: Blockholders are likely to have an impact on corporate disclosure policy. As suggested in previous research [24,58], both the concentration of ownership and dispersion of ownership affect corporate disclosure policy. The evidence in Reverte (2009) [27] suggests that ownership is positively related to corporate social responsibility (CSR) disclosure score. However, there is also evidence suggesting that shareholders of firms with a more dispersed ownership structure pay more attention to environmental management and will also impose greater pressure on voluntary disclosure policies [59], especially disclosure of environmental stewardship information [58]. We argue that when blockholders have a higher ownership ratio, they will be more concerned about the firm's legitimacy issues (e.g., water risks management) because these issues affect the firm's image and reputation. Blockholders' heightened concerns about these issues will relatively increase the pressure of water disclosure on managers. Therefore, we propose the following hypothesis to examine whether blockholders' ownership ratio is also a driver of CWD.

Hypothesis 4. *Firms with a higher blockholders' ratio release more information on CWD.*

High market visibility: Since 2009, CWD has been a concern for investment institutions [6]. This is because the stakeholder group believes that through disclosure of water-related information, corporations also make their water risks and coping mechanisms more transparent [60]. Besides, water disclosure assures stakeholders that the company's profit has not been created at the expense of the environment [27]. To be more specific, investment institutions are also changing their attitude to place a greater emphasis on sustainability [60]. This is why more and more investment institutions consider water disclosure in the making of investment decisions [2]. For instance, S&P500 is a market value-weighted index. Firms listed in S&P500 are relatively larger in size and playing a more important role in the stock market. The criteria for S&P500 inclusion are high. Hence, S&P500 is said to be representative of the stock market and even the US economy. Firms included in S&P500 have higher market visibility (exposure) and can more easily win the trust of market investors (institutional investors). In order to meet stakeholder expectations and legitimacy requirements, managers of these firms may volunteer to accept CDP's evaluations in pursuit of higher environmental performances, such as water disclosure rating, which is an important reference for green investors. Therefore, we use S&P500 inclusion as a proxy variable for high market visibility. As hypothesized below, whether the inclusion in a capital market index is positively related to water disclosure is tested.

Hypothesis 5. *Firms included in a famous index of capital market release more information on CWD.*

Industry characteristics: Water-sensitive industries draw heightened attention from stakeholders [57] because their operations are susceptible to close attention and scrutiny by the government, environmental groups, and the public [18,49]. The attention or pressure from stakeholders influences the environmental disclosure of firms in these industries. For example, Morrison et al. (2010) [16] and Sarni (2013) [9] pointed out that environmental disclosure is related to specific industry characteristics. Kuo and Yu (2017) [53] found that environmentally sensitive industries are significantly associated with higher environmental disclosure levels. To be more specific, environmentally sensitive industries are expected by stakeholders to meet higher environmental disclosure and water disclosure requirements compared to non-environmentally sensitive industries [49]. This also explains why the environmental disclosure policy of firms in environmentally sensitive industries is subject to the influences of stakeholders. To examine whether this industry characteristic is a driver of water disclosure, we propose the following hypothesis:

Hypothesis 6. *Firms belonging to a water-sensitive industry release more information on CWD.*

3. Method

3.1. Sample

The empirical data consist of two parts. The first part is financial data collected from the annual reports published on each sample firm's website. The second part is water disclosure data collected from CDP Global Water Report 2016. CDP's scoring method is step-wise. Participating companies will be accessed across four levels, including Disclosure, Awareness, Management, and Leadership. The number of points that a company has been awarded for each level will be divided by the maximum number that could have been awarded. The fraction is then converted to a percentage by multiplying by 100. The result is the company's score for this level. The company's final grade is determined by the score it has received for each level. The letter grading method is as shown in Table 1. A minimum score of 75% is required to be accessed on the next level. For instance, company A scores 86% on Disclosure, 77% on Awareness, and 63% on Management, so company A will be awarded "B". Company B scores 76% on Disclosure and 37% on Awareness, so company B will be awarded "C-". Companies that have not disclosed any water-related information will be given an "F" grade (i.e., Failure indicates no sufficient information is available for evaluation).

Table 1. Letter Grading Method.

Level		Score
Leadership	A	75–100%
	A ⁻	0–74%
Management	B	40–74%
	B ⁻	0–39%
Awareness	C	40–74%
	C ⁻	0–39%
Disclosure	D	40–74%
	D ⁻	0–39%
Failure	F	Failure to disclose

Source: CDP (www.cdp.net/en/research/global-reports/global-water-report-2016).

