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# Business Efficiency in Times of Crisis: A Comparative Study of Family and Non-Family Firms in Indonesia

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***Abstract***

*This study investigates the prioritized strategies of family and non-family firms in maintaining efficiency during economic crises, employing a two-phase analytical approach. Initially, we utilized the Data Envelopment Analysis (DEA) method to compute efficiency scores, which served as the dependent variable in the subsequent Generalized Estimating Equations (GEE) model. Our analysis revealed that family firms exhibited superior efficiency, particularly in the years 2020 and 2021, while the business sector significantly impacted efficiency outcomes. The second phase employed the Analytic Hierarchy Process (AHP), integrating the dynamic capability framework and socio-emotional wealth (SEW) characteristics to derive prioritized strategies. The findings indicated that family firms emphasize relational governance and long-term stability, which enhance their resilience during crises, whereas non-family firms focus primarily on immediate financial objectives. The results offer crucial insights for managers and policymakers on leveraging ownership dynamics to bolster resilience and operational efficiency amid economic downturns. These insights are particularly relevant for developing strategies tailored to the unique strengths and weaknesses of family and non-family firms, ultimately contributing to sustainable performance in challenging economic environments.*

***Keywords:*** *Dynamic Capabilities, Economic Crises, Efficiency, Family Firms, Socio-Emotional Wealth.*

## Introduction

Studies reveal that company and industry characteristics significantly influence resilience during economic downturns (Carletti et al., 2020). Ding et al. (2021) and Fahlenbrach et al. (2021) found that companies with higher cash reserves and lower debt face fewer negative impacts during crises, emphasizing the importance of financial flexibility in these situations. Li et al. (2021) further showed that an innovative culture within firms bolsters resilience. Human resources also play a key role, with companies reporting higher employee satisfaction demonstrating better performance, as employees adapt to alternative work arrangements, handle stress, and sustain productivity (Shan and Tang, 2020). Additionally, effective governance and rapid decision-making by executives facing economic uncertainty have been shown to enhance company performance during crises (Ding et al., 2021). Literature indicates that ownership structures also impact resilience, affecting a firm's ability to withstand external shocks (Johnstone-Louis et al., 2020).

In terms of ownership, companies can be classified into family and non-family firms. Family firms differ from non-family firms in certain characteristics. Although definitions vary, most

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reference two core attributes: first, control by family members in executive roles, and second, family members acting as controlling shareholders with a substantial share of the company's capital (Villalonga and Amit, 2006). Santos et al. (2022) add that the strong bond between family and business is a distinctive social characteristic, often with the intention to pass the business on to future generations. From a social capital perspective, family executives hold significant influence over management and key decision-making processes, impacting organizational strategies and policies (Chirico and Salvato, 2008; De Massis et al., 2017). Miller et al. (2015) argue that family firms prioritize long-term sustainability, where family values, continuity, and legacy are central goals, commonly termed as socio-emotional wealth (SEW) (Berrone et al., 2010; Gomez-Mejía et al., 2007). SEW suggests that family firms prioritize non-economic goals, like maintaining control, over short-term profits (Gomez-Mejía et al., 2007, 2011).

Ownership share levels are a debated topic, with varying views on the minimum percentage family members must hold. Bacci et al. (2018), Doucet and Requejo (2022), and Santos et al. (2022) agree that a company is a family business if family members hold at least 50% of shares. In Indonesia, the Indonesia Stock Exchange defines a controlling shareholder as one holding at least 25% of shares. The European Commission has a similar view, defining a firm as a family business if founders, family members, or descendants control at least 25% of voting rights (Mandl, 2008). Generally, controlling shareholders possess the majority voting power, particularly in strategic decisions that are essential to family firms.

Research indicates that family firms are more resilient than non-family firms during and after economic downturns (Minichilli et al., 2016; Zhou et al., 2017; Cucculelli and Peruzzi, 2020). Strong family control allows for quick and efficient decision-making in times of crisis (Casillas et al., 2019). Additionally, close and trustful relationships with external stakeholders provide family firms an advantage in responsiveness to market changes and business challenges (Berrone et al., 2010). These social connections grant family firms faster and more reliable access to business partners, helping them better manage production disruptions (Miller et al., 2015; Mzid et al., 2019).

