Addressing Environmental Challenges through Mandatory Sustainability Reporting: The Indonesian Context

Abstract

Mandatory sustainability reporting regulation has garnered significant attention for its potential impact on corporate behavior and market outcomes. In this paper, we examine the effect of such regulation on the sustainability performance, environmental practices, and valuation of Indonesian public companies. Using a differences-in-differences (DID) analysis with Thomson Reuters (Refinitiv) data from 2019 to 2022, we find that the regulation can enhance sustainability performance as measured by ESG scores and improve environmental practices, particularly in emissions and water efficiency management. However, our analysis also indicates that the regulation does not significantly impact renewable energy usage, possibly due to financial constraints. Additionally, we find a negative effect on firm valuation, potentially driven by compliance costs or market skepticism. These findings contribute to the sustainability accounting literature by providing insights into the effectiveness of mandated reporting on both sustainability outcomes and market valuation. Our results highlight the critical role of transparency and accountability in encouraging sustainable operations, particularly in emerging markets, where the impact of such regulations is still underexplored. The study emphasizes the importance of targeted strategies and informed policy development to maximize the benefits of mandatory sustainability reporting.

Keywords: sustainability reports, mandatory sustainability reporting, sustainability performances, environmental practices, firm valuation, emerging markets.

1. Introduction

Growing awareness of sustainability has driven a significant increase in the number of companies adopting and reporting their environmental, social, and governance (ESG) practices and impacts. While initially voluntary, many countries now mandate sustainability reporting, leading to debate on whether mandatory requirements can improve sustainability performance (Christensen et al., 2021; Cicchiello et al., 2023; Khatri & Kjærland 2023). While some studies in the context of developed markets find a positive impact (Cicchiello et al., 2023; Pulino et al., 2022), few have explored the impact within emerging markets (Lozano & Martínez-Ferrero, 2022). We also have little insight into how sustainability disclosure regulations might affect company financial performance (Christensen et al., 2021). This study addresses these gaps by investigating the impact of the introduction of mandatory sustainability reporting requirements for all publicly listed companies in Indonesia, from 2021, on both sustainability performance and firm valuation.

Indonesia is an important context for such a study. Indonesia, made up of over 18,000 islands, stands as the world's largest archipelago (Consulate General of the Republic of Indonesia, 2024). Indonesia is the fourth most populous country in the world (World Bank Group, 2023), and faces significant environmental issues, including the loss of approximately 85% of its humid primary forest cover from 2001 until 2023 (Global Forest Watch, 2023). Indonesia is also the world's eighth largest emitter of greenhouse gases (Friedrich et al., 2023), making significant contribution to climate change. Since sustainability activities are expected to be in greater demand in emerging markets such as Indonesia compared to more mature markets due to pressing social and environmental needs (Dobers & Halme, 2009), this study aims to focus on understanding the impact of mandatory sustainability reporting where it matters most.

On the one hand, mandating sustainability reporting might motivate companies to enhance transparency and accountability regarding ESG performances (Cicchiello et al., 2023), which might then lead to improved reputation and long-term value (Ioannou & Serafeim, 2017). Alternatively, related requirements may also add burden and cost to existing reporting practices, pushing companies to consider new ways in which they might differentiate themselves (Mion & Adaui, 2019). Extant studies in the context of Indonesia suggest that demand for, and understanding of, sustainability information may be limited (Suryaputra et al., 2024; Trisnowati et al., 2022). We respond in this study by investigating the impact of

mandatory sustainability reporting regulations on not only sustainability performance, but also on the valuation of Indonesian public companies.

Using a differences-in-differences (DID) analysis, we compare outcomes between Indonesia (treatment group) and the Philippines (control group), a country which shares a similar economic profile and emerging market classification, but which has not (yet) implemented any mandatory sustainability reporting requirements. Our study utilizes overall ESG scores to measure sustainability performance, along with individual environmental ESG scores, renewable energy policies and consumption, emissions scores, and water policy efficiency to evaluate corporate environmental practices. Tobin's Q ratios are utilised to measure firm valuation. Data is sourced from Thomson Reuters (Refinitiv), covering 2019 to 2022, with 2019 and 2020 as the pre-regulation period and 2021 and 2022 as the post-regulation period.

Our results reveal that mandatory sustainability reporting regulation can improve overall sustainability performance and have a positive impact on several specific environmental practices, including greenhouse gas emissions and water efficiency. However, we do not find that these mandatory reporting developments in Indonesia encouraged companies to shift to renewable energy sources. This may indicate a prioritising of less expensive sustainability options, offering faster payback periods (International Energy Agency, 2021). With respect to firm valuation, we find that mandatory reporting requirements had a negative impact. This suggests that such regulations may lead to higher compliance costs, infrastructure challenges, and market scepticism regarding sustainability disclosures, especially in emerging markets, where ESG awareness remains low (PwC Indonesia, 2023). In short, we contribute to Christensen et al., (2021), Cicchiello et al., (2023), and Khatri & Kjærland (2023), by identifying that while mandatory reporting requirements can have a positive impact on sustainability practices, including greenhouse gas emissions and water efficiency in particular, they can also lead to negative impacts on firm valuation. By conducting research in the Indonesia context, we also addressed gaps identified by Lozano & Martínez-Ferrero (2022) regarding the limited sustainability literature in emerging market settings.

The remainder of this paper is structured as follows. Section 2 reviews relevant literature and presents hypothesis development. Data and methodology are presented in Section 3. Section 4 presents findings with analysis, and section 5 offers some conclusions.

2. Literature review and hypothesis development

2.1 Sustainability reporting and ESG

So called ‘sustainability’ reporting has become a global corporate practice in recent decades (Landrum & Ohsowski, 2018). Related practices commonly focus on environmental and social goals, risks and performance (Benameur et al., 2024; Milne et al., 2009). Sustainability reporting can be presented in various formats, offering diverse content across industries (Lokuwaduge & Heenetigala, 2017; Lozano & Huisingh, 2011). Environmental disclosures might focus on emissions, waste management, and climate change, with social information focusing on diversity, child labour, employee discrimination, and community support. Governance initiatives might also be addressed, including ethical codes, corporate governance systems, and board effectiveness. While many argue that sustainability reporting benefits long-term value creation (Oncioiu et al., 2020; Slater & Gilbert, 2004), debates persist regarding the effectiveness of mandatory sustainability reporting in improving decision-making for both internal management and external stakeholders, including investors (Friede et al., 2015).

According to PwC (2023), sustainability reporting can enhance transparency, enabling investors to better understand corporate impacts and associated risks and opportunities (Cicchiello et al., 2023; Junior et al., 2014). Disclosing sustainability information also can boost market position and stakeholder trust by demonstrating corporate commitment to environmental and social expectations (Gray, 2006; Grewal et al., 2020). However, questions regarding the reliability and quality of related disclosures persist (Adams, 2004), as companies often selectively present their most favourable outcomes or exaggerate their sustainability initiatives (Comyns et al., 2013; Deegan & Rankin, 1996). These concerns can lead stakeholders to view ESG disclosures as symbolic rather than substantive, undermining companies’ credibility, reducing investors trust, and damaging profitability (Laufer, 2003; Tohang et al., 2024). Moreover, variability in the quantity and quality of information disclosed, influenced by differing regulations and standards such as the Global Reporting Initiative (GRI), the Task Force on Climate-related Financial Disclosures (TCFD), and the International Sustainability Standards Board (Zaid & Issa, 2023), results in significant inconsistencies, making it difficult for stakeholders to compare and assess sustainability performance across companies in various jurisdictions.