We collected water disclosure results of 347 US firms in 2016 (in 2015, US firms disclosed water-related information only as a response to CDP, and no evaluation result was published). We excluded the following firms from the sample: (1) 3 firms in the financial industry. The financial industry has special industry characteristics [61]. As a service industry, the financial industry has a comparatively smaller impact on water resources and is faced with fewer environmental problems [22]. (2) 25 firms whose water-related information was “not scored” were excluded. (3) 18 firms with missing financial data, and 7 non-listed firms were excluded. The final sample consists of 294 firms. The sample distributions before and after filtering are shown in Table 2.

Table 2. Sample Distribution by Industry.

Industry Type	Initial Number of Firms	Final Number of Firms
Consumer discretionary	64	61
Consumer staples	48	39
Energy	38	35
Financials	3	0
Health care	38	34
Industrials	45	38
Information technology	46	33
Materials	31	28
Telecommunication Services	3	1
Utilities	31	25
Total	347	294

3.2. Research Model

To capture potential drivers of voluntary water disclosure by corporations, we develop an empirical model as follows:

$$Wdisc_{i,t} = \beta_0 + \beta_1 Size_{i,t} + \beta_2 Profit_{i,t} + \beta_3 Lev_{i,t} + \beta_4 Ownership_{i,t} + \beta_5 S\&P500_{i,t} + \beta_6 WSensi_{i,t} + \varepsilon \quad (1)$$

where $i = 1, 2, \dots, 294$ and $t = 2016$, WDisc denotes water disclosure. In CDP, water disclosure is divided into five levels: Leadership (A and A⁻), Management (B and B⁻), Awareness (C and C⁻), Disclosure (D and D⁻), and Failure (F). To achieve the goal of our empirical analysis, we adopt Chiang and He’s (2010) [62] method, which is to convert A and A⁻ into “5” points, B and B⁻ into “4” points, C and C⁻ into “3” points, D and D⁻ into “2” points and F into 1 point. Size denotes the firm size. It is measured by business revenue. In our sample, Size ranges between US\$142 million and US\$728,243 million. To correct non-normality, this variable is converted to a natural logarithm. Profit denotes profitability. In this paper, Profit is measured by earnings before interest and taxes (EBIT) over average assets. Based on Reverte’s (2009) [27] concept, this variable is also represented by a natural algorithm.

Lev denotes leverage and is measured by total debts over total assets. Ownership is the ownership ratio by blockholders. Following previous research [63], we use the total ownership of the top five blockholders as a measure of ownership concentration. To correct non-normality, we convert data of this variable into natural logarithms. S&P500 is a dummy variable, where 1 denotes that the firm is included in S&P500, and 0 denotes that the firm is not. WSensi is also a dummy variable, where 1 indicates that the firm belongs to a water-sensitive industry, and 0 indicates that the firm does not.

4. Results

Table 3 shows descriptive statistics. As shown in Table 3, the mean level of water disclosure in the entire sample is 2.40, which also implies that the overall level of water disclosure is not high. We further use an independent-sample *t*-test to analyze differences between different sample groups. The results are presented in the Table (*T*-Test of Water Disclosure).

Table 3. Descriptive Statistics.

	Obs	Min	Max	Mean	S.D.
WDisc	294	1.00	5.00	2.40	1.49
Size	294	2.15	5.86	4.06	0.50
Profit	294	0.23	3.35	0.97	0.38
Lev	294	0.08	2.03	0.66	0.21
Ownership	294	0.34	3.81	2.21	0.65
S&P500	294	0.00	1.00	0.70	0.46
WSensi	294	0.00	1.00	0.56	0.50

Note: WDisc denotes water disclosure level. Size is firm size. Profit stands for profitability. Lev denotes debt ratio. Ownership denotes concentration of ownership. S&P500 is a dummy variable, where 1 indicates the firm is listed in S&P500 index and 0 indicates the firm is not. WSensi is a dummy variable indicating whether the firm belongs to a water-sensitive industry. 1 indicates Yes, and 0 indicates No.

Table 4 shows the correlations between variables. As shown in this table, the correlation coefficients range between -0.07 and 0.25 , suggesting almost no collinearity between variables. Besides, water disclosure (WDisc) is significantly and positively correlated to firm size (Size), blockholders' ownership ratio (Ownership), S&P500 inclusion (S&P500), and the status of belonging to a water-sensitive industry (WSensi).

Table 4. Correlation Matrix.

