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Information disclosure on environmental activities and corporate values of pulp and paper firms in Japan

BIOPRODUCTS BUSINESS

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Abstract

The expansion of wood utilization directly contributes to mitigating climate change, owing to the characteristics of wood as a material. Some environmental, social and governance (ESG) investors place high value on the wood industry, especially firms that demonstrate transparency regarding its challenges to environmental issues. There is a hypothesis that robust ESG propositions can generate additional value for businesses, and this study aims to clarify whether this hypothesis is supported in the case of pulp and paper industry. This study surveyed pulp and paper firms in Japan from 2008 to 2017, covering the emergence and growth of ESG investment, as recommended by the Principles for Responsible Investment (PRI) established in 2006 and Sustainable Development Goals declared by the United Nations in 2015. Additionally, this study determined the current condition of environmental information disclosure using the Global Reporting Initiative (GRI) standards and investigated the relationship between environmental information disclosure patterns and the corporate values among six Japanese pulp and paper firms. The findings indicate that these firms attached importance to environmental information disclosure during this period, although the detailed disclosure strategies differed among firms. Furthermore, this study finds that the GRI standards are useful for clarifying the environmental information strategies presented in non-financial reports. Our findings follow the premise of ESG investing that refers to the consideration of environmental, social, governance, and financial factors in investment decision-making processes: that a strong ESG proposition can generate additional corporate value and support the concept of ESG EBIT (earnings before interest and taxes) that includes not only operating profits, but also investments and labor costs as indicators of stakeholder value.

Keywords: corporate value, environmental information disclosure, wood industry, ESG investing, case in Japan

1. Introduction

Environmental, social, and governance (ESG) investing refers to the consideration of environmental, social, governance, and financial factors in investment decision-making processes (OECD 2020). The number of listed companies that have active efforts on ESG issues has increased in recent years as ESG investing has grown rapidly worldwide. Total ESG investment by institutional investors in Japan reached JPY 514 trillion[1] by March 2021, an increase of 66% over the previous year (Japan Sustainable Investment Forum 2022). Thus, efforts to disclose ESG information have become important business strategies for firms.

The increase in ESG investment supports the hypothesis that a robust ESG proposition can generate additional value for businesses (Koller et al. 2019). This concept is similar to that of the creating shared

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1 For reference, the current approximate conversion rate is: USD 1 = JPY 140.

values (CSV) strategy proposed by Porter and Kramer (2011), who emphasized the importance of investments in long-term business competitiveness that simultaneously address social and environmental objectives (Bockstette et al. 2011). However, empirical evidence supporting this hypothesis remains limited.

Regarding the environmental issues that comprise ESG issues, the expansion of wood utilization directly contributes to mitigating climate change, owing to the characteristics of wood as a material, although sustainable forest management remains an important prerequisite for achieving positive outcomes by utilizing wood products. Therefore, the business models of wood product firms can be considered to have the potential to be positively evaluated by ESG investors particularly concerned with environmental issues. Therefore, this study aimed to clarify whether the hypothesis, robust ESG proposition can generate additional value for businesses, would support the case of the pulp and paper industry. This study examines the potential of wood product manufacturers by specifying the challenges of environmental information consisting of ESG issues of pulp and paper firms in Japan and then measuring the changes in their corporate values in response to the trend of environmental information disclosure.

2. Theoretical background

The rise in ESG investment may provide additional value for enterprises (Koller et al. 2019), which is parallel with the CSV strategy (Porter and Kramer 2011). However, additional evidence corroborating this hypothesis is needed. Halbritter and Dorfleitner (2015) analyzed US market financial data from 1991 to 2012 and concluded that investors should not expect additional returns from trading portfolios of high- and low-rated firms based on ESG aspects. Similar findings were reported by Bauer et al. (2005) for German, UK, and US ethical mutual funds, and by Renneboog et al. (2008) for socially responsible investment funds worldwide, including Japan. Conversely, Nishitani (2014) demonstrated consistency with the hypothesis that environmental efforts positively influence their corporate value through active information disclosure on environmental issues (hereafter, environmental information) by conducting an empirical analysis of financial and non-financial data of 505 Japanese manufacturers between 2008 and 2011. Additionally, Ghoul et al. (2011) found that firms in the US with better corporate social responsibility (CSR) scores exhibit cheaper equity financing, resulting in higher corporate value.

