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Role of women board members in the relationship between internal CSR and firm efficiency: Evidence from multiple countries

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Abstract: The study aims to analyze the effect of internal CSR practices on firm efficiency, focusing on the moderating role of women board members. Using a sample set of 5,997 firms from 39 countries between 2008 and 2019, this study performs Data Envelopment Analysis (DEA) to measure firm efficiency and applies a panel regression to investigate the moderation effect of women board members. The empirical results show that women board members play a crucial moderating role in the relationship between internal CSR and firm efficiency. In general, the link between internal CSR and firm efficiency becomes more positive as the proportion of women board members grows. Similar results were reported in the group of developed country. In the developing status group, however, the role of women board members in the positive relationship between internal CSR and firm efficiency was not significant. This study is novel since no prior research has examined the relationship between the presence of women board members in internal CSR-firm efficiency relationships. Moreover, this study employs a broader range of research data, making the conclusions more representative. We recommend investigating additional characteristics of top management, such as experience, education, and age, for future studies.

Subjects: Gender Studies - Soc Sci; Economics; International Finance; Finance; Corporate Finance; Business, Management andAccounting; Corporate Governance

Keywords: corporate social responsibility; internal CSR; firm efficiency; women board members; data envelopment analysis; DEA

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1. Introduction

Corporate social responsibility (CSR) has become an important issue for business, with over 80% of G250 companies reporting their CSR activities online (McCalla-Leacy et al., 2022). Thus, currently, the benefits of CSR implementations in firm performance and the value it creates for stakeholders have been extensively explored by researchers to meet business objectives. CSR implementation can be divided into CSR practices involving internal (ICSR) and external (ECSR) stakeholders. This study will only focus on the firm's responsibility to its internal stakeholders, especially to employees.

Employees are the business foundations. Companies must realize that making employees happy is important. Productive and loyal employees are valuable resources. Conversely, unmotivated workers will cost the company. Studies show that happier people are more productive. Some happiness indicators are job satisfaction, the quality of work life, and life satisfaction (Zelenski et al., 2008). Meanwhile, empirical evidence showed that a causal relationship exists between worker well-being and productivity. In this case, some factors such as high-quality supervisors and natural capital can strengthen the relationship (Isham et al., 2021).

At the same time, there has also been a growing public concern about female representation on corporate boards. For institutional investors, gender equality on boards has also become an essential investment requirement (Ararat & Yurtoglu, 2021). Consequently, companies are becoming more mindful of the importance of appointing women as board members. Currently, *OECD.stat* records that one in five board seats in the largest publicly listed companies from 37 OECD countries and 6 non-OECD countries are occupied by women. The gender proportion is not just to fulfill legitimacy but because of social demand. Fifty percent of Americans choose to work in companies led by women. They believe that women's values are more focused on the goal and that they pay attention to the needs of women, especially working mothers, by providing daycare for children at work, maternity leave, and flexible working hours by offering the same salary compared to companies led by men. Also, a study involving respondents in 43 countries showed that overall employee job satisfaction was higher when women led the company because women demonstrated more ability to communicate with employees and could create more employee engagement than men (Castrillon, 2019).

In 2015, MSCI Global Research projected that the percentage of women on the board will continue to increase until 2027. This is because many global company owners realize that the presence of women on the board will provide many benefits. This includes gender diversity reducing the controversy regarding corporate governance and improving decision-making. Additionally, the presence of women on this board did not reduce the board's willingness to take risks in investment decisions (L. Lee et al., 2015).

In spite of the vast amount of research on CSR and firm performance relationship (Velte, 2021; Q. Q. Wang et al., 2016) some questions are still unexplored, such as whether women board members have a significant role to strengthens the internal CSR and firm efficiency relationship. The role of women on boards is an interesting thing to study because it exhibits practical implications that are often encountered (Uribe-Bohorquez et al., 2019). Board members as the strategic decision maker and management might demonstrate a significant influence on worker happiness. The argument to be developed is that the effect of internal CSR on firm efficiency may be contingent on the board gender composition. The number of women on a board may influence the board's decisions about the acceptability of internal CSR investment strategies to increase employee motivation and business productivity.

This empirical study is based on data from 35,546 firm-year observations from 39 countries from 2008 to 2019. Data were utilized on workforce scores and board gender percentages from Corporate Governance and ESG ASSET4 Refinitiv databases as proxies for firm internal CSR investment and women on board members, respectively. Financial data were collected from a worldwide financial database from Refinitiv. Firm efficiency is the company's ability to transform inputs into

outputs and represented the firm's financial goal. Data Envelopment Analysis (DEA) was used to measure firm efficiency to determine which companies are better than others of group companies used as samples.

Companies are said to be more efficient than other companies when they are better at maximizing the output from the number of resources that were provided. Finally, the interplay between women board members and internal CSR increases firm efficiency. This evidence adds new insights into the relationship between internal CSR and firm efficiency (Setyowati et al., 2021). While this literature found mixed evidence on the link between internal CSR, women board members, and firm efficiency, a country-developed status context within which this link is more likely to be positive.

Section 2 of this study provides the related literature review and predictions. Section 3 describes the sample and the variable measurements. Section 4 discusses the main results and robustness test. Section 5 concludes the study.

2. Related literature and predictions

This paper intercepts of two different branches of the literature. Section 2.1 discusses the estimation of firm efficiency, and Section 2.2 discusses CSR.