2.2 Sustainability reporting in emerging markets including Indonesia

Much of the research on sustainability reporting focuses on developed markets (Cheng et al., 2014). Emerging markets, which accounted for 50.1% of global Gross Domestic Product in 2023 (World Economics, 2024), remain underrepresented. Emerging countries often face significant structural issues, such as corruption, inequality, and limited resources, which complicate the impact of mandatory sustainability reporting (Garcia et al., 2017; Lozano and Martínez-Ferrero, 2022). While ESG activities might enhance firm performance within developed countries (Achim & Borlea, 2014; Pulino et al., 2022), studies in emerging markets, such as Ruan & Liu (2021) in China and Saygili et al. (2022) in Istanbul, found that ESG activities negatively impact firm valuation due to high costs and limited benefits, stemming from weaker regulatory and investor focus. Furthermore, research in other emerging markets, such as in India (Narula et al., 2024), Russia (Popov, 2024), and South Africa (Masongweni, 2023), has found no significant impact from ESG disclosures on firms' performance. Visser (2009) noted this may be attributed to sustainability being irrelevant in emerging markets, where primary concerns focus on access to international markets and investment. These contrasts highlight the importance of understanding whether mandatory sustainability reporting might yield different results in emerging market contexts.

Within the emerging market context, limited attention has been given to Indonesia, despite its importance as Southeast Asia's largest economy (World Bank Group, 2023), and as a major crude petroleum and natural gas exporter (Legge et al., 2024). Indonesia's underdeveloped financial infrastructure, low liquidity, and limited diversity in financial instruments (International Monetary Fund, 2024; Setiawan, 2015) results in lower ESG awareness and integration compared to mature markets (Suryaputra et al., 2024; Trisnowati et al., 2022). This is further evidenced by Indonesia's rank of 36th out of 47 in global ESG indices, indicating limited sustainability investment and transparency (Rahmaniati & Ekawati, 2024).

Indonesia is an important context for this study, as it has recently demonstrated a strong commitment to sustainability issues through initiatives such as Law of the Republic of Indonesia No. 32 of 2009 on Environmental Protection and Management (Republic of Indonesia, 2009), requiring companies to assess their environmental impacts, and the Program for Environmental Performance Rating (PROPER), which evaluates compliance with waste management related practices (Ministry of Environment and Forestry Indonesia, 2018). Of

specific interest, Presidential Decree No. 59 of 2017 was introduced to accelerate the achievement of a range of related targets (Ministry of National Development Planning Indonesia, 2018). In addition, Corporate Social Responsibility engagement is now mandated for companies under regulations such as Law of the Republic of Indonesia No. 40 of 2007 on Limited Liability Companies (Republic of Indonesia, 2007a), Law of the Republic of Indonesia No. 25 of 2007 on Investment (Republic of Indonesia, 2007b), and Government Regulation No. 47 of 2012 on Corporate Social and Environmental Responsibility (Government of Indonesia, 2012). Until 2017, there were no specific regulations in Indonesia mandating companies to report sustainability impacts (Gunawan et al., 2022), with only 54 of 400 listed companies voluntarily published reports by that year (Sebrina et al., 2023). The introduction of Regulation POJK No. 51/POJK.03/2017 marked a turning point, mandating sustainability reports for Indonesian publicly listed companies starting in 2021. By 2022, 88% of companies submitted reports, with 80% using GRI standards and others adopting TCFD or alternative frameworks (PwC Indonesia, 2023). These efforts highlight Indonesia's growing emphasis on sustainability and regulatory enforcement.

These mandatory reports must include disclosures related to ESG aspects, such as the company's sustainability strategy, an overview of economic, social, and environmental sustainability aspects, a company profile, a statement from the directors, sustainability governance, and sustainability performance (Otoritas Jasa Keuangan, 2017). Compared to other countries, these mandatory Indonesian requirements are generally less detailed, offering flexibility for companies to choose reporting standards and allowing sustainability reports as part of or separate from, annual reports (SSEK Law Firm, 2023). In contrast, stricter frameworks in the EU, the UK, and Japan mandate specific standards like TCFD or European Sustainability Reporting Standards (European Commission, 2023; MarshMcLennan, 2023; Wit et al., 2024).

Several studies have examined Indonesia's sustainability reporting practices prior to the introduction of these mandatory reporting requirements. Gunawan et al. (2022) found economic information dominated sustainability reporting practices at that time, with human rights being the least disclosed. Sebrina et al. (2023) highlighted low-quality sustainability reports from 2016 to 2019, marked by repetitive formats offering little insight into related improvements. Adhariani and du Toit (2020) found that reports from 2015 to 2017 were difficult to read, with complex language drawn on to appeal to investors. As noted, research on

sustainability reporting in Indonesia since mandatory requirements were introduced, remains limited.

2.3 Mandatory vs voluntary sustainability reporting

This literature review highlights ongoing debates about the benefits and limitations of sustainability reporting, as well as the potential differences in the outcomes of mandatory sustainability reporting regulations between developed and emerging markets. A question that follows, is whether the quality of disclosed information can improve through regulation, or whether it is better for related reporting practices to remain voluntary (Comyns et al., 2013; Laufer, 2003). Gray (2001) argues that voluntary sustainability reporting lacks consistency, hence, making regulation a more effective solution. Caputo et al. (2020) and Mion & Adaui (2019) support this notion by revealing that mandatory laws in Europe improved standardization and comparability. Similarly, Krueger et al. (2021) documented the positive impact of such regulation on the quality of information published, especially in firms with weaker information environments and Ioannou & Serafeim (2017) observed improved disclosure quality and quantity under mandatory sustainability reporting in various countries.

2.3.1 The effect of mandatory sustainability reporting on sustainability performance

On the one hand, mandatory sustainability reporting regulations can drive sustainable business models (Caputo et al., 2021), which might then improve sustainability performance (Jiang et al., 2018; Labuschagne et al., 2005). Firms subject to mandatory sustainability regulations experience pressure to enhance their sustainability performance due to government oversight (Chabrak, 2018; Chen et al., 2018), as observed in European companies during the post-mandate period (Cicchiello et al., 2023). While disclosing positive sustainability impacts may enhance companies' reputation and competitiveness (Gray, 2006; Grewal et al., 2020), revealing negative impacts can have the opposite effect. On the other hand, critics argue that mandatory sustainability reporting regulations will not lead to substantial changes, as it is likely to result in basic compliance rather than genuine commitment (Gong et al., 2018; Ioannou & Serafeim, 2017). Moreover, differing regulatory environments, varying levels of enforcement, and distinct corporate governance practices, might lead to different outcomes (Visser, 2009).

To date, only Rahmaniati and Ekawati (2024) have studied the impact of mandatory sustainability regulation on Indonesia's sustainability performance, finding that tying ESG

practices to projected financial performance effectively drives substantive ESG outcomes. Regarding disclosure post-mandate, Mutiha (2022) concluded that mandatory regulation improves disclosure quality. Given the ongoing debates on mandatory sustainability regulation impacts and the limited research in the Indonesian context, our first hypothesis is developed as follows:

H1: Mandatory sustainability reporting regulation positively impacts the overall sustainability performance of Indonesian public companies.

2.3.2 The effect of mandatory sustainability reporting on environmental practices

In addition to enhancing sustainability performance, mandating sustainability reporting can encourage positive changes in specific corporate environmental practices (Christensen et al., 2021; Gray et al., 2003; Ioannou & Serafeim, 2017). By requiring companies to increase transparency and accountability regarding their sustainability impacts, sustainability regulations can heighten external pressures from stakeholders, encouraging firms to integrate sustainability practices into their core operations, leading to various environmental initiatives (Ivic et al., 2021) and innovations (Mbanyele et al., 2022), as evidenced by reduced industrial wastewater in China (Chen et al., 2018) and lower emissions levels in the United States and the UK (Tomar, 2023; Jouvenot & Krueger, 2019). However, while voluntary sustainability reporting may benefit the environment, its impact may be limited, as the projects chosen are usually based on corporate preferences, for example, planting trees or reducing plastic use, which may have limited impact on environmental issues at the national level (O'Sullivan & O'Dwyer, 2009). Alternatively, mandatory reporting might enforce standardized, transparent disclosures, ensuring more significant environmental responsiveness (Christensen et al., 2021).