In Japan, the signing of the United Nations Principles for Responsible Investment by the Government Pension Investment Fund in September 2015 precipitated the expansion of ESG investment. The environment for the promotion of ESG investment has been steadily improving, with firms being required to formulate their corporate governance codes and stewardship code. Institutional investors are now under an obligation to engage with the firms in which they have invested, taking ESG issues into account, and to disclose information for the exercise of voting rights.

Nagasaka et al. (2022) analyzed the disclosure of information on social issues by pulp and paper firms in Japan. The findings indicated that the impacts of the SDGs were few, however, a pronounced surge was observed around 2016 pertaining to gender and diversity (concerning SDG5). Furthermore, the disclosure of initiatives pertaining to job creation (concerning SDG8), inequality and human rights (concerning SDG8 and 10), and workplace environment (concerning SDG 8) was prevalent.

3. Method

This study focuses on pulp and paper firms in Japan, which represent the largest consumers of wood materials. Most wood product manufacturers in Japan have recently begun disclosing environmental information, except for pulp and paper firms, which have long been challenged to actively disclose their environmental information after having addressed air and water pollution through their business operations in the past (Kuninaka 1980).

The six firms surveyed were Oji Holdings (Oji), Nippon Paper Industries (Nippon Paper), Rengo Co., Ltd. (Rengo), Daio Paper Corporation (Daio), Hokuetsu Corporation (Hokuetsu), and Mitsubishi Paper Mills Limited (Mitsubishi). These firms belong to the "Pulp and Paper" division listed in the First Section of the Tokyo Stock Exchange Market. Their combined sales represented 69% of 29 major pulp and paper firms in 2020. Oji was Mitsubishi's top shareholder, accounting for 33% of its total stock in 2020. Hokuetsu was also Daio's top shareholder, holding 24% of its total

stock at the same time. Oji, Nippon Paper, and Daio produced paperboards made of recycled paper and printing paper made from wood pulp and recycled paper. Rengo primarily produces paperboard. The other firms primarily produce printing papers.

Non-financial reports showing the firms' countermeasures taken to address environmental issues published between 2008 and 2017 from the six firms were analyzed to determine the conditions of environmental information during the period. This period covers the emergence and growth of ESG investment, as recommended by the Principles for Responsible Investment (PRI) established in 2006. In addition, the Sustainable Development Goals (SDGs) declared by the United Nations in 2015 were covered by the targeted period in this study.

To determine the tendency of environmental information disclosure during this period, we conducted a quantitative content analysis to extract words concerning the environmental information of the six firms using the KH Coder (Higuchi 2016). All sentences in the 60 non-financial reports were used as the dataset for analysis.

This study defines the environmental information of the six firms based on the GRI Standards provided by the Global Reporting Initiative, an independent international organization that helps businesses and other organizations take responsibility for their impacts (Global Reporting Initiative 2021). As all the surveyed reports were written in Japanese, the official Japanese translation of the GRI Standards was employed. This study utilized GRI 301 on "Materials" published in 2016 (Global Reporting Initiative 2016), GRI 302 on "Energy" published in 2016 (Global Reporting Initiative 2016), GRI 303 on "Water and Effluents" published in 2018 (Global Reporting Initiative 2018), GRI 304 on "Biodiversity" published in 2016 (Global Reporting Initiative 2016), and GRI 305 on "Emissions" published in 2016 (Global Reporting Initiative 2016) as the standards concerning environmental issues.

Table 1 presents the coding rules developed for the KH Coder analysis, highlighting keywords concerning environmental issues based on the five GRI Standards. Sentences that included more than one keyword selected according to the coding rules were counted and divided by the total number of sentences in each report. This ratio is called the appearance rate of environmental information. This shows the target firms' tendency to disclose environmental information.