2.1. Firm efficiency and data envelopment analysis

In 1957, (Farrell, 1957) introduced the concept and measurement of productive efficiency. He explained that an efficient company is a company that successfully produces a lot of output from given inputs. Then, he developed a measurement of production efficiency by differentiating it into price/allocative efficiency and technical efficiency. Three decades later, (Charnes et al., 1978) introduced a nonparametric method to measure firm technical efficiency, DEA, that uses a linear programming model to calculate the input-output ratio for each Decision-Making Unit (DMU) compared to a population. Then, in 1984, (Banker et al., 1984) improved the DEA method known as the BCC model/variable return to scale (VRS) model. This model decomposes overall technical efficiency into pure technical efficiency and scale efficiency. This model is built on an assumption of a situation where the DMUs are in imperfect competition and exhibit different government regulations and constraints in finance, which might cause DMUs to not operate at optimum scale (Coelli et al., 2005).

So far, DEA is the most commonly used of the two methods in the technical efficiency literature (Bayar et al., 2018; Odeck & Bråthen, 2012; Uribe-Bohorquez et al., 2019). The objective of measuring DEA is to find the relative efficiency level of DMUs to similar companies in the same frontiers' "efficient curve" (Demerjian et al., 2012). In other words, we can use this method to assess the relative efficiency of similar objects. Several advantages to using DEA as a firm's financial performance analysis exist. First, this method can evaluate multi-variables simultaneously and catch the interaction of output-input variables. Thus, this model is more flexible and robust than other conventional measurements. Second, the most efficient company can be identified through this DEA method. Finally, this DEA method provides more information analysis than financial ratios and comprehensive analysis of relative efficiency (Gong et al., 2019; Merkert & Hensher, 2011; Uribe-Bohorquez et al., 2019; W.-K. K. W.-K. K. Wang et al., 2014).

2.2. Internal CSR, women board members, and firm efficiency relationship

To explain the trivariate association between internal CSR, women board members, and firm efficiency, we employ contingency theory, which argues that external factors affect the relationship between dependent and independent variables (Donaldson, 2001). In other words, the effect of internal CSR on firm efficiency will vary when the moderating variable is high or low. Furthermore, we adopt stakeholder theory to explain the direct relationship between internal CSR and corporate efficiency, and gender socialization theory to explain the moderating effect of women board members.

2.2.1. Stakeholder theory

In general, researchers turned to stakeholder theory to operationalize the concept of CSR in their studies. Most of them found a positive relationship between CSR and firm profitability (Return on Asset/ ROA) and/or (Return on Equity/ ROE; Javeed & Lefen, 2019; Theodoulidis et al., 2017), the net present value of investment (Benlemlih & Bitar, 2018), as well as market value (Hou, 2019; Theodoulidis et al., 2017). (Yoon & Chung, 2018) also found evidence that internal CSR enhances firm operational profitability (ROA) in U.S. restaurant firms. Meanwhile, (J. Lee & Kim, 2016; Setyowati et al., 2021) found that firms with good employee initiatives (internal CSR) exhibit a higher level of firm market value (Tobin's Q) and firm efficiency (EFF).

In stakeholder theory, the corporation views all stakeholders as part of the business environment that must be appropriately managed to improve the firm financial performance (Freeman et al., 2021). This theory contradicts the preceding shareholder theory, also known as Fiduciary Capitalism, which asserts that the fundamental objective of business is to maximize shareholder welfare. This shareholder theory posits that corporate social actions are only permissible if they promote shareholder welfare or meet legal obligations (Carroll, 2009). However, stakeholder theory does not simply dismiss shareholder theory; as the organization's goals are broader, the interests of other stakeholders must also be taken into account.

Therefore, the conclusion is that the primary purpose of business CSR operations is to satisfy the expectations of all stakeholders (Carroll, 2009). This study focuses on the implementation of corporate social responsibility towards employees (internal stakeholders). According to the notion of stakeholders, meeting employee expectations is not an expense. Providing salaries, incentives, and excellent health programs (good employee health insurance) are investments. Ensuring that the firm is committed to gender and racial equality in recruiting and career development, or involving workers in decision-making, is the company's approach to increasing employee happiness and motivation. These strategies may boost employee satisfaction and motivation. When workers feel motivated, their production will increase. They could manufacture more goods/ services and a few faulty items. They will work harder to expand the business, which might lead to an improvement in the company's financial objectives (Yoon & Chung, 2018). Therefore, based on the explanation above, we propose a hypothesis:

H1. Internal CSR significantly increases firm efficiency.

2.2.2. Gender socialization theory

This study also employs the contingency (Donaldson, 2001) and gender socialization (Mason & Mudrack, 1996) theory to describe that firm efficiency is contingent on the interaction between internal CSR and board gender. The argument to be established is that the impact of internal CSR on firm efficiency would vary depending on the gender composition of the board. The proportion of women on a board will have an impact on the board's judgments on whether internal CSR investment options are acceptable to boost employee motivation and corporate productivity.

Meanwhile, to achieve the right investment strategy to make employees happy, the role of women board members might become important. Board members as the investment strategy decision maker will influence how workers as firm internal stakeholders respond through increased productivity that shows their loyalty. Gender socialization theory shows that women and men tend to view morality and ethical behavior differently. These differences in views and behavior are based on how their family and environment treated them from birth. Gender socialization theory states that men and women exhibit different values, ethical views, and attitudes toward the workplace because gender is dictated during childhood and reinforced over time through social norms (Harjoto & Rossi, 2019; Mason & Mudrack, 1996). Based on this theory, women are believed to demonstrate several different characteristics from men, including being more ethical, having more

empathy, and demonstrating a better attitude toward the workplace (Lu¨ckerath-Rovers & Lückerath-Rovers, 2013; McGuinness et al., 2017; Reguera-Alvarado et al., 2015; Uribe-Bohorquez et al., 2019).

