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Does Mandatory Csr Influence the Link between Board Gender Diversity and Firm Efficiency in an Emerging Economy?

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Abstract: Despite the increasing emphasis on responsible corporate practices and governance mechanisms, research on the impact of board gender diversity on firm technical efficiency remains limited—particularly in the context of mandatory CSR regimes. This study seeks to address this gap by empirically analyzing the effect of board gender diversity on firm performance using a technical efficiency indicator, while also examining whether mandatory CSR moderates this relationship in a developing economy: Indonesia. The data, sourced from the Thomson Reuters Eikon database (2012–2021), reveal that board gender diversity positively influences firm efficiency. Moreover, mandatory CSR requirements strengthen this positive association. These findings offer valuable insights into the link between board gender diversity and firm efficiency, as well as the moderating role of regulatory frameworks. They also raise questions about policies aimed at promoting gender diversity on corporate boards. The study provides practical implications for managers seeking to improve efficiency and for policymakers designing regulations to enhance firm performance in developing countries.

Keywords: board gender diversity; firm efficiency; data envelope analysis; CSR mandatory.
JEL Classification: M14, K20

I. INTRODUCTION

Corporate governance encompasses a system of mechanisms designed to mitigate agency conflicts arising from the separation of ownership and control, thereby safeguarding the interests of stakeholders (C. Lin et al., 2009). Over the past few decades, corporate governance has garnered significant attention as organizations and regulators seek to address agency problems amid increasing global interconnectedness (Ioannou & Serafeim, 2017). This heightened focus stems partly from voluntary corporate social responsibility (CSR) initiatives and partly from government-mandated regulations. Institutional-based corporate governance mechanisms—such as appointing independent directors, enhancing board gender diversity, or separating CEO and board chair roles—have gained prominence in driving and communicating CSR efforts.Resource dependency theory posits that institutional-based governance, particularly board gender diversity, plays a critical role in overseeing corporate operations, managing key resources, and maintaining strategic relationships, all of which can influence firm performance (C. Lin et al., 2009; Rodriguez-Fernandez, 2016). However, prior research presents conflicting findings regarding the relationship between board diversity and firm performance (EmadEldeen et al., 2021; Hsu et al., 2019). Moreover, empirical studies examining the impact of board gender diversity on firm technical efficiency remain scarce. To address this gap, this study investigates the link between institutional-based corporate governance—specifically board gender diversity—and firm efficiency.

Indonesia has also embraced this trend through the enactment of Government Regulation No. 47/2012 on Corporate Social and Environmental Responsibility, which extends mandatory CSR requirements to listed firms operating in natural resource-based and natural resource-related sectors. Compliance with such regulations can strengthen corporate discipline, incentivizing firms to improve operational performance, allocate resources more efficiently, and establish legal safeguards (Ioannou & Serafeim, 2017; Liu & Tian, 2021). Additionally, effective CSR practices may reduce costs associated with stakeholder management by fostering stronger social legitimacy (Jones, 2016).However, mandatory CSR regulations—as an external governance mechanism—may also impose additional costs and, in some cases, conflict with shareholder value maximization (C. P. Lin et al., 2016). Some studies suggest that such regulations could even negatively impact long-term financial performance (Asfour & Eltoukhy, 2010; Chen et al., 2018). Given Indonesia's status as a leading Southeast Asian economy with a mandatory CSR framework, this study seeks to examine how CSR regulations influence the relationship between board gender diversity and firm efficiency, providing deeper insights into the interplay between regulatory pressures and corporate governance mechanisms.

In summary, this study examines (1) the extent to which institutional-based corporate governance influences firm efficiency and (2) whether mandatory CSR moderates the relationship between governance mechanisms and efficiency. Using Data Envelopment Analysis (DEA) to measure technical efficiency among Indonesian listed firms and Tobit regression to account for censored data, we find that board gender diversity positively impacts firm efficiency, leveraging the relative advantages of diverse perspectives. Furthermore, mandatory CSR—as an external regulatory pressure—strengthens this relationship by reinforcing governance discipline.These findings contribute to existing literature by empirically validating (1) the board diversity-efficiency linkage and (2) the moderating role of CSR mandates in emerging markets. For policymakers, the results suggest that regulatory support for gender-diverse boards—coupled with well-designed CSR frameworks—can enhance governance quality and operational performance. Firms, in turn, should recognize diversity not merely as a compliance requirement but as a strategic lever for efficiency gains.

II. Literature Review and Hypothesis Development

2.1 Theoretical Background

In economic theory, firm efficiency is achieved when a company either maximizes output from a given set of inputs or minimizes inputs for a given level of output (Fare et al., 1994; Farrell, 1957). Under resource constraints, Resource Dependence Theory (RDT) examines how organizations manage critical resources and stakeholder relationships to maintain operational effectiveness (Ruigrok et al., 2007). From an RDT perspective, gender-diverse boards play a pivotal role in corporate governance by enhancing operational oversight, optimizing resource allocation, and strengthening stakeholder relationships - all of which contribute to improved business performance (C. Lin et al., 2009; Rodriguez-Fernandez, 2016).