To measure the impact of the appearance rate on corporate value, the following multiple regression model was employed:

$$\mathrm{CVij} = \beta_0 + \beta_1 \mathrm{GRIkj} + \beta_2 \mathrm{Cj} + \beta_3 \mathrm{YEARj} + \varepsilon$$

where CV represents corporate value derived from financial reports; GRI means the appearance rate of environmental information (hereafter the GRI rate); C indicates corporate dummy variable; YEAR indicates year dummy variable; ε represents the error term; $\beta_{0,1,2,3}$ denote coefficients; k denotes the publication, which varies from 1 to 10; j represents individual firms that vary from 1 to 6; and i indicates temporal variables (k, k+1, k+2) examining the CV-GRI time lag. When i was equal to k, we considered that the GRI would give positive or negative impact to the CV in the same year. Similarly, k+1 considered that the GRI would give positive or negative impact to CV after one year, and k+2 would do so after two years.

Three different types of corporate values (CVs) were established in this study for the explained variables. First, return on equity (ROE), is calculated as operating profit divided by shareholder equity. Operating profit was selected as the numerator because it reflects the firm's regular annual earnings capability, which is the basis of long-term corporate value, compared to ordinary profit and bottom-line profit.

Additionally, this study also defines ESGROEr, ESGROEh, and ESGROErh as the explained variables. To calculate ESGROEr, we divide operating profits and investments (R&D) by shareholder equity. Similarly, ESGROEh is calculated as operating profits plus labor costs divided by shareholder equity. For ESGROErh, the numerator includes operating profit, labor costs, and R&D investment divided by shareholder equity. These definitions are based on the ESG EBIT concept developed by Eisai Co., Ltd. and ABeam Consulting Ltd. (Eisai 2020). Regarding these explained variables, this study considers R&D and human capital investment as critical sources of future profits for firms and society.

Additionally, this study specifies whether there is a time lag between the published year of nonfinancial reports and the trend of corporate values by introducing i, which indicates the simultaneous

Table 1. Selected keywords from the GRI Standards in Japanese as the coding rule concerning environmental issues.

GRI Standards		Coding rules in Japanese	Coding rules in English (for reference)
GRI301	Materials	(原材料 and 重量) or (原材料 and 体積) or リサイクル or 再生利用	('materials' and 'weight') or ('materials' and 'volume') or 'recycle' or 'reclaimed'
GRI302	Energy	エネルギー消費量 or エネルギー原単位 or エネルギー必要量	'energy consumption' or 'energy intensity' or 'energy requirements'
GRI303	Water and Effluents	(共有資源 and 水) or 取水 or 排水 or 水消費	('shared resources' and 'water') or ' water discharge' or 'water withdrawal' or 'water consumption'
GRI304	Biodiversity	保護地域 or 生物多様性 or (生息地 and 保護) or (生息地 and 復元) or IUCNレッドリスト or 国内保全種リスト or 生物種	'protected areas' or 'biodiversity' or ('habitat' and 'protected') or ('habitat' and 'restored') or 'IUCN redlist' or 'national conservation list' or 'species'
GRI305	Emissions	温室効果ガス or GHG or スコープ1 or スコープ2 or スコープ3 or 温室効果ガス排出原単位 or オゾン層破壊物質 or ODS or 窒素酸化物 or NOx or 硫黄酸化物 or SOx	'greenhouse gas' or 'GHG' or 'scope 1' or 'scope 2' or 'scope 3' or 'GHG emissions intensity' or 'ozone-depleting substances' or 'ODS' or 'nitrogen oxides' or 'NOx' or 'sulfur oxides' or 'SOx'

effects of information disclosure on corporate value, a one-year time lag, and a two-year time lag.

4. Results and discussion

The dataset, based on 60 non-financial reports of the six firms, was divided into 55,110 sentences. This study clarified 2,314 sentences that included more than one keyword for the defined environmental information. The total number of sentences concerning "Materials (GRI301)" was 961, "Water and Effluents (GRI303)" was 407, "Biodiversity (GRI304) was 803, and "Emissions (GRI305)" was 143. No sentences concerning "Energy (GRI302)" appeared during the period.

The number of sentences concerning "Materials" was the highest because pulp and paper firms focused on using recycled paper for production. Japan Paper Association, which is formed by major pulp and paper firms, including the target six firm, published the recovered paper utilization rate of 66.8% in 2023, which was one of the highest in the world (Japan Paper Association 2024a). This statistical data provides the background for the target six pulp and paper firms to be particularly proactive in disclosing information about material recycling.