In the Indonesian context, most research on environmental practices primarily explores the relationship between environmental performance and financial performance (Ifada et al., 2021; Lukman et al., 2020; Vira Salsabila & Novianty, 2022), the effect of environmental performance on sustainability reporting practices (Jati et al., 2023), and the impact of mandatory regulations on improving corporate social responsibility implementation (Windari & Dewi, 2024). Research on the direct relationship between mandatory reporting regulations and environmental practices remains limited (Christensen et al., 2021). Furthermore, as highlighted by Khatri and Kjærland (2023), while sustainability reports might be positively associated with environmental performance, further research is needed to determine whether

mandating sustainability reporting yields consistent results. Therefore, to address these gaps and respond to Khatri and Kjærland's (2023) call for further examination, our second hypothesis is developed as follows:

H2: Mandatory sustainability reporting regulation positively impacts the environmental practices of Indonesian public companies.

2.3.3 The effect of mandatory sustainability reporting on firm valuations

Ongoing debates over mandatory sustainability reporting regulation extends to its financial impact. Many argue that mandatory sustainability reporting is associated with enhanced financial performance and valuation, improved corporate reputation, and can have advantages in labour, goods, and capital markets (Eichholtz et al., 2019; Morioka & de Carvalho, 2016). Improved ESG disclosure has been linked to higher firm valuations, as seen in the United States and other countries, due to favourable market sentiment (Bofinger et al., 2022), and long-term benefits such as retaining high-quality employees (Ioannou & Serafeim, 2017). However, several studies counter, by suggesting that mandatory sustainability reporting incurs significant direct and indirect costs, including preparation, certification, proprietary risks, and increased expenses from competitors, suppliers, or labour unions (Christensen et al., 2021; Miroshnychenko et al., 2017; Ruan & Liu, 2021; Saygili et al., 2022). Mandatory reporting can also heighten legal risks from overly optimistic forward-looking statements or bad news disclosures (Comyns et al., 2013; Tohang et al., 2024).

Several studies have examined the link between sustainability reporting and firm value in Indonesia. Halimah et al. (2020) found that sustainability reporting in Indonesia boosts corporate reputation and firm value by providing relevant information for investors. Putri and Wardhani (2019) showed a positive impact on financial performance (measured by Return on Assets (ROA) and Tobin's Q) as investors viewed these efforts as valuable. However, none of these Indonesian studies have focused specifically on the relationship between mandatory sustainability reporting regulation and firm valuation. Given the uncertainty about whether mandatory sustainability reporting positively or negatively influences firm valuation and the limited research in the Indonesian context, our third hypothesis is developed as follows:

H3: Mandatory sustainability reporting regulation affects the valuation of Indonesian public companies.

3. Data and Research Methodology

3.1. Dependent variable of interest

To evaluate the impact of mandatory sustainability reporting on overall sustainability performance (H1), we retrieve ESG score data from the Refinitiv database. This indicator is widely drawn from, in studies seeking insight into corporate sustainability performance (Cicchiello et al., 2023; Giannopoulos et al., 2022; Mbanyele et al., 2022). Regarding environmental practices (H2), we analyse individual environmental ESG scores of Indonesian public companies, focusing on impacts on natural ecosystems and its management of environmental risks and opportunities (LSEG Data Analytics, 2023). Additionally, we incorporate four specific environmental measures from Refinitiv. The first two measures are related to renewable energy use, including policies and total usage in gigajoules (Khan et al., 2020). Emissions scores, based on 22 metrics such as waste reduction and climate change risk management (LSEG Data Analytics, 2023), are also examined, which provide insight into efforts to lower emissions (Aliani, 2023). Lastly, we investigate water efficiency policies, which offer insight into initiatives to improve water use efficiency (Ananda, 2019). Together, these measures provide a comprehensive view of environmental practices under mandatory sustainability reporting.

Finally, to assess the impacts of mandatory reporting on firm valuation (H3), this research uses Tobin's Q ratio, calculated using data from Refinitiv. This ratio reflects key valuation factors such as market sentiment, growth potential, and asset efficiency, helping stakeholders identify investment opportunities and make strategic decisions (Piñeiro-Chousa et al., 2016). If the market views mandatory sustainability reporting as beneficial, it may result in a higher Tobin's Q, indicating favourable financial prospects (Rodgers et al., 2013).

3.2 Model

This study extends the regression models of Cicchiello et al. (2023) to the Indonesian context (2019-2022), using a DID methodology. The DID method is commonly used to evaluate the impacts of regulation (Cai & Ye, 2020; Chang & Li, 2020; Cicchiello et al., 2023). DID enables comparison of changes in outcomes between a treatment group (Indonesian firms) and a control group (Philippine firms) before (2019-2020) and after (2021-2022) introduction of mandatory sustainability reporting. DID also accounts for omitted variables affecting both groups

(Cicchiello et al., 2023). The regression incorporates firm and time fixed effects to isolate the average treatment effect, as shown in the equation below:

$$EFFECT_{jt} = \beta_0 + \beta_1 POST * TREAT + \beta_2 TREAT_j + \beta_3 POST_t + \beta_i \sum Control_i + \beta_4 TIME + \beta_5 FIRMS + \varepsilon_{jt} \quad (1)$$

$EFFECT_{jt}$ represents the dependent variable (e.g., ESG scores for H1) for firm j at time t. $TREAT_j$ is a dummy variable (1 for Indonesian firms, 0 for Philippine firms). $POST_t$ is a dummy variable (1 for post-mandate period). $POST*TREAT_{jt}$ captures the regulation's effect, with β1 indicating whether the regulation positively impacts the dependent variable. Control variables ($\sum CONTROL_i$) include ROA, firm size (ASSET), and firm leverage (LEV). ROA (net income to total assets) measures profitability, as more profitable firms tend to invest in sustainability (Krueger et al., 2021). Firm size (ASSET), represented by the natural log of total assets, is included since larger firms disclose more sustainability information and face stricter regulations (Drempetic et al., 2020). Firm leverage (LEV), measured as the debt-to-equity ratio, reflects riskier firms that prioritize short-term investments, potentially reducing ESG disclosures (Krueger et al., 2021). *TIME* accounts for time-specific effects, and *FIRMS* controls for firm-specific factors. εjt (error term) captures unobserved factors affecting the dependent variable for firm j at time t.

3.3 Sample and Descriptive Statistics

This study starts with an initial sample of 1,111 publicly listed companies from the Indonesian Stock Exchange (IDX) (825) and the Philippine Stock Exchange (PSE) (286), excluding financial institutions, so that our focus concentrates on industries with direct environmental impacts, such as mining, oil, and manufacturing (Chabot & Bertrand, 2023). IDX-listed companies form the treatment group, subject to Indonesia's mandatory sustainability reporting regulations, while PSE-listed companies serve as the control group as the Philippines did not implement similar regulations during the sample period. Both countries are ideal choices for this ESG research, as both are classified as emerging markets, with rich natural resources and rapid urbanization (Yang et al., 2020). The sample covers 2019–2022, with 2019–2020 as the pre-regulation period and 2021–2022 as the post-regulation period. Data limitations in Refinitiv may affect the sample size, as ESG scores are not available for all firm-year observations, and further criteria will be applied for each hypothesis.

Table 1 lists the samples. For H1, the sample is filtered to include companies with ESG scores (ESG-OV) for all sample years and total asset data for at least one year. This reduces the sample to 54 companies, with 39 from the IDX (treatment group) and 15 from the PSE (control group). To test H2 using the environmental ESG score (ESG-ENV), the same selection criteria as H1 are applied. Additional criteria for the four additional measures used in H2 include public companies with data on at least one of these indicators: renewable energy use policy (RENUSE), total renewable energy (RENEG), emission score (EMI), and water efficiency policy (PWE). As for H3, companies with data on market capitalization, total assets, and liabilities are also included for calculating Tobin's Q ratio (TOBIN). These filters yield 100 companies—69 from the IDX and 31 from the PSE—representing 39.4% and 34.8% of the market capitalization in Indonesia and the Philippines, respectively.