Furthermore, to achieve organizational objectives and ensure long-term sustainability, firms must fulfill social commitments that align with either regulatory requirements or societal expectations, such as promoting gender equality (Guthrie & Parker, 1989). Legitimacy Theory provides a framework for understanding corporate responses to these commitments through two dimensions: (1) compliance with formal regulations and informal social norms, and (2) strategic pursuit of benefits derived from meeting these obligations (Rodriguez-Fernandez, 2016). This dual approach enables firms to simultaneously satisfy stakeholder expectations while enhancing their competitive position.

2.2Hypothesis development

2.2.1 Board gender diversity and firm efficiency

Board gender diversity, defined as the proportion of female representation on corporate boards, is theoretically linked to enhanced firm efficiency through multiple mechanisms. Resource Dependence Theory (RDT) posits a positive relationship, grounded in empirically observed behavioral differences between male and female directors. Female directors demonstrate greater receptiveness to problem-solving (Konrad et al., 2008), exhibit more rigorous oversight through questioning and issue-raising (Hsu et al., 2019), and show stronger commitment to stakeholder protection. Their presence also correlates with improved corporate transparency (Ahmed et al., 2017), enabling more accurate performance evaluation across both economic and non-economic dimensions, which facilitates strategic adjustments for optimal efficiency (EmadEldeen et al., 2021).

From a legitimacy theory perspective, gender-diverse boards enhance corporate reputation regarding social commitments, potentially reducing stakeholder management costs and thereby improving operational efficiency (Solakoglu & Demir, 2016). Based on these theoretical foundations and empirical evidence, we propose the following hypothesis:

H1: Board gender diversity positively correlates with firm efficiency.

2.2.2 The moderating effect of CSR regulation on the association between board gender diversity and firm efficiency

Indonesia's mandatory CSR regime, established through Government Regulation No. 47/2012, provides a unique institutional setting to examine how regulatory pressures interact with board gender diversity to influence firm efficiency. This regulation specifically targets natural resource-based and related listed companies, creating three distinct mechanisms that may enhance the gender diversity-efficiency relationship:

Regulatory Discipline Effect:

The mandatory CSR framework compels firms to develop systematic monitoring and reporting mechanisms (Ioannou & Serafeim, 2017). When combined with gender-diverse boards' documented tendency for rigorous oversight (Hsu et al., 2019), this creates synergistic governance improvements that translate into operational efficiency gains (Kieu et al., 2022).

Conflict-to-Performance Conversion:

While board diversity may initially increase managerial disputes (Hassan et al., 2015), CSR regulations provide a structured framework that channels these diverse perspectives toward productive strategic alignment (Akram & Abrar Ul Haq, 2022). The mandatory nature transforms potential conflicts into constructive debates about resource allocation and stakeholder management.

Strategic Legitimacy Shield:

For Indonesian natural resource firms, simultaneous compliance with gender diversity expectations and CSR mandates creates compounded legitimacy benefits (Liu & Tian, 2021). This dual compliance reduces regulatory risks and stakeholder pressures, allowing for more efficient long-term resource planning.

H2: CSR regulations have a moderating effect on the association between board gender diversity and firm efficiency.

III. METHODOLOGY

3.1Data and Sample Selection

This study analyzes Indonesian firms listed on the Indonesia Stock Exchange (IDX) from 2012 to 2021, using data sourced from Thomson Reuters Eikon. The sample includes only domestic firms subject to Government Regulation No. 47/2012 on mandatory CSR, excluding those with incomplete data. After filtering, the final sample consists of 298 unique firms, yielding 3,272 firm-year observations. By focusing exclusively on natural resource-based and related companies under Indonesia's mandatory CSR regime, the study ensures a controlled examination of how regulatory pressures interact with board gender diversity to influence firm efficiency.

3.2Firm's Efficiency Evaluation

Efficiency, defined as productivity per unit cost (Stuebs & Sun, 2010), is measured in this study using Data Envelopment Analysis (DEA)—a non-parametric, linear programming approach that evaluates relative efficiency across decision-making units (DMUs) (Cooper et al., 2007). Each DMU (in this case, firms) is benchmarked against an empirically constructed "efficiency frontier" formed by the best-performing units (efficiency score = 1).This study employs a DEA model with two standard input measures - cost of goods sold, and selling, general and administrative expenses - and a single output measure (total revenue) to evaluate firm-level technical efficiency.