The number of sentences concerning "Biodiversity" was also high, because all firms claimed that they procured wood chips from sustainably managed forests that were closely related to biodiversity conservation. Additionally, Oji and Nippon Paper operated large areas of forests themselves, and these forests were certified by the Forest Stewardship Council (FSC) or the Programme for the Endorsement of Forest Certification (PEFC), which place great importance on biodiversity-related issues. Biodiversity has been a key issue for sustainable management that is closely related to natural capital including resources such as water and trees, which are essential resources for the pulp and paper industry. The results suggested that these firms were conducting their businesses with an emphasis on biodiversity and natural capital as core competencies.

"Water and Effluents" and "Emissions" have also been critical issues for all targeted firms because their business operations had caused air pollution and water contamination that had environmental impacts in the 1960s and 1970s in Japan (Kuninaka 1980); pulp and paper firms in Japan have been challenged to take countermeasures to address these issues over the years. For example, the Japanese pulp and paper industry achieved 91.5% reduction of volatile organic compounds (VOCs) emissions in 2022 compared to emissions in 2000, according to the 2023 sustainability published by the Japan Paper Association (Japan Paper Association 2024b).

Conversely, none of the firms had sentences that mentioned "Energy" (GRI302) from 2008 to 2017. The category GRI302 covers energy consumption, energy intensity, and reduction in energy requirements; these topics are critical in connection with climate change issues. They are likely to appear in the non-financial reports of pulp and paper firms as well as in other industries after 2018, however, which is beyond our research period.

Table 2 shows the GRI scores of pulp and paper firms. This study found that trends in environmental information disclosure differed among the six firms. The total GRI scores of the Oji and Nippon paper companies increased during this period. For example, Oji continues its activities concerning environmental conservation and environmental information disclosure. Oji announced the results of an estimate that the multifaceted functions supplied by the approximately 190,000 ha of company owned forests in Japan amount to approximately 550 billion yen per year (Oji Holdings Corporation 2024). This fact implies that environmental information disclosure has become a crucial factor for the corporate management.

The total GRI rates of the other four firms decreased during the same period, however. For example, Rengo showed the highest mean value of the total GRI rate in 10 years, but the GRI rate decreased during the same period. Rengo mainly disclosed "Materials" issues because Rengo's main product was paperboard. The second highest mean value of the total GRI rate was shown by Daio; however, Daio disclosed not only "Materials" issues but also other GRI-related words because Daio produces not only paperboard but also other paper products.

Hokuetsu was an equity method affiliate of Daio, and Mitsubishi was an affiliate of Oji in 2020. However, the GRI rates differed. This indicates that the financial power of parent firms did not affect com-

Table 2. Appearance rate of environmental information (GRI rate) by six pulp and paper firms in Japan.