Several previous studies explored how women board members influence CSR practices (Amorelli & García-Sánchez, 2021; Le et al., 2023). Generally, these studies found a positive effect on this relationship. Increased sensitivity and participation in decision-making are characteristics of women board members to become a major key to attaining corporate responsibility strength rating (Rao & Tilt, 2016). Women on boards seem to be more sensitive to charitable giving and to be well connected with the community, internal organizational practices, and the environment. This relationship was seen more clearly in developing countries where CSR practices were seen to be proactive and strategic (Kyaw et al., 2017). The presence of women on boards motivates the board of directors to obtain, discuss, and negotiate different knowledge from all directors' perspectives. Moreover, their findings clarify that women exhibit equal access to education, employment, and other opportunities. This can help distribute power in decision-making in various corporate strategies, including CSR (Byron & Post, 2016). The involvement of women as top managers increased CSR performance. The studies further explained the social preferences, attitudes, and psychological differences between women and men. Women are more compassionate than men, and their response to social and community needs is higher than men's (McGuinness et al., 2017).

In addition, the studies found a relationship between female directors and the firm's financial performance. The presence of women on the board could improve return on assets (ROA). Women board members encourage socially responsible investment, and ultimately, the company's financial performance will improve (Valls Martínez et al., 2019). In addition, companies with female directors performed better than companies that did not. A study also explained that the diverse composition of the board would lead to quality corporate strategic decision-making because of the many perspectives evaluated. The presence of women on the board also makes companies more innovative, modern, and transparent. Besides, women board members would enhance good relations with all company stakeholders. Moreover, women workers in companies will be more motivated to perform better because they have a role model in a top position (Lu¨ckerath-Rovers & Lückerath-Rovers, 2013). In their research on companies in Spain, (Reguera-Alvarado et al., 2015) concluded that a positive relationship exists between gender diversity and economic outcomes. In other words, increasing the proportion of women board members can improve business performance. Gender diversity on the board will increase the value for the company because women bring new ideas, skills, and views. Furthermore, the presence of women on the board will contribute to corporate stakeholders through substantial ethical and social improvements in the company's strategies. Another study (Uribe-Bohorquez et al., 2019) concluded that the presence of women board members enhances workers' commitment, the firm's reputation, and the firm's market value.

This research argues that the internal CSR investment choice is a strategic decision made by top managers. Based-on gender socialization theory, we argue that female board members will choose internal CSR activities that are more ethical and acceptable to their workers. Many women board members demonstrate more empathy about employee issues such as providing daycare services and flexible working hours for women employees and involving staff in decision-making. Meanwhile, as explained in stakeholder theory, employees as internal stakeholders will provide positive feedback to the company when the company meets its needs. Employee feedback on the decisions of the female board is that employees feel more valued; they will commit more to the company. With higher commitment from the employees, the internal activities made by the female board will improve labor productivity and efficiency. Additionally, money spent on recruitment and training costs for new employees will be saved. Thus, relying on gender socialization and stakeholder theory, the following hypothesis is tested:

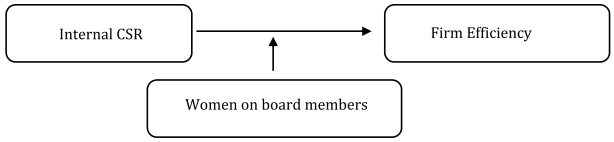

Figure 1. Research framework on the moderation of women board members regarding the impact of internal CSR and firm efficiency.

H2. Women board members moderate the positive relationship between internal CSR and firm efficiency.

Figure 1 places women board members within our conceptual framework as a moderator of the internal CSR and firm efficiency link. Thus, this study adopts both the direct and contingency approaches to analyze the role of women board members on internal CSR-firm efficiency relationships. In the direct approach, the linear relation between internal CSR and firm efficiency is investigated.

3. Materials and methods

Several databases were used to construct our sample. For internal CSR, the workforce score from the ESG ASSET4 Refinitiv database was used (J. Lee & Kim, 2016). This score is from the lead provider of the world's largest objective, comparable, and auditable database of ESG information and combines workforce information about employment quality, health and safety, training and development, and diversity. For the financial data, we used a worldwide database from Refinitiv and macroeconomic data from the International Monetary Fund. All continuous data are winsorized at the 1st and 99th percentiles to reduce the potential impact of outliers.

The study excluded firm observations with missing data on input-output indicators for firm efficiency measures, internal CSR, women board members, and control variables. The final sample consists of unbalanced 35,546 firm-year observations from 39 countries and 9 industries for the period 2008 to 2019, of which 27,927 observations were from developed-country economies, and 7,619 observations were from developing-country economies. Table 1 shows that a wide variation in the number of firms is found across countries. As can be seen, the highest geographic diversity is in the United States (33.97%). Table 2 shows that the number of firms increases steadily over the sample period based on the data available for this period. Table 3 shows the distribution of the sample by industry. Industries grouping is based on 9 main industries defined by the Industry Classification Benchmark (ICB). In this study, we did not include the financial and utilities industries considering that these two industries demonstrate different financial valuation characteristics from other industries.