	WDisc	Size	Profit	Lev	Ownership	S&P500	WSensi
WDisc	1.00	0.16 **	-0.07	0.13 **	0.22 ***	0.16 ***	0.13 **
Size		1.00	-0.09	0.18 ***	0.23 ***	0.18 ***	0.05
Profit			1.00	-0.04	0.12 **	-0.05	0.25 ***
Lev				1.00	0.06	0.07	0.01
Ownership					1.00	0.24 ***	0.22 **
S&P500						1.00	0.04
WSensi							1.00

** $p < 0.05$, *** $p < 0.01$.

Table 5 compares the water disclosure scores between different sample groups. From Panel A to Panel C, we can find that firms in the water-sensitive industries, S&P500 firms, and S&P500 firms in water-sensitive industries all score higher on water disclosure than their respective counterparts, and the differences are significant. However, what are the factors driving these firms to disclose water information voluntarily? Table 5 does not offer an answer to this question. Therefore, we further conduct ordinal logit regression analysis to explore the drivers of voluntary water disclosure. The results are presented in the next section.

Table 5. T-Test of Water Disclosure.

Panel A: Firms in Water-Sensitive Industries vs. Firms not in Any Water-Sensitive Industry	
	Water disclosure score
	Mean (S.D.)
WRSI (Obs. = 167)	2.57 (1.52)
NWRSI (Obs. = 127)	2.18 (1.43)
<i>t</i> -value	2.24 **
Panel B: S&P500 firms vs. Non-S&P500 firms	
	Water disclosure score
	Mean (S.D.)
S&P500 (Obs. 207)	2.56 (1.49)
Non-S&P500 (Obs. 87)	2.03 (1.44)
<i>t</i> -value	2.80 ***
Panel C: S&P500 firms in water-sensitive industries vs. Non-S&P500 firms in non-water-sensitive industries	
	Water risk disclosure scores
	Mean (S.D.)
S&P500 with WRSI (Obs. 120)	2.72 (1.50)
Non-S&P500 with NWRSI (Obs.174)	2.18 (1.18)
<i>t</i> -value	3.055 **

** $p < 0.05$, *** $p < 0.01$.

Table 6 presents the drivers of water disclosure obtained from empirical analysis. As shown in this table, Lev, Ownership, S&P500, and WSensi are all positively and significantly related to water disclosure. This finding supports H3, H4, H5, and H6, meaning that debt ratio (Lev), ownership concentration (Ownership), inclusion in a capital market index (S&P500), and the status of belonging to a water-sensitive industry (WSensi) are all important factors of CWD. Firm size (Size) is positively related to water disclosure score, but not to the extent of significance. The relation between profitability (Profit) and water disclosure score is negative but not significant. Therefore, there is no evidence suggesting that firm size and profitability are significant drivers of CWD.

Table 6. Ordinal Logit Analysis of the Drivers of Water Disclosure.

	Coefficient	Wald
Size	0.29	1.52
Profit	−0.40	1.36
Lev	1.21	5.00 **
Ownership	0.42	4.82 **
S&P500	0.48	3.36 *
WSensi	0.49	4.34 **
Pseudo R-Square		
Cox and Snell		0.094
Nagelkerke		0.103
<i>Obs.</i>		294

* $p < 0.1$, ** $p < 0.05$.

5. Discussion and Conclusions

5.1. Discussion of Results

The objective of this paper is to explore drivers of CWD, which is an important aspect of corporate accountability. Based on legitimacy theory and stakeholder theory, we develop a theoretical framework consisting of six independent potential drivers of CWD. Among the six proposed hypotheses, four are supported. These hypotheses posit that debt ratio (Lev), blockholders' ownership ratio (Ownership), inclusion in a capital market index (S&P500), and the status of belonging to a water-sensitive industry (WSensi) are positively related to water disclosure. The other two unsupported hypotheses posit that

firm size (Size) and profitability (Profit) have an effect on water disclosure. Our empirical results are respectively discussed as follows: Firstly, the debt ratio is positively and significantly related to CWD. This suggests that when firms have higher leverage, in response to pressure from creditors, they will disclose more information on issues that are concerned by creditors (e.g., water risks and opportunities). The relation between blockholders' ownership ratio and water disclosure is significantly positive. This suggests that firms with a larger ownership ratio by blockholders are likely to be more concerned about their image, reputation, and the impacts of water-related issues on them (e.g., sales and legitimacy). As a result, their managers are under greater pressure to disclose water-related information.