Table 1. Detail of samples

Criteria	Firms		Obs	
	IDX	**PSE**	**IDX**	**PSE**
All firms listed in IDX and PSE	825	286		
Firms excluding financial institutions	719	254		
Firms with ESG scores	39	15	167	69
Firms' observations over sample period for RENUSE	69	31	168	82
Firms' observations over sample period for RENEG	69	31	163	80
Firms' observations over sample period for EMI	69	31	239	112
Firms' observations over sample period for PWE	69	31	202	98
Firms' observations over sample period for TOBIN	69	31	276	124

Tables 2 summarize ESG scores and control variables for the periods before and after the implementation of the mandatory sustainability reporting regulation for the treatment and control groups. In Indonesia, the mean overall ESG score increased from 47.789 to 53.633. Similarly, the Philippine control group showed an increase in ESG scores from 51.482 to 54.103. These improvements suggest better sustainability performance after the regulation implementation, but further analysis using a DID test is needed to determine whether the mandatory regulation directly contributed to these changes. Standard deviation (SD) analysis indicates reduced variation in ESG scores in Indonesia, decreasing from (19.038) to (18.541), suggesting more consistent sustainability practices post-regulation. In contrast, the Philippines

saw a slight increase in SD from (14.714) to (15.422). Additionally, Indonesian companies experienced a decline in ROA (0.081 to 0.059) and leverage (1.127 to 1.003), alongside an increase in firm size (ASSET rising from $4.40 billion to $4.81 billion). Similar trends were observed in the Philippines, where ROA and LEV decreased while ASSET grew from $6.10 billion to $6.28 billion. These trends highlight declining profitability and leverage but increasing firm size in both regions post-regulation.

Table 2. Summary statistics for H1

Panel A – Indonesia

Variable	Obs	Mean		Std. dev.		Min		Max	
		Before	After	Before	After	Before	After	Before	After
ESG-OV	168	47.789	53.633	19.038	18.541	10.147	18.692	85.129	87.764
ROA	168	0.081	0.059	0.096	0.082	(0.046)	(0.166)	0.474	0.344
ASSET	168	4,400	4,810	4,610	4,910	350	369	25,400	26,600
LEV	168	1.127	1.003	2.428	1.406	0	0	20.346	7.107

Panel B – Philippines

Variable	Obs	Mean		Std. dev.		Min		Max	
		Before	After	Before	After	Before	After	Before	After
ESG-OV	69	51.482	54.103	14.714	15.422	31.800	23.960	87.583	86.276
ROA	69	0.055	0.042	0.024	0.034	(0.011)	(0.058)	0.097	0.148
ASSET	69	6,100	6,280	4,110	4,400	588	634	15,000	15,800
LEV	69	1.404	1.293	1.866	1.541	0.034	0.145	8.546	7.898

Table 3 outlines the ESG-ENV, RENEG, RENUSE, EMI, PWE, TOBIN, and control variables for companies in Indonesia and the Philippines before (2019–2020) and after (2021–2022) the mandatory sustainability reporting regulation. In Indonesia, the mean values of ESG-ENV, RENUSE, RENEG, EMI, and PWE increased post-regulation, suggesting improved environmental practices, while in the Philippines, similar increases were observed except for RENEG, which declined. TOBIN, representing firm valuation, decreased significantly for

Table 2 shows the descriptive statistics for H1. The dependent variable is the ESG rating score (ESG-OV) from Refinitiv, which reflects an overall company score based on self-reported information in the environmental, social, and corporate governance pillars (in log terms). The control variables are ROA, representing profitability and calculated by dividing net income by total assets; ASSET, indicating the company's asset size in million dollars, transformed using the natural logarithm to account for scale; and LEV, representing leverage, defined as the ratio of total debt to common equity, reflecting the company’s financial risk.

Indonesian companies (6.399 to 2.830) but showed a slight increase for Philippine companies (1.375 to 1.382). Decreases in SD for ESG-ENV, RENUSE, RENEG, EMI, and PWE in both countries suggest more consistent environmental management practices, with TOBIN also showing reduced disparities among firms. Control variables reveal that Indonesian companies experienced slight increases in ROA (0.055 to 0.059) and ASSET ($3.29 billion to $3.74 billion) alongside reduced LEV (1.234 to 0.942), reflecting improved profitability, firm size growth, and lower debt levels. In contrast, Philippine companies showed a decline in ROA (0.050 to 0.036) but similar trends in ASSET and LEV. Further analysis using a DID test is required to confirm the regulation's impact on these variables.

Table 3. Summary for H2 and H3

Panel A – Indonesia

Variable	Obs	Mean		Std. dev.		Min		Max	
		Before	After	Before	After	Before	After	Before	After
ESG-ENV	167	39.535	46.927	24.297	23.670	0.128	5.761	84.968	89.167
RENUSE	168	0.614	0.744	0.490	0.438	-	-	-	-
RENEG	163	6.735	7.336	21.200	20.000	0	0	111.000	110.000
EMI	239	31.210	49.157	30.670	25.848	0	0	95.312	99.074
PWE	202	0.670	0.871	0.472	0.335	-	-	-	-
TOBIN	276	6.399	2.830	36.347	12.367	0.331	0.386	330.453	142.764
ROA	276	0.055	0.059	0.100	0.099	-0.433	-0.280	0.474	0.552
ASSET	276	3,290	3,740	3,900	4,240	158	25	25,400	26,600
LEV	276	1.234	0.942	2.460	1.233	0	0	20.345	7.107

Panel B – Philippines

Variable	Obs	Mean		Std. dev.		Min		Max	
		Before	After	Before	After	Before	After	Before	After
ESG-ENV	69	49.401	50.080	16.618	19.098	21.395	7.143	85.582	83.957
RENUSE	82	0.800	0.808	0.406	0.397	-	-	-	-
RENEG	80	1.378	1.236	4.560	3,522	0	0	19.900	19.500
EMI	112	47.753	53.854	32.115	25.619	0	0	94.753	97.540
PWE	98	0.930	0.945	0.258	0.229	-	-	-	-
TOBIN	124	1.375	1.382	0.589	0.742	0.634	0.314	3.184	4.262
ROA	124	0.050	0.036	0.037	0.043	-0.017	-0.067	0.172	0.226
ASSET	124	8,490	8,920	9,510	9,770	440	634	39,800	43,000
LEV	124	1.222	1.177	1.449	1.339	0.034	0.093	8.546	7.898

Table 3 shows the descriptive statistics for H2 and H3. The dependent variables for H2 are ESG-ENV, RENUSE, RENEG, EMI, and PWE. ESG-ENV represents individual environmental ESG scores, RENUSE reflects companies' policies on using renewable energy for their own operations, RENEG is the total amount of primary renewable energy purchased and produced, measured in million gigajoules, EMI is the emissions score, and PWE represents companies' water efficiency policies. The dependent variable for H3 is TOBIN, a financial metric that compares the market value of a company's assets to their replacement costs. The control variables are ROA, representing profitability and calculated by dividing net income by total assets; ASSET, indicating the company's asset size in million dollars, transformed using the natural logarithm to account for scale; and LEV, representing leverage, defined as the ratio of total debt to common equity, reflecting the company’s financial risk.