This study employed two stages of analysis to investigate the moderating role of women board members in the relationship between internal CSR and firm efficiency. First, the paper measures the level of the firm technical efficiency. DEA was used to measure firm efficiency as a dependent variable proxy and was employed as an output-oriented VRS assumption. This output orientation means maximizing firm outputs from a portfolio of inputs. In order to represent a firm's efficiency, this paper follows prior studies (Frijns et al., 2012; W.-K. K. W.-K. K. Wang et al., 2014) that interpret two outputs as the operational outcome and shareholder value and three inputs as capital, labor, and total other operating expenses. Table 4 explains the input-output categories selection used in this study, while a summary and the measurement of all variables are presented in Table 5.

Table 6 shows descriptive statistics for all variables in panel regression analysis, including dependent, independent, moderating, and control variables. The mean of firm efficiency (EFF) scores as our dependent variable are 68.00 in the full sample data, 67.27 in developed-country economies, and 70.67 in developing-country economies. These data demonstrate that the average firm efficiency in developing countries outperforms the average firm efficiency in developed nations.

Table 1. Sample distribution based on country origin

Country	Freq.	Percent	Cum.
Australia	1,215	3.42	3.42
Austria	145	0.41	3.83
Belgium	245	0.69	4.52
Brazil*	361	1.02	5.53
Canada	1,950	5.49	11.02
Chile*	115	0.32	11.34
China*	1,522	4.28	15.62
Denmark	269	0.76	16.38
Finland	280	0.79	17.17
France	994	2.8	19.96
Germany	967	2.72	22.68
Greece	106	0.3	22.98
Hong Kong*	1,467	4.13	27.11
India*	666	1.87	28.98
Indonesia*	286	0.8	29.79
Ireland	104	0.29	30.08
Israel*	108	0.3	30.38
Italy	300	0.84	31.23
Japan	3,947	11.1	42.33
Malaysia*	237	0.67	43
Mexico*	281	0.79	43.79
Netherlands	328	0.92	44.71
New Zealand	115	0.32	45.03
Norway	295	0.83	45.86
Philippines*	127	0.36	46.22
Poland	159	0.45	46.67
Portugal	75	0.21	46.88
Russia*	166	0.47	47.35
Singapore*	237	0.67	48.01
South Africa*	719	2.02	50.04
South Korea*	441	1.24	51.28
Spain	379	1.07	52.34
Sweden	669	1.88	54.23
Switzerland	616	1.73	55.96
Taiwan*	403	1.13	57.09
Thailand*	272	0.77	57.86
Turkey*	211	0.59	58.45
UK	2,693	7.58	66.03
US	12,076	33.97	100
Total	35,546	100	

*Developing economies country. The country development economies status is adapted from United Nations (UN) country classification

Table 2. Sample distribution based on year

year	Freq.	Percent	Cum.
2008	1,497	4.21	4.21
2009	1,730	4.87	9.08
2010	2,115	5.95	15.03
2011	2,244	6.31	21.34
2012	2,307	6.49	27.83
2013	2,357	6.63	34.46
2014	2,520	7.09	41.55
2015	3,082	8.67	50.22
2016	3,545	9.97	60.2
2017	4,044	11.38	71.57
2018	4,750	13.36	84.94
2019	5,355	15.06	100
Total	35,546	100	

Table 3. Sample Distribution based on Industry

Industry*	Freq.	Percent	Cum.
Basic Materials	3,745	10.5	10.54
Consumer Discretionary	7,180	20.2	30.73
Consumer Staples	2,792	7.85	38.59
Energy	2,634	7.41	46
Health Care	3,466	9.75	55.75
Industrials	8,306	23.4	79.12
Real Estate	2,690	7.57	86.68
Technology	3,255	9.16	95.84
Telecommunications	1,478	4.16	100
Total	35,546	100	

*The industry is classified by Industry Classification Benchmark (ICB)

Table 4. Selection input-outputs on output-oriented approach

Input		Output	
1.	Capital [net property, plant, and equipment (PP&E) + total intangible asset] in US$	1.	Revenue [total firm revenues] in US$
2.	Labor [total number of employees] in person	2.	Market Value [number of shares outstanding] in US $
3.	Other input [Total other operating expense in US$]		

Table 5. Variables description

Variable	Symbol	Description	Data Source
Dependent variable Firm Efficiency	EFF	We measure firm efficiency with DEA analysis under VRS assumption. Firm efficiency is the firm effectiveness to produce an output with a given set of inputs. A firm is technically efficient if a firm is producing the maximum output from the minimum quantity of inputs. Firm efficiency score is between 0 and 1. We multiply EFF score by 100 in performing regression analysis.	Refinitiv worldwide financial database
Independent variable Internal CSR	ICSR	The firm responsibility practices and policies to its employees.	Workforce score of ESG ASSET4 Refinitiv
Moderating variable Women on Board Member	PWBOARD	% of women directors on the board of directors	ASSET4 Refinitiv
	DWBOARD	Dummy of women directors on the board of directors DWBOARD = 1 if there is at least one women director on board members, DWBOARD = 0 otherwise)	ASSET4 Refinitiv
Control variable			
Leverage	LEV	Leverage (total debt to total asset)	Refinitiv worldwide financial database
Profitability ratio	ROA	Return on Asset (%)	Refinitiv worldwide financial database
PPE/Asset	PPE/Asset	Plant, property, and equity ratio divide total asset	Refinitiv worldwide financial database
Market value ratio	MVTB	market value to book ratio (%)	Refinitiv worldwide financial database
GDP per capita	GDP	GDP per capita in each country/ year	IMF data mapper
Inflation	INF	Inflation in each country/ year	IMF data mapper

To consider potential outlier problems or data errors, all continuous variables are winsorized at the 1% and 99% levels

The mean values of *ICSR* as the main independent variable are 52.88 in the full sample data, 52.65 in developed countries, and 53.72 in developing economies. Developing economies' internal CSR mean scores are higher in comparison to developed economies' scores. Meanwhile, the women board members moderating variable mean scores are, in the full sample, developed-country, and developing-country economies, 14.90, 16.07, and 10.56, respectively. This means that, on average, the presence of women on board in developed-country economies is higher than in developing countries.