IV. DATA ANALYSIS AND RESULTS

4.1 Descriptive statistics

Table 2 presents the descriptive statistics for all study variables. The technical efficiency (TE) scores show a mean value of 0.359 (SD = 0.142), indicating that sample firms operated at approximately 35.9% of their potential efficiency frontier during the 2012-2021 observation period. Board gender diversity (BGEN) averaged 18.7%, suggesting that women occupied nearly one-fifth of board positions across the sample.The CSR regulation variable (CSRR) reveals that 23.5% of listed firms fell under the mandatory CSR requirements. Firm size, measured by the natural logarithm of total assets, exhibited substantial variation (Range: 10.982-27.347; Mean = 19.855, SD = 3.217), reflecting the diverse composition of Indonesian listed firms.Financial leverage (LEV) averaged 38.23% (Range: 12.77%-59.13%), while firm age showed an average listing duration of 16 years (Maximum = 31 years), indicating our sample includes both established market participants and relatively younger public companies.

Table 1. Descriptive statistics.

Variables	Mean	Min.	Max.	Std. dev.
TE	0.359	0.006	1	0.17
BGEN	0.187	0	0.548	0.081
CSRR	0.235	0	1	0.122
SIZE	19.855	10.982	27.347	1.389
LAGE	16.238	-7	31	8.117
LEV	38.23	12.77	59.13	6.179

** Notes: TE: technical efficiency; BGEN: board gender diversity; CSRR: CSR regulations; SIZE: total assets; LAGE: firm's listing age; LEV: leverage.*

Source: Authors' calculation

4.2 Empirical Results

The regression technique to test hypotheses will be performed by Tobit regression analysis. Since firm technical efficiency score is limited from 0 to 1, the uncensored regression models can be biased while the Tobit regression is justified(Ngo, 2012a, 2012b).

Table 2. Hypotheses testing results.

Variables	Dependent variable: Technical efficiency		
	(1)	(2)	(3)
Control variables			
SIZE	0.094*** (0.020)	0.092*** (0.020)	0.091*** (0.021)
LEV	0.079*** (0.021)	0.078*** (0.021)	0.077*** (0.021)
LAGE	-0.0021*** (0.0006)	-0.0021*** (0.0006)	-0.0020*** (0.0006)
Independent variables			
BGEN	0.184*** (0.013)	0.173*** (0.014)	0.175*** (0.014)
Moderation variable			
CSRR	-	0.087*** (0.008)	0.082*** (0.008)
Interaction variables			
BGEN*CSRR	-	-	0.069* (0.013)
Industry dummy	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes
Pseudo R^2	0.3581	0.4117	0.4189
p-value	0.0000	0.0000	0.0000
N	3,272	3,272	3,272

*Note:***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.Robust standard errors clustered by firm are reported in parentheses.*

The regression analysis (Table 2) reveals several key findings: (1) Board gender diversity (BGEN) has a statistically significant positive effect at the 1% level ($\beta = 0.184$), supporting Hypothesis 1, indicating that a 10% increase in female board representation improves technical efficiency by 1.84%; (2) Mandatory CSR regulations (CSRR) also show a positive and significant impact ($p < 0.01$), confirming that regulatory pressure enhances operational efficiency; and (3) The interaction between BGEN and CSRR is statistically significant, validating Hypothesis 2 that CSR mandates amplify the positive effect of gender diversity. Additionally, firm size and financial leverage positively influence efficiency, while listing age exhibits a small but significant negative coefficient, consistent with behavioral finance's "new listing effect," where investors tend to overvalue newly listed stocks. These findings support resource dependence theory and provide empirical evidence for Indonesian policymakers on the dual benefits of gender diversity combined with CSR regulations.

V. DISCUSSION AND CONCLUSION

The findings of this study confirm that board gender diversity positively influences firm technical efficiency, consistent with existing literature highlighting the operational advantages of diverse boards (EmadEldeen et al., 2021; Nanka-Bruce, 2011). Notably, the research reveals that mandatory CSR regulations serve as a significant moderator, amplifying the beneficial effects of gender diversity on efficiency. This suggests that firms operating under CSR mandates not only achieve higher efficiency levels but also experience enhanced performance when their boards are gender-diverse. These results align with prior studies demonstrating the positive impact of regulatory frameworks on corporate performance (Ioannou & Serafeim, 2017; Liu & Tian, 2021), as CSR compliance promotes more disciplined board governance and optimal resource utilization (Hsu et al., 2019). For policymakers, these insights underscore the importance of implementing board diversity requirements and potentially expanding mandatory CSR regulations to additional sectors, given their demonstrated ability to improve governance quality and operational outcomes. However, the study's focus solely on gender diversity and its limitation to Indonesian firms over a ten-year period suggests opportunities for future research to explore other diversity dimensions, conduct cross-country comparisons, and employ qualitative methods to examine board members' perceptions of CSR regulations. Additionally, event studies could provide valuable insights into market responses to CSR mandate implementations.

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