However, close social ties can also pose challenges. Older family firms often develop dependencies on external environments, which can reduce their flexibility and adaptation capabilities during crises. Such dependencies may delay necessary cost-cutting measures or restructuring for survival (Kacher et al., 2020). Additionally, family firms generally take a cautious approach to innovation, viewing change as a significant risk with high costs and uncertain results. This perspective may limit their ability for continuous improvement and hinder their adaptability (Decker, 2018).

In times of crisis, studies show that family firms in Asia and non-OECD countries perform better financially than non-family firms (Hansen et al., 2020). The pandemic has particularly impacted family firms' resilience, especially regarding systemic endurance (Zukowska et al., 2021). De Massis and Rondi (2020) assert that the social and economic challenges brought by crises test family firms' survival capacity, affecting both business continuity and family member well-being. Family business owners sometimes choose to leverage personal resources to secure business survival during crises.

A long-term outlook is a defining trait distinguishing family from non-family firms. According to Leppaaho and Ritala (2021), this perspective enables family firms to explore innovative opportunities with family financial support. Meutia et al. (2018) emphasized that family firms' proactive innovation during crises positively impacts performance. Family business managers

are often willing to sacrifice short-term gains to ensure long-term sustainability, using family resources to keep operations running. Strong emotional ties between family and business during crises reinforce family members' commitment to the business amid uncertainty.

Ding et al. (2021) found that family firm stock returns during COVID-19 surpassed those of non-family firms. This finding supports the theory of social capital advantage, which argues that family control at top management levels over extended periods minimizes managerial opportunism, strengthens bonds between family and business, and fosters relationships with stakeholders beyond shareholders. These factors contribute to the resilience of family firms in uncertain times, with a positive impact on stock prices (Anderson and Reeb, 2003; Ding et al., 2021).

In a study of 167 family firms in Poland, Zukowska et al. (2021) identified two essential dimensions for family business survival: internal resources from directly involved family members and external resources from non-operationally involved family members. Family firms are more likely to use internal resources first, accessing external resources only when failure risk increases. This approach aligns with the resource-based view (RBV), which suggests companies should maximize internal assets before seeking external support. RBV also supports sustainable family business principles, emphasizing the use of internal assets to achieve long-term sustainability.

Family firms' contributions to the global economy are expected to support post-crisis recovery, given their significant role across various sectors. Amore et al. (2021) note that family firms have strong potential to drive economic recovery. Poza and Daugherty (2014) report that family firms comprise about 80% of businesses worldwide, contributing over 75% of global GDP and employing more than 75% of the workforce in many countries. Veldre and Ancans (2022) corroborate these figures, stating that 66% of global firms are family businesses, contributing 70%-90% of global GDP. In Indonesia, more than 95% of businesses are family-owned, with around 60% of publicly listed firms as family businesses (PwC, 2014).

This study aims to explore the competitive advantages of family and non-family firms in Indonesia. Through in-depth analysis, it will highlight differences in strategy and efficiency that can serve as learning foundations for both types of firms. Non-family firms may gain insights into family firms' resilience strategies, while family firms can adopt new strategies to improve efficiency. Thus, this research seeks to offer valuable insights for both types of firms in strengthening competitiveness and resilience, particularly in challenging economic periods.

## Literature Review

### Dynamism in family firms and its socio-emotional Wealth (SEW) characteristic

Research by Llanos-Contreras et al. (2019) reveals that external shocks impacting either the family or the business often drive significant shifts in priorities and routines within family firms. The well-being and comfort of the family are viewed as equally vital as the company's financial stability, both essential to ensuring long-term sustainability (Cliff and Jennings, 2005; Miller et al., 2020). This alignment suggests that family businesses may be better positioned to withstand major crises due to their unique capital structure and the deep emotional commitment between family members and the business itself.

The adaptability, innovation, and resilience of family businesses during crises are well explained by the Dynamic Capabilities Theory, as proposed by Eisenhardt and Martin (2000) and Teece

(1997). This theory highlights a firm's proactive abilities to identify opportunities (sensing), capitalize on them (seizing), and implement necessary transformations (transforming) to survive and thrive amid dynamic and uncertain environments.