Table 6. Descriptive statistics

Variable	Obs	Mean	p50	Std.Dev.	Min	Max
Full sample						
EFF	35,546	68.00	69.60	21.04	12.10	100
ICSR	35,546	52.88	53.87	28.48	2.10	99.11
WBOARD	35,546	14.90	12.50	12.71	0	50.00
LEV	35,546	35.92	34.80	25.88	0	132.19
ROA	35,546	5.03	5.55	10.88	−50.84	32.85
PPE/Asset	35,546	31.93	25.11	25.66	0.43	95.49
MVTB	35,546	2,972.64	455.00	8,511.94	−1472.62	63,866.50
GDP	35,546	44,165.07	47,195.94	18,451.19	1,732.05	83,158.27
INF	35,546	1.95	1.80	1.60	−1.1	9.00
sub sample: Developed economies countries						
EFF	27,927	67.27	68.90	21.13	11.60	100
ICSR	27,927	52.65	53.63	28.40	2.13	99.11
WBOARD	27,927	16.07	14.29	12.90	0	50.00
LEV	27,927	36.44	35.07	26.94	0	140.96
ROA	27,927	4.29	5.31	11.66	−55.17	32.17
PPE/Asset	27,927	31.60	23.74	26.44	0.49	96.17
MVTB	27,927	1,105.41	314.28	2,658.94	−1985.31	18,734.21
GDP	27,927	51,449.29	50,074.88	10,904.43	23,126.19	83,959.83
INF	27,927	1.53	1.60	1.07	−1.3	4.10
sub sample: Developing economies countries						
EFF	7,619	70.67	72.40	20.51	14.40	100
ICSR	7,619	53.72	54.79	28.78	1.96	99.13
WBOARD	7,619	10.56	9.09	10.84	0	42.86
LEV	7,619	34.15	34.04	22.36	0	92.86
ROA	7,619	7.69	6.50	7.39	−16.12	34.38
PPE/Asset	7,619	33.14	29.86	22.49	0.30	86.52
MVTB	7,619	11,709.26	3,392.38	27,921.07	6.00	205,077.40
GDP	7,619	17,680.43	10,286.58	15,698.58	1,443.88	60,912.73
INF	7,619	3.61	2.90	2.52	−0.6	15.20

Table 7 presents the Pearson correlation matrix for the explanatory variable validity test. A model faces a multicollinearity challenge if the correlation between pairs of explanatory variables exceeds 0.80. Therefore, all independent variables are in the range of 0.001 to 0.420, indicating that the models do not face the challenge of multicollinearity.

4. Empirical models

This section presents our empirical models. First, firm efficiency was estimated using DEA analysis. To calculate the degree of firm efficiency under VRS assumptions, (Bayar et al., 2018; Frijns et al., 2012) was followed.

$$D^{\rightarrow}(x_i, y_i, g_x, g_y) = \max \lambda$$

$$s.t \sum_{j=0}^{j} z_j y_{jm} \geq y_{im} + \lambda g_{ym} \quad m$$

Table 7. Correlation matrix

	EFF	ICSR	WBOARD	LEV	ROA	PPE/Asset	MVTB	GDP	INF
EFF	1								
ICSR	0.172***	1							
WBOARD	−0.097***	0.248***	1						
LEV	0.017**	0.055***	0.077***	1					
ROA	0.293***	0.089***	0.046***	−0.074***	1				
PPE/Asset	0.013*	0.028***	−0.067***	0.143***	−0.001	1			
MVTB	0.170***	0.088***	−0.035***	0.022***	0.146***	0.004	1		
GDP	−0.124***	−0.120***	0.184***	0.036***	−0.150***	−0.047***	−0.304***	1	
INF	−0.009	0.049***	−0.024***	0.007	0.103***	0.036***	0.179***	−0.420***	1

Note: ***, ** and * indicate significance at the 1%, 5%, and 10% levels respectively

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$$\sum_{j=0}^{j} z_j x_{jn} \geq x_{in} + \lambda g_{xn} \quad n$$

$$z_j \geq 0 \quad j$$

$$\sum_{j=0}^{j} z_j = 1 \quad i$$

Where x_i and y_i are the firm's specific input and output vectors, respectively, g_x and g_y are directional input and output vectors, respectively, and λ is the solution (the distance to the efficient frontier). The firm efficiency score of DMU *i* is between 0 and 1. If the efficiency score of unit *i* is 1, the DMU is perfectly efficient in utilizing inputs to produce outputs. If the efficiency score is less than 1, the DMU is relatively inefficient in employing input to maximize output.