Secondly, inclusion in a capital market index is confirmed as a potential driver of water disclosure. When a firm is included in S&P500, it will pay particular attention to information that affects stakeholders' investment decisions. This empirical finding also supports the argument that managers prefer the managerial view of stakeholder theory.

Thirdly, the status of belonging to a water-sensitive industry is also a driver of CWD. Most water-sensitive industries are engaged in the production of products that are essential in our daily life. As a result, they invite special attention from stakeholders easily. Compared to other industries, water-sensitive industries are exposed to higher water risks and under greater pressure to disclose water-related information [13]. They are also more dedicated to water disclosure compared to other industries (see Table 4). Besides, the water shortage has become a global issue [16], as it may cost businesses tens of billions of dollars [4,6]. Therefore, as suggested by legitimacy theory and stakeholder theory, water-sensitive industries pay greater attention to water management and disclosure of water-related information.

Finally, there is no direct evidence showing that firm size is a driver of CWD, but it is positively related to the water disclosure level. The relation between profitability and water disclosure level is negative. This finding does not support a prominent finding of previous research [64] that firms with higher profitability are faced with higher stakeholder expectations and higher demands for non-financial information. However, it echoes the evidence in Brammer and Pavelin (2008) [22] which suggests that profitability is not significantly related to environmental disclosure.

5.2. Implications for Research

Firms' strategies to disclose information to stakeholders may depend on their decision to take the managerial or the normative/ethical view of stakeholder theory. As to disclosure of environmental issues, especially issues that concern the basic rights of stakeholders (basic right to water), previous research [41] has pointed out that the managerial view of stakeholder theory is more advised. Our empirical evidence also supports this view (i.e., the managerial view of stakeholder theory).

In this paper, we classify CWD performances into several levels to identify potential drivers of CWD. Our findings are not entirely consistent with those shared in literature [13]. Therefore, our findings can not only strengthen the managerial view of stakeholder theory but also have a practical value. To be more specific, the design of disclosure levels has helped us capture factors driving CWD and also find that increased monitoring by blockholders and creditors' pressure can contribute to a significant improvement in transparency of corporate water management.

5.3. Implications for Practice

A firm's attitude toward water stewardship is hard to fake. As water resources are increasingly scarce around the globe, water has become one of the most important natural assets [1,16], and stakeholders are also paying special attention to water-related issues. This trend has affected firms' water disclosure policy. Based on our empirical findings, we propose two practical suggestions as follows. The first suggestion is about the water disclosure level. Our empirical analysis does not find any information overload in water disclosure by US sample firms [65] but seemingly detects an insufficiency of disclosure among the firms. This finding is consistent with the survey results obtained by Fung et al. (2007) [66]. Therefore, managers should realize that their information disclosure can

hardly meet stakeholder expectations if the disclosure is overloaded or insufficient. The characteristics of information are the key to effective disclosure [67–69]. In other words, in addition to regulatory compliance of water disclosure, managers should also pay attention to the balance of information quality, quantity, and accuracy, so as to maintain a better relationship with stakeholders and create opportunities for sustainable operation and investment [60].

The other suggestion is about drivers of the disclosure. Our findings indicate that the debt ratio and blockholders' ownership ratio are positively related to the water disclosure level. In other words, higher leverage and larger ownership ratio of blockholders can lead to higher transparency of water-related information. To be more specific, when planning a water disclosure strategy, firms are advised to comprehensively consider the disclosure level and the effects of all potential drivers. By doing so, they can not only better meet stakeholder expectations but also win public recognition of their water stewardship practices. Besides, the government and other stakeholder groups can also use water disclosure as a regulatory tool to reduce the regulatory cost.

5.4. Limitation and Future Research

In this paper, the water disclosure data were obtained from CDP's report [1], which shows only the disclosure grade for each participating firm. With only the grade data, we were unable to further excavate other potential drivers of CWD. However, we believe that our empirical findings have covered the major drivers of CWD. In addition, our sample consisted of only US firms. Given this limitation, caution is advised when generalizing our empirical findings to other regions or countries. Future researchers can also compare findings from different countries. Their results will be contributive to literature.

Author Contributions: H.-C.Y. and L.K. proposed the conceptualization of this study and wrote the paper and used the methodology, B.M. wrote and revised the paper. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Major Research plan of the National Natural Science Foundation of China (No. 91846301), Chinese Academy of Engineering Consulting Project (No. 2020-XY-36), Social Science Foundation of Hunan Province of China (Nos. 17YBA409, 15YBB052), and the Think Tank Special Project of Hunan Social Science (No. 18ZWB22).

Conflicts of Interest: The author declares no conflict of interest.

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