3.4 Identification

Figures 1–7 in Appendix 1 illustrate parallel trends in ESG-OV, ESG-ENV, RENUSE, RENEG, EMI, and PWE between the Philippine control group and Indonesian treatment group before (2019–2020) and after (2021–2022) Indonesia's mandatory sustainability reporting regulation. The trend of the variable of interest for all figures, except TOBIN, follows a similar pattern over time in both the treatment and control groups prior to the "shock," and there is a change in the pattern before and after the regulation's implementation, indicating that DID can be used, which aligns with the parallel trend assumption. However, the TOBIN figure shows a declining trend for the treatment group and a flat trend for the control group, indicating non-parallel trends. Therefore, when testing the third hypothesis, we will also utilize robustness tests in Section 4.4 to validate the consistency of the results. Further analysis of this declining trend will be discussed in the results section.

4. Results

4.1 H1: The effect of mandatory sustainability reporting on sustainability performance

Table 4 column (1) presents the results of the DID analysis using ESG scores as the dependent variable, to assess the impact of mandatory sustainability reporting regulations in Indonesia. The POST coefficient for ESG-OV is 0.065 (significant at 10%), indicating a positive post-regulation increase in overall ESG scores. The POST*TREAT coefficient in column 1 is 0.078 (significant at 5%), showing a notable improvement in the sustainability performance of treated firms compared to the control group. In support of Cicchiello et al. (2023), these findings suggest that mandatory sustainability reporting positively influences sustainability performance of publicly listed companies in Indonesia. Control variables also show significant relationships: ASSET (0.181, significant at 1%), indicating that larger companies tend to have higher ESG scores, likely due to more resources for sustainability improvements, inline with studies by Cicchiello et al. (2023) and Krueger et al. (2021) while LEV (0.010, significant at 10%) suggests highly leveraged firms improve ESG performance as a risk mitigation strategy. By enhancing sustainability practices, leveraged firms can reduce risks such as legal liabilities and regulatory penalties, supporting financial stability.

The positive association between mandatory sustainability reporting and sustainability performance in Indonesia highlights several underlying factors. Our insights suggest that mandatory reporting can enhance transparency and accountability, leading to improved ESG scores, as observed by Mutiha (2022) and reflected in the 88% increase in sustainability reports by 2022 (PwC Indonesia, 2023). Additionally, regulation appears to pressure companies to align operations with sustainability standards (Rahmaniati & Ekawati, 2024), and raises stakeholder awareness of ESG concerns, encouraging scrutiny and critique to drive improvements. Companies may also comply to avoid penalties and protect their legitimacy and reputation (Gray, 2006; Müller & Pfleger, 2014). These findings suggest that regulatory pressures effectively motivate better sustainability practices.

4.2 H2: The effect of mandatory sustainability reporting on environmental practices

4.2.1 The result of H2 using environmental ESG scores (ESG-ENV)

Table 4, column 2, shows DID regression results with ESG-ENV as the dependent variable, assessing the impact of mandatory sustainability reporting on environmental performance. Consistent with the findings of Khatri and Kjærland (2023) and Mbanyele et al. (2022), the POST*TREAT coefficient (0.416) is significant at 1%, suggesting substantial improvements in environmental practices for treated firms' post-regulation. The TREAT coefficient (-0.751), also significant at 1%, shows lower pre-regulation environmental scores for treated firms, emphasizing the regulation's impact. Although the control variables (ROA, ASSET, LEV) are not significant, the high R-squared value (0.817) highlights the model's effectiveness in explaining environmental outcomes.

The significant impact of mandatory sustainability reporting on environmental performance, as reflected in individual environmental ESG scores, may be attributed to several factors. First, environmental issues appear to be a government priority, as indicated by increased regulatory scrutiny and the longstanding enforcement of environmental laws, such as Law No. 32/2009 on Environmental Protection and Management (Republic of Indonesia, 2009). Additionally, environmental reporting may be more straightforward to measure, due to well-established tools like ISO 14001, which provide clear benchmarks for environmental management (The ISO Council, 2022). In contrast, the social and governance aspects of sustainability may involve more subjective evaluations, such as surveys and assessments of corporate culture or diversity,

making them harder to quantify (UNEP Finance Initiative & UN Global Compact, 2017). This ease of quantification may motivate companies to focus on environmental performance.

4.2.2 The result of H2 using four measurements: RENUSE, RENEG, EMI, and PWE

The baseline analysis in Table 4 columns (3)-(6) presents the DID regression results on the impact of mandatory sustainability reporting on four environmental indicators: RENUSE, RENEG, EMI, and PWE. The POST coefficients are significant at the 1% level, indicating overall improvements in environmental practices post-regulation. The POST*TREAT coefficients for EMI (10.748) and PWE (0.115) are significant at the 1% and 5% levels, respectively, suggesting substantial improvements in emissions reduction and water efficiency among treated firms in Indonesia compared to the control group. However, the coefficients for RENUSE and RENEG are not significant, suggesting less pronounced effects on renewable energy practices. These results are consistent with Chen et al. (2018), who found that mandatory sustainability reporting in China reduced industrial wastewater and emissions, as well as with studies by Tomar (2023) and Jouvenot and Krueger (2019), who concluded that the mandating of reporting reduced emissions in the United States and the UK. Additionally, control variables reveal that profitability (ROA) positively influences environmental actions like emissions reduction and renewable energy use, while leverage (LEV) negatively impacts renewable energy investments, likely due to financial constraints. Asset size (ASSET) shows no significant effect on environmental behaviour. The high R-squared values, especially 0.836 for EMI, and the inclusion of firm and time fixed effects, underscore the robustness of the results, confirming the regulation's effectiveness in driving specific environmental improvements.

A significant improvement in emissions reduction and water efficiency, while progress in adopting renewable energy initiatives seems to have been limited, can be attributed to several factors. Companies may prioritize cost-effective measures like emissions and water management, which require lower initial investments and offer quicker payback periods compared to renewable energy projects (McKinsey & Company, 2021). Emissions and water efficiency are argued to be easier to measure and integrate into operations, supported by available technical expertise in Indonesia (International Energy Agency, 2021). These metrics may also attract greater investor and public attention, with carbon emissions and water usage

directly linked to air quality, climate change, and resource sustainability (Sugiarto et al., 2023). Pressure from NGOs and the media further incentivizes companies to focus on these areas.

In contrast, transitioning to renewable energy faces significant barriers, including high upfront costs, long payback periods, and limited incentives from the government (Akbar Bagaskara et al., 2024). Indonesia's heavy reliance on fossil fuels, with coal and natural gas accounting for 80% of electricity generation, and the economic significance of its coal industry, further complicates the shift (Ember, 2024). Investment gaps and regulatory obstacles exacerbate these challenges, making renewable energy less appealing in the short term. Additionally, the two-year post-mandate observation period may be insufficient to capture the long-term impacts of renewable energy projects, which typically require several years to show results (Boomsma et al., 2012). Stronger government incentives, such as subsidies, tax incentives, custom duties, and pricing incentives implemented in China and the EU, may be necessary to drive meaningful progress in renewable energy adoption.

4.3 H3: The effect of mandatory sustainability reporting on firm valuation

Table 4 column (7) illustrates the DID results regarding the effects of mandatory sustainability reporting regulation on firms' valuation, measured by TOBIN. The POST*TREAT coefficient is -3.539, significant at the 10% level, indicating a decrease in valuation for treated firms relative to the control group post-regulation. Control variables show mixed results: ROA has a positive but insignificant coefficient (13.706), suggesting a potential association between profitability and valuation; ASSET has a negative coefficient (-5.131), indicating larger firms may have lower valuations; and LEV shows a marginally positive but insignificant effect (0.078). The model explains 68.94% of TOBIN's variation (R-squared = 0.6894) and incorporates firm and time fixed effects to ensure robust results. These findings align with studies in emerging markets, including Ruan & Liu (2021) and Saygili et al. (2022), which report negative valuation impacts of ESG activities. However, our insights contrast with studies in developed markets, like Achim & Borlea (2014) and Giannopoulos et al. (2022), where mandatory sustainability reporting positively influenced valuations. This supports arguments that ESG practices are less mature in emerging markets compared to the more advanced frameworks in developed markets.