Company name	Year	Total	GRI301 (Materials)	GRI303 (Water and Effluents)	GRI304 (Biodiversity)	GRI305 (Emissions)
Oji Holdings	2008	2.43%	1.26%	1.17%	0.00%	0.00%
Oji Holdings	2009	3.49%	2.15%	0.54%	0.67%	0.13%
Oji Holdings	2010	3.43%	2.53%	0.30%	0.15%	0.45%
Oji Holdings	2011	3.33%	1.95%	0.49%	0.65%	0.24%
Oji Holdings	2012	3.15%	1.80%	0.09%	1.17%	0.09%
Oji Holdings	2013	3.32%	1.28%	0.83%	0.98%	0.23%
Oji Holdings	2014	5.02%	2.38%	1.32%	0.53%	0.79%
Oji Holdings	2015	2.94%	0.98%	0.98%	0.59%	0.39%
Oji Holdings	2016	3.74%	0.83%	1.46%	0.62%	0.83%
Oji Holdings	2017	4.20%	1.40%	1.63%	0.47%	0.70%
Nippon Paper Industries	2008	4.26%	1.53%	0.80%	1.70%	0.23%
Nippon Paper Industries	2009	3.24%	1.24%	0.33%	1.57%	0.10%
Nippon Paper Industries	2010	5.54%	1.59%	0.71%	2.89%	0.35%
Nippon Paper Industries	2011	5.67%	1.62%	0.58%	3.24%	0.23%
Nippon Paper Industries	2012	5.03%	2.12%	0.39%	2.32%	0.20%
Nippon Paper Industries	2013	6.53%	2.42%	0.65%	3.20%	0.26%
Nippon Paper Industries	2014	6.66%	2.17%	0.72%	3.48%	0.29%
Nippon Paper Industries	2015	7.50%	1.80%	1.08%	4.40%	0.22%
Nippon Paper Industries	2016	7.48%	2.07%	1.35%	3.90%	0.16%
Nippon Paper Industries	2017	6.79%	2.09%	0.61%	4.00%	0.09%
Rengo Co. Ltd.	2008	14.05%	10.32%	2.58%	0.29%	0.86%
Rengo Co. Ltd.	2009	11.30%	6.78%	2.26%	1.41%	0.85%
Rengo Co. Ltd.	2010	8.25%	5.41%	1.71%	0.85%	0.28%
Rengo Co. Ltd.	2011	11.26%	7.36%	1.73%	1.52%	0.65%
Rengo Co. Ltd.	2012	8.10%	4.66%	1.72%	1.23%	0.49%
Rengo Co. Ltd.	2013	5.48%	3.02%	1.51%	0.76%	0.19%
Rengo Co. Ltd.	2014	4.26%	2.41%	0.74%	0.74%	0.37%
Rengo Co. Ltd.	2015	4.82%	2.93%	0.86%	0.69%	0.34%
Rengo Co. Ltd.	2016	5.17%	3.10%	0.69%	1.21%	0.17%
Rengo Co. Ltd.	2017	4.89%	3.06%	0.61%	1.07%	0.15%
Daio Paper Cooperation	2008	2.68%	1.48%	0.88%	0.16%	0.16%
Daio Paper Cooperation	2009	11.72%	7.42%	2.93%	0.78%	0.59%
Daio Paper Cooperation	2010	12.47%	7.05%	3.25%	1.36%	0.81%
Daio Paper Cooperation	2011	12.11%	7.96%	2.08%	1.38%	0.69%
Daio Paper Cooperation	2012	7.94%	4.11%	2.74%	0.27%	0.82%
Daio Paper Cooperation	2013	7.28%	3.64%	2.34%	0.52%	0.78%
Daio Paper Cooperation	2014	5.22%	2.80%	1.49%	0.37%	0.56%
Daio Paper Cooperation	2015	4.94%	2.84%	1.20%	0.45%	0.45%
Daio Paper Cooperation	2016	6.71%	3.56%	1.47%	0.84%	0.84%
Daio Paper Cooperation	2017	2.08%	0.52%	1.30%	0.26%	0.00%
Hokuetsu Cooperation	2008	2.89%	0.28%	0.74%	1.40%	0.47%
Hokuetsu Cooperation	2009	3.71%	2.23%	0.37%	0.74%	0.37%
Hokuetsu Cooperation	2010	1.72%	0.60%	0.26%	0.52%	0.34%
Hokuetsu Cooperation	2011	1.40%	0.60%	0.30%	0.50%	0.00%
Hokuetsu Cooperation	2012	5.80%	3.25%	1.39%	0.93%	0.23%
Hokuetsu Cooperation	2013	2.66%	0.83%	0.66%	1.00%	0.17%
Hokuetsu Cooperation	2014	0.37%	0.11%	0.15%	0.11%	0.00%
Hokuetsu Cooperation	2015	0.55%	0.13%	0.21%	0.21%	0.00%
Hokuetsu Cooperation	2016	0.44%	0.12%	0.16%	0.16%	0.00%
Hokuetsu Cooperation	2017	1.21%	0.27%	0.54%	0.40%	0.00%
Mitsubishi Paper Mills Ltd.	2008	3.73%	1.87%	0.41%	1.04%	0.41%
Mitsubishi Paper Mills Ltd.	2009	6.62%	0.33%	0.33%	5.63%	0.33%
Mitsubishi Paper Mills Ltd.	2010	3.22%	0.40%	0.20%	2.62%	0.00%
Mitsubishi Paper Mills Ltd.	2011	3.43%	0.14%	0.29%	2.57%	0.43%
Mitsubishi Paper Mills Ltd.	2012	4.60%	1.06%	0.53%	2.30%	0.71%
Mitsubishi Paper Mills Ltd.	2013	4.85%	0.75%	0.37%	3.17%	0.56%
Mitsubishi Paper Mills Ltd.	2014	3.78%	0.22%	0.22%	2.67%	0.67%
Mitsubishi Paper Mills Ltd.	2015	3.51%	0.32%	0.32%	2.39%	0.48%
Mitsubishi Paper Mills Ltd.	2016	3.02%	0.40%	0.20%	2.22%	0.20%
Mitsubishi Paper Mills Ltd.	2017	2.32%	0.19%	0.39%	1.55%	0.19%

munication strategies on environmental issues during this period.