Secondly, fixed-effect panel regression was used to investigate the interaction effect of women board members in the relationship between internal CSR and firm efficiency. The following models were estimated in this study:

$$\mathrm{EFF}_{i,t} = \sigma + \beta_1 \mathrm{ICSR}_{i,t} + \beta_2 \mathrm{LEV}_{i,t} + \beta_3 \mathrm{ROA}_{i,t} + \beta_4 \mathrm{PPE/Asset}_{i,t} + \beta_5 \mathrm{MVTB}_{i,t} + \beta_6 \mathrm{GDP}_t + \beta_7 \mathrm{INF}_t + \mathrm{n}_i + \mathrm{u}_{i,t} \quad (1)$$

$$\mathrm{EFF}_{i,t} = \sigma + \beta_1 \mathrm{ICSR}_{i,t} + \beta_2 \mathrm{WBOARD}_{i,t} + \beta_3 \mathrm{ICSR}_{i,t} * \mathrm{WBOARD}_{i,t} + \beta_4 \mathrm{LEV}_{i,t} + \beta_5 \mathrm{ROA}_{i,t} + \beta_6 \mathrm{PPE/Asset}_{i,t} + \beta_7 \mathrm{MVTB}_{i,t} + \beta_8 \mathrm{GDP}_{j,t} + \beta_9 \mathrm{INF}_t + \mathrm{n}_i + \mathrm{u}_{i,t} \quad (2a)$$

$$\mathrm{EFF}_{i,t} = \sigma + \beta_1 \mathrm{ICSR}_{i,t} + \beta_2 \mathrm{DWBOARD}_{i,t} + \beta_3 \mathrm{ICSR}_{i,t} * \mathrm{DWBOARD}_{i,t} + \beta_4 \mathrm{LEV}_{i,t} + \beta_5 \mathrm{ROA}_{i,t} + \beta_6 \mathrm{PPE/Asset}_{i,t} + \beta_7 \mathrm{MVTB}_{i,t} + \beta_8 \mathrm{GDP}_t + \beta_9 \mathrm{INF}_t + \mathrm{n}_i + \mathrm{u}_{i,t} \quad (2b)$$

Where *EFF* is firm efficiency, and *ICSR* is internal CSR. We use two alternative proxies to define the presence of women board members, namely *WBOARD* and D*WBOARD*. WBOARD is the percentage of women board members, while *DWBOARD* is a dummy of the women's presence on boards. Thus, in Model 2b, *DWBOARD* is 1 if at least one woman is a board member and 0 if none. (Bayar et al., 2018) and (Shabbir et al., 2020) were followed for the control variable. *LEV* is the total debt to total asset, *ROA* is the return on assets, *PPE/Asset* is net property, plant, and equipment divided by assets, *MVTB* is market value to book ratio, *GDPcpt* is *GDP* per capita, and INF is inflation in each country. Finally, industries and years were controlled for by including industry and year effects in the model.

5. Results and discussion

The first part of this section focuses on the direct relationship between internal CSR and firm efficiency results. The second part of the section addresses the second objective of the paper, which is to assess of the effect of women board members on the relationship between internal CSR and firm efficiency. The first part is explained in Table 8. Models 1 and 2 show the results of the direct effect of *ICSR* on *EFF* from all countries' data (full sample). Models 3 and 4 show the results of regression testing on the sub-sample data (developed-country economies). Meanwhile, models 5 and 6 show the results of sub-sample data from developing-country economies. According to the Hausman test, our results are robust on the fixed-effect model.

In the full sample data, we found that internal CSR is strongly positively related significantly to firm efficiency (see models 1 and 2). The same results were found both in developed- and developing-country economies samples with a significance level at 0.01 (Model 3–6). Our R-squared degree is satisfactory. These results imply that this research supports *H1*, which suggests that firm investment in employees increases firm efficiency in all countries—developed and developing. Therefore, the result supports stakeholder theory and aligns with earlier studies (J. Lee

& Kim, 2016; W.-K. K. W.-K. K. Wang et al., 2014; Yoon & Chung, 2018). Based on these results, we conclude that the firm's commitment to employees in terms of their workforce responsibility increases firm efficiency. When the company provides a comfortable and safe work environment and provides insurance, rewards, bonuses, educational and career opportunities for employees, or other forms of benefits to employees, it will meet the internal stakeholder expectation and will motivate employees to increase employee motivation, productivity, and efficiency (J. Lee & Kim, 2016; Setyowati et al., 2021).

Table 8 also shows that our control variables, leverage (*LEV*), *ROA, PPE/Asset*, and *MVTB*, positively, whereas *PPE/Asset* and *INF* negatively affect the firm efficiency in the full sample data. These results are statistically significant at a 1% significance. However, no significant effect of GDP on firm efficiency is found. Overall, we found almost the same thing in developed and developing-country.

Table 9 represents the findings of the interaction of internal CSR and women board members (WBOARD) on firm efficiency. The interaction effect of internal CSR and WBOARD associated with firm efficiency is relevant. Models 1 and 2 show the positive and significant effects of ICSR and WBOARD interaction on firm efficiency at the 1% level of significance. However, Model 3 finds that the interaction between ICSR and WBOARD is not significant. To further investigate the sensitivity of our regression, we performed a robustness check by excluding the U.S. firms in the entire sample and developed economies data (see Model 4). This eliminated the possibility that the dominance of U.S. companies would affect the test results because the U.S. firms contribute more than 30 percent of the data. However, the result was consistent with previous evidence. Although companies from the U.S. dominate the sample size, the results did not change.

In Table 10, the tests were re-estimated by applying an alternative measurement of the women board member variable. In Table 9, the women board members are proxied by the percentage of total women on the total number of board members, and in Table 10, we used a dummy variable from women board members. We gave the value 1 if there is female representation on the board (at least 1 female board member), and 0 if there are no female board members.