Several factors may explain the decline in firm valuations following the implementation of mandatory sustainability reporting in Indonesia. Compliance with the regulation likely imposes significant costs, reducing profitability and, in turn, firm valuation. Additionally, Indonesia's limited infrastructure, including inadequate data management systems and a lack of human resource skills, increases the challenges and costs of meeting regulatory requirements (Setyaningsih et al., 2024; PwC Indonesia, 2023). The perceived lack of financial benefits from sustainability initiatives may also contribute, as investors in emerging markets like Indonesia tend to undervalue sustainability due to skepticism about its long-term impact on firm value (Suryaputra et al., 2024; Trisnowati et al., 2022). Furthermore, the inefficiency of Indonesia's stock market, where investor behaviour is often influenced by speculation and sentiment (Gede Wirama et al., 2017; Luxianto et al., 2020), may lead to sustainability information being undervalued, resulting in a lower Tobin's Q ratio compared to developed markets.

Table 4. Effects of mandatory sustainability reporting regulation

Dependent variables	*(1) ESG-OV*	*(2) ESG-ENV*	*(3) RENUSE*	*(4) RENEG*	*(5) EMI*	*(6) PWE*	*(7) TOBIN*	*(8) MBR*
POST	0.065*	0.075	0.227***	4.850***	9.381***	0.220***	-0.558	0.096
	(0.038)	(0.093)	(0.063)	(1.324)	(3.401)	(0.056)	(1.243)	(0.239)
TREAT	-0.220*	-0.751***	-0.065	-4.764	-24.586***	-0.146	4.504	0.396
	(0.114)	(0.160)	(0.124)	(3.048)	(6.904)	(0.149)	(3.464)	(1.035)
*POST*TREAT*	0.078**	0.416***	0.040	0.314	10.748***	0.115**	-3.539*	-0.631**
	(0.036)	(0.102)	(0.062)	(1.282)	(3.297)	(0.057)	(2.089)	(0.308)
ROA	-0.164	-0.145	0.616*	10.199***	38.735***	0.063	13.706	3.988
	(0.190)	(0.735)	(0.317)	(3.455)	(16.304)	(0.376)	(9.111)	(4.603)
ASSET	0.181***	0.190	0.066	2.573	2.851	0.173	-5.131	1.033
	(0.067)	(0.174)	(0.108)	(1.814)	(4.110)	(0.121)	(3.598)	(0.948)
LEV	0.010*	0.009	-0.009	-0.460**	-0.913	-0.031	0.078	0.099
	(0.005)	(0.014)	(0.011)	(0.198)	(0.795)	(0.019)	(0.180)	(0.185)
Constant	-0.188	-0.022	-0.606	-49.042	-7.790	-2.889	113.365	-20.046
	(1.462)	(3.781)	(2.343)	(39.621)	(89.591)	(2.641)	(78.279)	(20.782)
Obs	236	236	400	243	351	400	400	400
Firms	54	54	100	100	100	100	100	100
R-squared	0.922	0.817	0.774	0.716	0.836	0.748	0.6894	0.909
Firms FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 presents the effects of mandatory sustainability reporting regulation on publicly listed companies in Indonesia. The dependent variables include: **ESG-OV**, representing the environmental, social, and governance rating score in log terms, **ESG-ENV** (environmental ESG score), **RENUSE** (reflecting companies' policies on using renewable energy for their own operations), **RENEG** (the total amount of primary renewable energy purchased and produced, measured in gigajoules), **EMI** (emissions score), **PWE** (policies on water efficiency), **TOBIN**, a financial metric that compares the market value of a company's assets to their replacement costs, serving as an indicator of firm valuation and **MBR** (Market-to-Book Ratio), which compares a company's market value to its book value, serving as an alternative measure of firm valuation. The main independent variables are **POST**, indicating the period after the implementation of the regulation; **TREAT**, representing companies subject to the regulation; and **POST*TREAT**, capturing the interaction effect, which assesses the regulation's impact on treated firms in the post-regulation period. Control variables are **ROA** (Return on Assets), a measure of profitability calculated as net income divided by total assets; **ASSET**, the company's asset size transformed using the natural logarithm to account for scale; and **LEV** (leverage), represented by the ratio of total debt to common equity, reflecting financial risk. The model includes **firm fixed effects** (Firms FE) and **time fixed effects** (Time FE) to control for unobserved heterogeneity across firms and over time. **R-squared** values represent the proportion of variance explained by each model. Statistical significance levels are denoted as follows: *p < 0.10, **p < 0.05, ***p < 0.01.

4.4 Robustness test

As noted in Section 3.4, the distribution of TOBIN is skewed, prompting a robustness test using the market-to-book value ratio (MBR) as an alternative measure of firm valuation. MBR, calculated by dividing market value per share by book value per share, reflects how the market values a firm relative to its assets and has been widely used in prior research (Pontiff & Schall, 1998). Table 4 column (8) shows regression results consistent with Section 4.3, with a POST*TREAT coefficient of -0.631, significant at the 5% level, indicating that firms subject to the regulation experienced a decrease in MBR post-implementation compared to the control group. Control variables such as ROA, ASSET, and LEV showed no statistical significance. These findings suggest that markets in Indonesia may be agnostic about the value of mandatory sustainability reporting.

5. Conclusions

In recent years, global awareness of environmental and social issues has risen significantly, prompting governments to view sustainability reporting as a critical component of the business environment. In Indonesia, the government has introduced POJK No. 51/POJK.03/2017, requiring all publicly listed companies on the IDX to publish annual sustainability reports from 2021. This study examines the impact of these regulations on sustainability performance, environmental practices, and firm valuation. Findings reveal that the regulation improves overall ESG scores and environmental practices, particularly in emissions and water efficiency management, though there is no significant progress in renewable energy use, likely due to cost considerations. However, the regulation negatively affects firm valuation, suggesting the market views associated costs as outweighing any benefits.

This research has three main contributions. First, it examines the debate on voluntary versus mandatory reporting, focusing on whether regulations improve sustainability performance. Building on Cicchiello et al. (2023), we uniquely explore the effects of mandatory reporting in the emerging market of Indonesia, where firms face significant environmental challenges and less experience with ESG practices, providing new insights into regulatory frameworks in diverse economic contexts. Second, we address the scarcity of insights into the direct impacts of such regulations on environmental practices (Christensen et al. 2021; Khatri and Kjærland 2023), by analysing how disclosure improvements lead to tangible environmental outcomes in emissions, water efficiency, and renewable energy use. Third, we expand on Ioannou &

Serafeim's (2017) work by investigating impacts on firm valuation, a topic underexplored in emerging markets (Lozano & Martínez-Ferrero, 2022), offering valuable insights into the effects of mandatory sustainability reporting in emerging economies. Overall, we contribute to the sustainability literature where it is most crucial, given that sustainability initiatives are likely to be more essential in emerging markets like Indonesia than in more developed markets due to significant social and environmental challenges (Dobers & Halme, 2009).

This study also offers significant practical contributions. For policymakers, we provide insights into the effectiveness of sustainability reporting regulations, highlighting their ability to improve emissions and water efficiency management but not renewable energy use, suggesting the need for additional measures, such as financial incentives, to enhance renewable energy adoption. For investors, our study aids in evaluating longer-term corporate value and risk profiles, supporting sustainable investment decisions in the Indonesian context. For corporations, we underscore the tangible impact of ESG practices on environmental performance, helping shape sustainability strategies to enhance reputation and competitiveness.

This research also has several limitations. Firstly, the sample size is restricted due to data availability, reducing the initial 825 IDX-listed companies to around 80–100, which limits the generalizability of the results. Additionally, the time frame may be insufficient to capture the long-term effects of mandatory sustainability reporting, particularly for renewable energy projects and firm valuation, which may yield different results over a longer period. The study also focuses primarily on environmental aspects, providing less insight into the social and governance components, despite the regulation addressing all three areas equally. These limitations all suggest fruitful opportunities for further studies.