Focusing on the trend of each GRI score, this study finds that communication strategies for environmental information differ among firms. For instance, Nippon Paper and Mitsubishi have shown great interest in disclosing information on biodiversity. Conversely, Oji displayed all four types of environmental information with a balance.

The SDGs launched in 2015 did not affect the tendency of the GRI rates of all firms until 2017, although all six firms mentioned the SDGs and their business activities in their non-financial reports published in 2017. This is a critical point to determine whether SDG-related issues would influence the future reports of wood product firms in Japan.

As a result, a table of descriptive statistics was set up in Table 3.

Table 4 shows the coefficient β that indicates the impacts on the corporate values as explained variables in response to the changes of the total GRI rates as an explanatory variable. The results indicate that all the coefficients have positive impacts with sufficient significance. This clarifies that the GRI rate plays a key role in the environmental information disclosure strategies of pulp and paper firms in Japan.

Regarding the time lag of the explained variables, there was little gap between the three pairs: the same year, the next year, and two years later. This result indicates that, at a certain point, corporate value would have already expected future increases or decreases of at least two years.

When analyzing the next year, explanatory variables in 2016, as the last year, would be affected by an explained variable in 2017. When conducting an analysis two years later, the explanatory variable in 2015, the last year, would be an explained variable in 2017.

Focusing on the case of individual firms in Table 5, Oji, Rengo, and Daio showed significantly positive coefficient β for all types of explained variables. These

Table 3. Descriptive statistics.

	Sample size	Average	Standard deviation	Min.	Max.
Corporate value	60	20.604	7.361	5.371	35.696
GRI appearance rate in total	60	0.051	0.031	0.004	0.141
Corporate dummy					
Oji Holdings	60	0.167	0.376	0	1
Nippon Paper Industries	60	0.167	0.376	0	1
Rengo Co. Ltd.	60	0.167	0.376	0	1
Daio Paper Cooperation	60	0.167	0.376	0	1
Hokuetsu Cooperation	60	0.167	0.376	0	1
Mitsubishi Paper Mills Ltd.	60	0.167	0.376	0	1
Year dummy					
2008	60	0.100	0.303	0	1
2009	60	0.100	0.303	0	1
2010	60	0.100	0.303	0	1
2011	60	0.100	0.303	0	1
2012	60	0.100	0.303	0	1
2013	60	0.100	0.303	0	1
2014	60	0.100	0.303	0	1
2015	60	0.100	0.303	0	1
2016	60	0.100	0.303	0	1
2017	60	0.100	0.303	0	1

Note: The corporate value is ESGROErh, which includes operating profit, labor costs, and R&D investment divided by shareholder equity.

Table 4. Impacts of corporate values by the tendency of environmental information disclosure based on all the 60 non-financial reports.

Explained variables: The same year				
Explained variables	ESGROErh	ESGROEr	ESGROEh	ROE
GRI appearance rate in total	125.493 ***	77.274 ***	123.689 ***	75.470 ***
Adj R^2	0.260	0.194	0.288	0.200
Explained variables: The next year				
Explained variables	ESGROErh	ESGROEr	ESGROEh	ROE
GRI appearance rate in total	122.402 ***	72.322 ***	119.605 ***	69.525 **
Adj R^2	0.253	0.160	0.274	0.157
Explained variables: Two years later				
Explained variables	ESGROErh	ESGROEr	ESGROEh	ROE
GRI appearance rate in total	105.446 ***	57.398 **	102.239 ***	54.191 **
Adj R^2	0.212	0.113	0.228	0.107

Note: ** and *** indicate significance at the 1% and 0.1% levels, respectively.

Table 5. Impacts of corporate values on the tendency of environmental information disclosure based on the 60 non-financial reports from individual firms in the same year.