The table shows the same results as the previous table that show the positive and significant effect of interaction ICSR and DWBOARD on firm efficiency in full sample data (Model 1) and developed economies data (Model 2). Meanwhile, the result for developing economies countries (Model 3) and full sample minus U.S. data (Model 4) also demonstrate the same result as the previous table. The interaction effect of ICSR and DWBOARD on firm efficiency is positive and significant at 1% in Model 1 and 2 and 5% in Model 4. However, we cannot find the significant effect of DWBOARD in the internal CSR-firm efficiency relationship. These findings indicate that women board members favorably strengthen the relationship between internal CSR and firm efficiency. Thus, the results support H2 in full sample data and developed economies countries. Based on the gender socialization theory, this result suggests that the higher the percentage of women on the board or at least one woman on the board, the more ethical CSR decision-making policies will be (Byron & Post, 2016; Harjoto & Rossi, 2019). Women with an innate attitude who are more concerned with social issues will pay more attention to the implementation of internal CSR practices within the company (Mason & Mudrack, 1996). Moreover, they treat their employees more delicately and enable employees to be more valued. Some of these things may ultimately affect the effectiveness of implementing CSR internal strategies on company efficiency. Meanwhile, in developing countries, the moderating effect of women on the board does not show a significant effect. This result describes that in developing countries, the presence of women on the board do not influence the internal CSR strategy to achieve an efficient firm.

This result might be in line with (Post & Byron, 2014) research that found that the relationship between the presence of women on the board and financial performance was stronger in developed countries (countries with more gender equality, knowledge, experience, and values). In

Table 8. Internal CSR and firm efficiency regression analysis

	Full sample		Developed Countries		Developing Countries	
VARIABLES	**Pooled OLS (Model 1)**	**Fixed Effect (Model 2)**	**Pooled OLS (Model 3)**	**Fixed Effect (Model 4)**	**Pooled OLS (Model 5)**	**Fixed Effect (Model 6)**
ICSR	0.0918***	0.0918***	0.0819***	0.0819***	0.0602***	0.0602***
	(0.0032)	(0.007)	(0.0038)	(0.0081)	(0.0070)	(0.0139)
LEV	0.0238***	0.0238***	0.0150***	0.0150*	0.0343***	0.0343*
	(0.0039)	(0.0079)	(0.0043)	(0.0085)	(0.0102)	(0.0200)
ROA	0.4979***	0.4979***	0.4672***	0.4672***	0.4922***	0.4922***
	(0.0114)	(0.0175)	(0.0120)	(0.0183)	(0.0343)	(0.0523)
PPE/Asset	−0.1355***	−0.1355***	−0.1023***	−0.1023***	−0.2118***	−0.2118***
	(0.0045)	(0.0100)	(0.0052)	(0.0118)	(0.0100)	(0.0215)
MVTB	0.0003***	0.0003***	0.0013***	0.0013***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.0000)
GDP	−0.0000***	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
INF	−1.2743***	−1.2743***	−2.2593***	−2.2593***	−0.5798***	−0.5798***
	(0.0644)	(0.1249)	(0.1123)	(0.1988)	(0.0786)	(0.1406)
Constant	89.6251***	66.5979***	89.4486***	65.4310***	94.0316***	70.2808***
	(0.6755)	(0.9434)	(0.8273)	(1.4432)	(1.5955)	(1.5451)
R-squared	0.3563	0.3563	0.3775	0.3775	0.3544	0.3544
F statistic	220.10***	769.41***	650.14***	226.29***	168.56***	38.47***
BL&LM x2	42,799.22***		32,145.56***		9285.66***	
Hausman x2		811.17***		621.09***		325.75***
Year effect	YES	YES	YES	YES	YES	YES
Industry effect	YES	YES	YES	YES	YES	YES
Firm effect	YES	YES	YES	YES	YES	YES
Observations	35,546	35,546	27,927	27,927	7,619	7,619
Number of id	5,997	5,997	4,464	4,464	1,533	1,533

This table displays the direct panel regression result of internal CSR and firm efficiency over the period 2008–2019.

*** Denotes statistical significance at the 1% level.

** Denotes statistical significance at the 5% level.

* Denotes statistical significance at the 10% level

addition, (Byron & Post, 2016; Endrikat et al., 2020) also found that the relationship between female board representation, and CSR was more positive in countries with higher gender parity, knowledge, experience, and scores.

6. Conclusion

This study attempts to investigate the role of women board members in the relationship between internal CSR (ICSR) and firm efficiency in multiple countries from 2008 to 2019. The findings show that firm investment in employees significantly increases firm efficiency in countries with full sample, developed, and developing economies. More importantly, the interaction between women board members and ICSR increases firm efficiency in countries in the full sample and developed economies. In other words, the higher the percentage of women board members, or if there is at least one woman board member, the stronger the positive relationship between ICSR and firm efficiency. Nevertheless, the same result could not be found in developing countries,

Table 9. Internal CSR, women on board members (percentage), and firm efficiency regression analysis