Future studies can seek to explore the impact of mandatory sustainability reporting on social conditions and governance practices, as well as conducting cross-country comparisons with nations of similar economic profiles but different regulatory frameworks, to assess effectiveness. Extending the observation period beyond four years could also offer insights into the long-term impacts of such regulations, including their effects on firm valuations. Research could also be further extended into environmental aspects, investigating factors that influence corporate choices about which sustainability initiatives to focus on, and the role of implementation costs to better capture sustainability impacts across supply chains.

Appendix 1. Parallel Trend

Figure 1. The trend of ESG overall scores (ESG-OV) among treatment and control groups

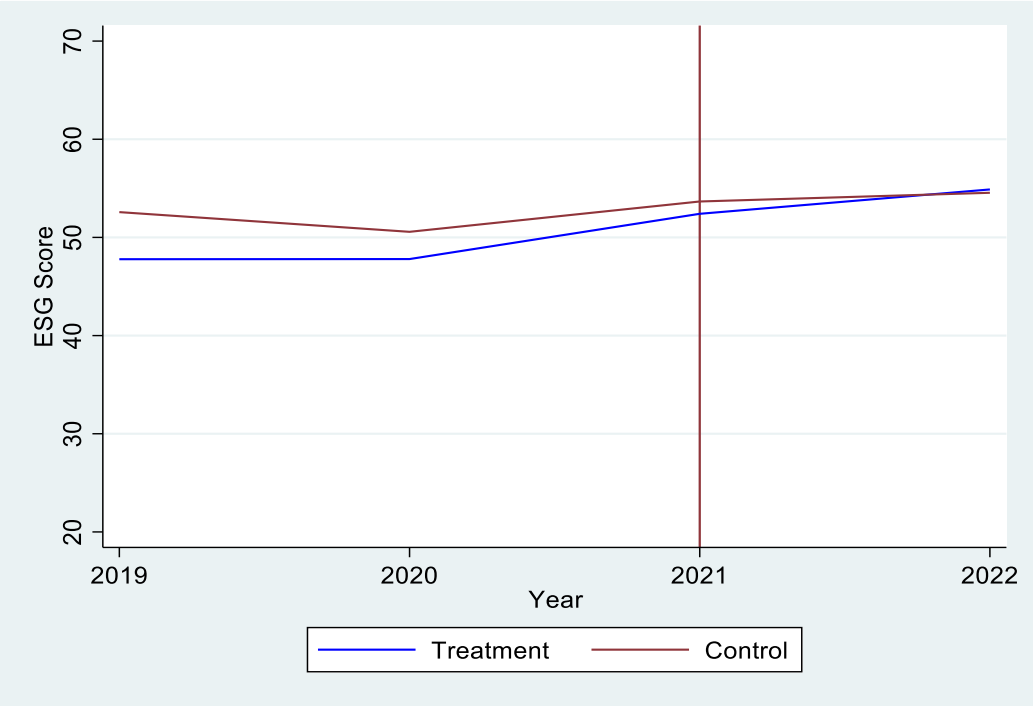


Figure 2. The trend of ESG-ENV scores among treatment and control groups

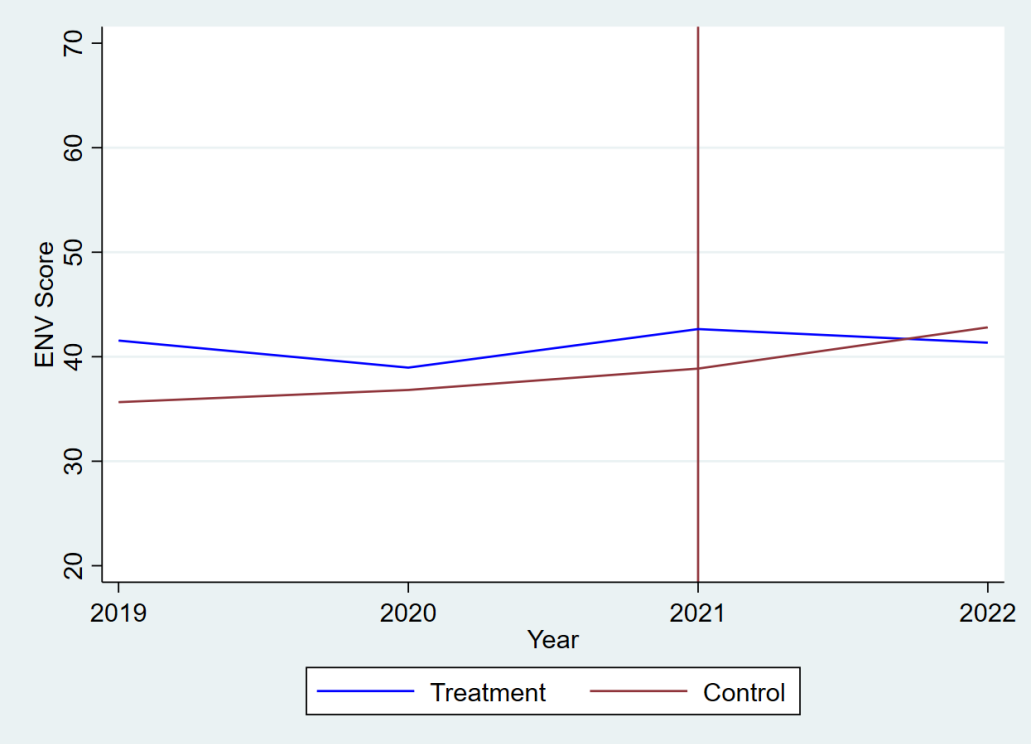


Figure 3. The trend of renewable energy use policy (RENUSE) among treatment and control groups

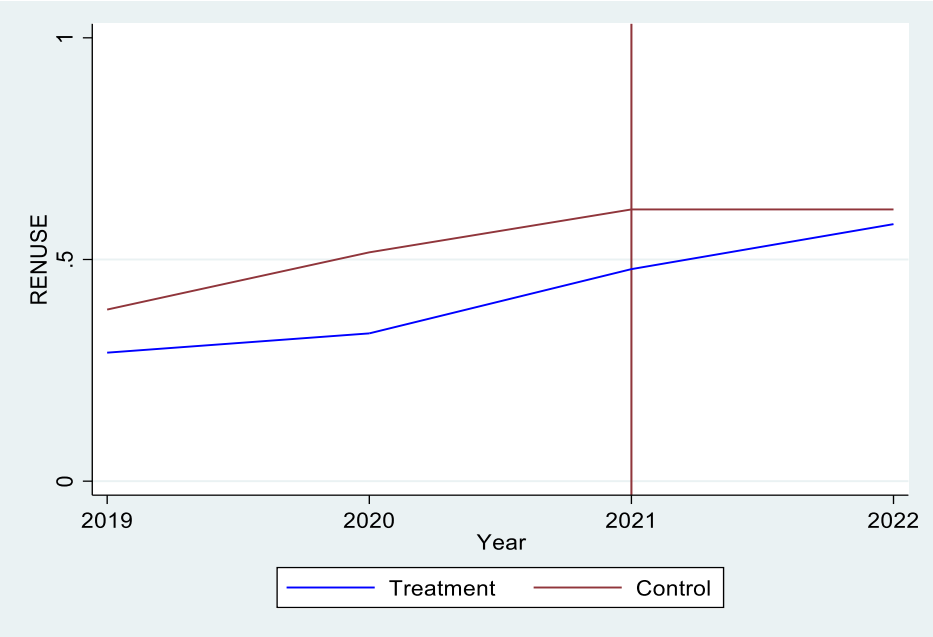


Figure 4. The trend of total renewable energy purchased and produced (in gigajoules) (RENEG) among treatment and control groups