Explained variables	ESGROErh	ESGROEr	ESGROEh	ROE
GRI appearance rate in total				
Oji Holdings	199.383 ***	144.025 **	176.941 **	121.583 **
Nippon Paper Industries	16.723	-14.831	11.123	-20.431
Rengo Co. Ltd.	104.778 ***	63.401 **	106.712 ***	65.335 ***
Daio Paper Cooperation	148.181 ***	94.082 ***	137.415 ***	83.317 ***
Hokuetsu Cooperation	-221.825 **	-91.560	-208.445 **	-78.179
Mitsubishi Paper Mills Ltd.	177.740 ***	-7.412	139.359 **	-45.793
Adj R^2	0.649	0.507	0.652	0.528

Note: ** and *** indicate significance at the 1% and 0.1% levels, respectively.
Explained variables applied the same year of explanatory variables.

firms' performances follow the hypothesis that active environmental information disclosure positively affects corporate value, which is the fundamental premise for ESG investing. Mitsubishi also showed significantly positive coefficient β for ESGROErh and ESGROEh. These facts indicate that labor costs, which could be translated into human capital investment in the context of ESG issues, strongly affected Mitsubishi's corporate values.

Subsequently, the coefficient β showed negative in the case of Hokuetsu's ESGROErh and ESGROEh both of which were affected by labor cost changes. Since the merger of the former Hokuetsu Corporation and former Kishu Paper Co., Ltd. was conducted in 2011, the accumulation of human capital may have been negatively affected by the process of merging.

None of the four explained variables in for Nippon Paper showed any significant negative or positive impacts during the period. Nippon Paper has long been published in CSR reports, but the GRI appearance rate has never affected corporate value. Further research is necessary to determine the reasons for these findings.

Focusing on the case of year in Table 6, significantly positive coefficient β for all explained variables were shown from 2009 to 2011, because it had been announced that 17 member companies of the Japan Paper Association had falsified recycled pulp content

Table 6. Impacts of corporate values on the tendency of environmental information disclosure based on the 60 non-financial reports annually in the same year.

Explained variables	ESGROErh	ESGROEr	ESGROEh	ROE
GRI appearance rate in total				
2008	77.263	38.449	76.262	37.448
2009	163.998 ***	120.322 ***	160.447 ***	116.770 ***
2010	144.105 **	91.788 **	140.723 **	88.407 **
2011	114.118 **	61.504 *	114.228 **	61.613 *
2012	103.485	48.087	103.069 *	47.670
2013	102.135	32.652	99.388	29.905
2014	76.708	15.906	77.110	16.308
2015	84.635	40.507	89.097	44.969
2016	92.011	54.487	95.302	57.777
2017	33.574	-7.172	39.946	-0.800
Adj R^2	0.211	0.224	0.245	0.226

Note: ** and *** indicate significance at the 1% and 0.1% levels, respectively.
Explained variables applied the same year of explanatory variables.

ratios in a wide range of recycled paper products, including notebooks and copy paper in January 2008, and the pulp and paper firms in Japan then had to announce the countermeasures to this issue (Research Bureau of the House of Representatives 2008). Other year dummy variables did not show any significance, and this indicated that there was no annual impact from 2013 to 2017.

5. Conclusion

This study focuses on the non-financial reports of six pulp and paper firms as advanced cases of environmental information disclosure by wood product firms in Japan. This study determined that these firms placed importance on environmental information disclosure from 2008 to 2017, although their detailed disclosure strategies differed. In addition, this study found that the GRI ratio can be a useful tool for clarifying the environmental information strategies shown in non-financial reports.

Our findings follow the premise of ESG investment in the case of pulp and paper firms in that firms can increase their corporate values. In addition, our findings support the concept of ESG EBIT developed by Eisai Co., Ltd. and ABeam Consulting Ltd. (Eisai 2020) that evaluating ESG investing can evaluate not only the income of firms but also the R&D and labor costs that would lead to long-term corporate values. Concerning the pulp and paper firms in Japan, ESGROErh and ESGROEh showed higher coefficient β than ROE, as Table 3 showed. This finding implies that human capital investment is a critical factor.

The potential of pulp and paper firms is high when considering ESG issues. Wood utilization can contribute to the global environmental and social issues that ESG investors perceive as important. Future studies may clarify whether Japanese pulp and paper firms will use their advantages to increase their long-term corporate value by dealing with suitable environmental and social information disclosure based on the GRI framework.

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