VARIABLES	Full sample (Model 1)	Developed countries (Model 2)	Developing countries (Model 3)	Minus US (Model 4)
ICSR	0.0642***	0.0551***	0.0677***	0.0553***
	(0.0095)	(0.0112)	(0.0178)	(0.0110)
WBOARD	−0.2013***	−0.1657***	−0.1894**	−0.2921***
	(0.0325)	(0.0363)	(0.0747)	(0.0491)
ICSR x WBOARD	0.0024***	0.0021***	0.0000	0.0027***
	(0.0005)	(0.0006)	(0.0012)	(0.0007)
LEV	0.0269***	0.0176**	0.0304	0.0057
	(0.0079)	(0.0084)	(0.0197)	(0.0114)
ROA	0.5021***	0.4696***	0.5035***	0.4218***
	(0.0174)	(0.0183)	(0.0522)	(0.0279)
PPE/Asset	−0.1379***	−0.1045***	−0.2104***	−0.1612***
	(0.0100)	(0.0118)	(0.0212)	(0.0121)
MVTB	0.0003***	0.0013***	0.0001***	0.0002***
	0.0000	(0.0001)	0.0000	0.0000
GDP	0.0000	0.0000	0.0000	−0.0001***
	0.0000	0.0000	0.0000	0.0000
INF	−1.1847***	−2.1040***	−0.5661***	−1.2093***
	(0.1236)	(0.1968)	(0.1395)	(0.1319)
Constant	68.1704***	66.5381***	72.0042***	74.2063***
	(0.9833)	(1.4559)	(1.6742)	(1.1584)
R-squared	0.3591	0.3793	0.3635	0.3192
F statistic	177.44***	178.88***	31.01***	77.14***
Firm effect	YES	YES	YES	YES
Year effect	YES	YES	YES	YES
Industry effect	YES	YES	YES	YES
Observations	35,546	27,927	7,619	23,470
Number of id	5,997	4,464	1,533	3,761

This table displays the direct panel regression result of internal CSR and firm efficiency over the period 2008–2019.

*** Denotes statistical significance at the 1% level.

** Denotes statistical significance at the 5% level.

* Denotes statistical significance at the 10% level

where there was no significant role of women board member percentage in the ICSR and firm efficiency relationship. This may be because the presence of women on boards in developing countries does not substantially affect internal CSR policy selection strategies, as was evidenced in previous studies (Byron & Post, 2016; Endrikat et al., 2020).

This paper contributes to the literature development on the new trivariate relationship between internal CSR, women board members, and firm efficiency. Empirical evidence shows that internal CSR and women board members explain firm efficiency as an endogenous and moderating variable. This is an early study, and future researchers might examine this link in greater depth by, for instance, assessing if the number of women on the board has an optimal level. In addition, future researchers can investigate the impact of other director characteristics, such as education, experience, age, country, etc., on the beneficial association between internal CSR and firm efficiency.

Table 10. Internal CSR, women on board members (dummy), and firm efficiency regression analysis

VARIABLES	Full sample	Developed countries	Developing countries	Minus US
ICSR	0.0623***	0.0491***	0.0650***	0.0622***
	(0.0116)	(0.0139)	(0.0207)	(0.0128)
DWBOARD	−3.3919***	−2.6694***	−2.9746**	−4.6790***
	(0.7339)	(0.8411)	(1.4902)	(0.9974)
ICSR x DWBOARD	0.0452***	0.0457***	0.0005	0.0358**
	(0.0134)	(0.0157)	(0.0248)	(0.0163)
LEV	0.0262***	0.0165*	0.0339*	0.0030
	(0.0079)	(0.0085)	(0.0199)	(0.0114)
ROA	0.5001***	0.4676***	0.4997***	0.4174***
	(0.0174)	(0.0183)	(0.0525)	(0.0280)
PPE/Asset	−0.1373***	−0.1037***	−0.2118***	−0.1597***
	(0.0100)	(0.0118)	(0.0215)	(0.0121)
MVTB	0.0003***	0.0013***	0.0001***	0.0002***
	0.0000	(0.0001)	0.0000	0.0000
GDP	0.0000	0.0000	0.0000	−0.0001***
	0.0000	0.0000	0.0000	0.0000
INF	−1.2170***	−2.1937***	−0.5741***	−1.2595***
	(0.1242)	(0.1966)	(0.1400)	(0.1334)
Constant	68.3622***	66.8609***	71.9543***	74.5117***
	(1.0182)	(1.4876)	(1.7911)	(1.1652)
R-squared	0.3576	0.3782	0.3589	0.316
F statistic	176.23***	178.88***	31.01***	76.87***
Firm effect	YES	YES	YES	YES
Year effect	YES	YES	YES	YES
Industry effect	YES	YES	YES	YES
Observations	35,546	27,927	7,619	23,470
Number of id	5,997	4,464	1,533	3,761

This table displays the direct panel regression result of internal CSR and firm efficiency over the period 2008–2019.

*** Denotes statistical significance at the 1% level.

** Denotes statistical significance at the 5% level.

* Denotes statistical significance at the 10% level

From a practical perspective, our findings have significant consequences for managers, investors, and regulators. Companies and regulators can utilize significant findings as an argumentation foundation for deciding on strategies that corporations might use to improve their firm efficiency. This study highlights the importance of the selection process and has substantial consequences for organizations deciding the composition of the board of directors. The study implies that meeting the expectations of employees and making them happy increases firm efficiency. To improve firm efficiency, the firm's decision-maker must assure the knowledge, skills, and values of female board members.

In addition, seeing the important role of female directors in the relationship between the internal CSR-firm efficiency relationship, investors can put their money in corporations that recognize the value of having women on the board. This makes the company more

sustainable. Furthermore, the government can use the findings of this study to draft legislation mandating the presence of women on company boards in order to improve business performance.

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