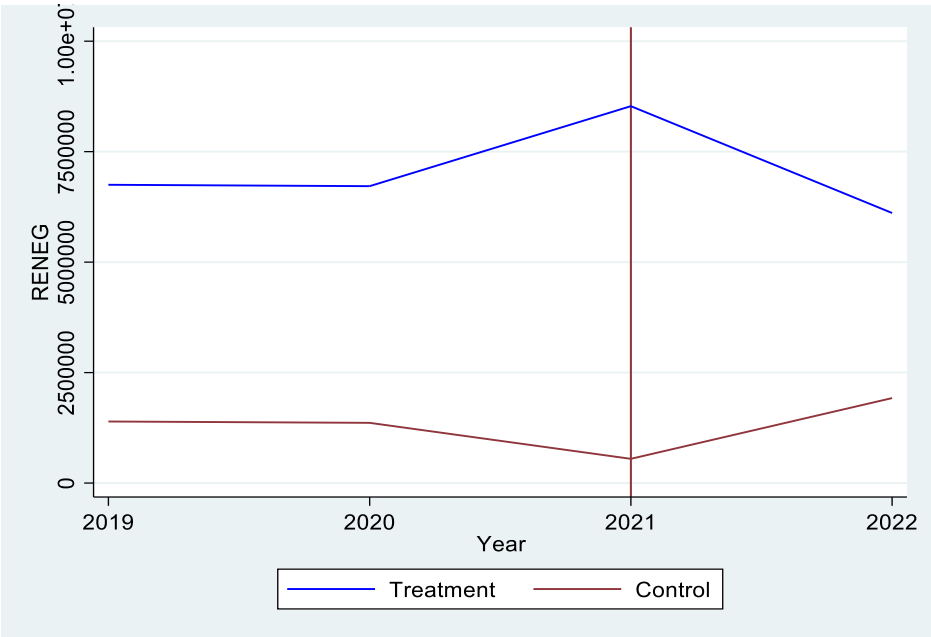


Figure 5. The trend of emissions score (EMI) among treatment and control groups

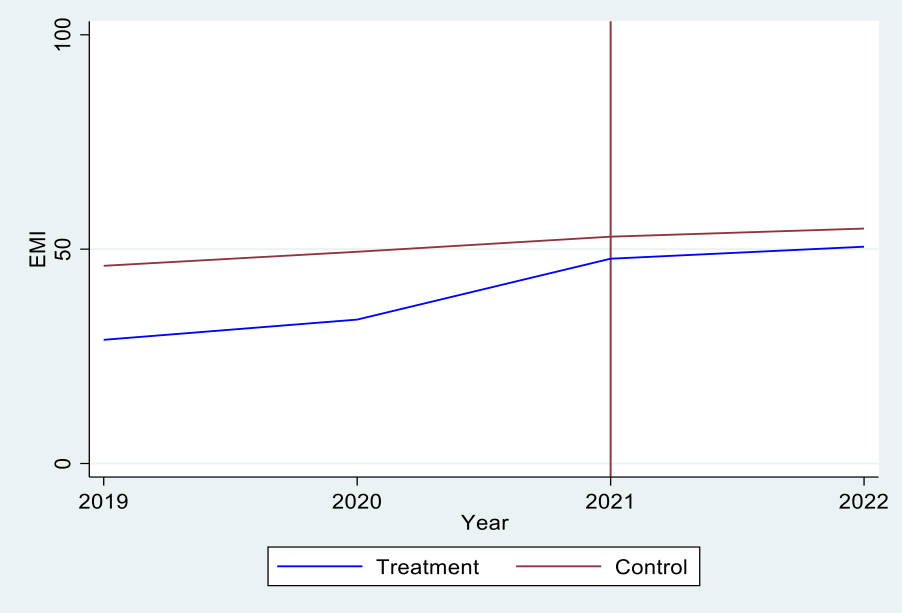


Figure 6. The trend of policy water efficiency (PWE) among treatment and control groups

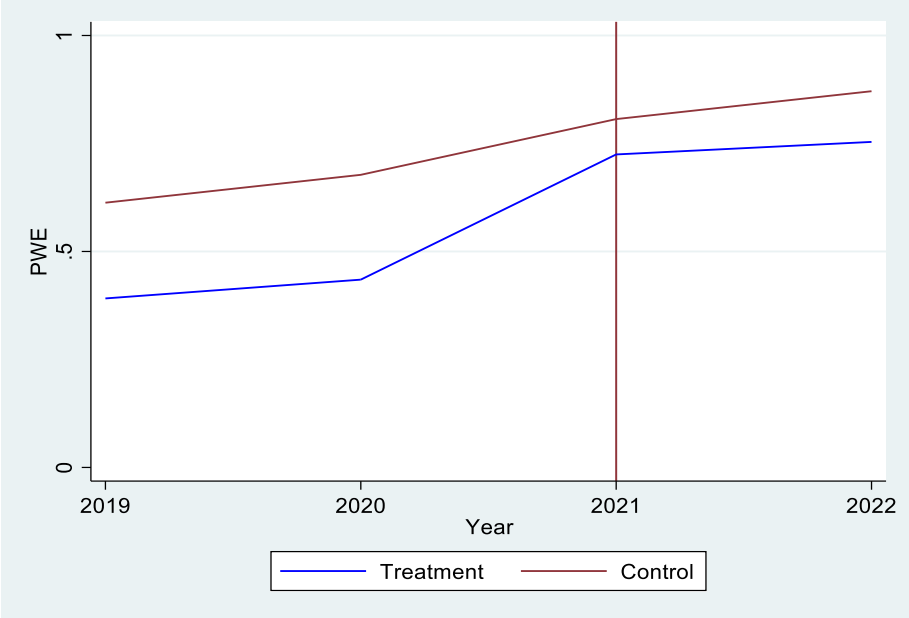
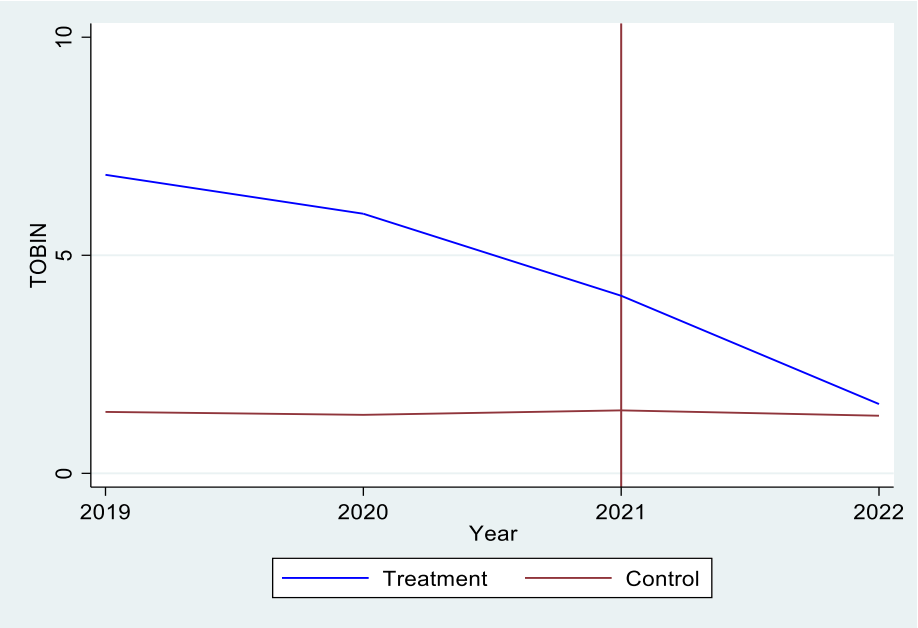


Figure 7. The trend Tobin's Q (TOBIN) ratio among treatment and control groups



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