In terms of sensing, family businesses possess a distinct advantage in detecting market opportunities and threats, attributed to the close-knit relationships and intensive communication among family members, which enable swift responses to changes, such as the rise of digitalization during the pandemic (Yilmaz et al., 2014). In the seizing phase, strategic decision-making is expedited by a strong sense of ownership and an innovation-driven culture that fosters adaptability to emerging opportunities (Ward, 2011). At the transforming stage, family firms demonstrate considerable flexibility in adapting their business structure and operations, a capability that aids in maintaining stability and averting financial distress during crises (Eisenhardt and Martin, 2000; Teece, 1997). This flexibility strengthens the resilience of family businesses when faced with unpredictable challenges.

Wang and Ahmed (2007) further underscore that adaptive, absorptive, and innovative capabilities are core elements of dynamic capabilities. Absorptive capability involves assimilating external knowledge, merging it with internal resources, and repurposing it for the firm's use. Adaptive capability refers to a firm's agility in adjusting through resource flexibility and aligning capabilities with environmental shifts. Innovative capability links a company's series of innovations to competitive advantages in new products or markets.

This high flexibility within family firms is closely tied to socio-emotional wealth (SEW), a unique attribute not found in non-family businesses (Gomez-Mejia et al., 2007). In contrast to non-family firms, the management of family businesses is often influenced by social values and a long-term vision aimed at sustaining the business for future generations. Non-economic factors—such as family traditions, identity, and reputation—play a significant role in decision-making within family firms (Antonio and Agustiono, 2023; Kuruppuge et al., 2018). When effectively harnessed, these SEW characteristics can serve as a competitive advantage, distinguishing family firms from their non-family counterparts.

**Efficiency and Firm's Performance During the Crises**

The often superior performance of family businesses compared to non-family firms is frequently attributed to their efficiency. In this context, efficiency measures how effectively a company utilizes available resources to achieve optimal performance. Coelli et al. (2005) define efficiency as the ratio between the output produced and the potential maximum output given available inputs. Various factors influence efficiency, including production technology, operational scale, process efficiency, and the environmental conditions in which the company operates. Fried et al. (2008) add that inefficiency within a company can stem from internal factors manageable by the firm's management, as well as external factors outside the company's direct control.

Efficiency is also seen as a company's ability to achieve maximum productivity while minimizing input usage. Coelli et al. (2005) and Rogers (2011) highlight that efficiency reflects a company's capacity to maximize output from a given set of inputs, enabling an efficient company to optimize resource utilization. Family businesses, with their more flexible organizational structures and rapid decision-making capabilities, often excel in achieving this efficiency, particularly during crises such as the COVID-19 pandemic.

Several variables, including firm size, firm age, beta (systematic risk), and business sector, are commonly analyzed to estimate or assess their influence on a company's efficiency. Firm size,

typically measured by total assets, has been linked to better operational efficiency and higher profitability in larger firms (Burca and Batrinca, 2014; Chen and Wong, 2004; Worku et al., 2024). This improved efficiency is often attributed to large firms' ability to lower production costs through economies of scale (Aryonindito et al., 2020). However, Bustami and Fadila (2022) suggest that having substantial assets might also decrease operational flexibility, negatively affecting the firm's overall value.

Firm age presents a complex relationship with efficiency, as older companies generally benefit from established systems and a steady customer base, enhancing efficiency (Mallinguh et al., 2020). Nonetheless, companies operating in fast-paced sectors may experience challenges in adopting new technologies as they age, potentially reducing their efficiency over time (Arnold et al., 2016). Thus, while firm age often strengthens efficiency in traditional industries, it can hinder it in highly innovative markets.

The beta coefficient, which measures systematic risk, also impacts firm efficiency. A beta value above one indicates greater volatility and sensitivity to market changes. Research by Nawaz et al. (2017) reveals a positive link between beta and profitability, although this increased risk also raises the potential for losses (Boz et al., 2015). Additionally, business sector plays a significant role in efficiency during economic crises. Fernandes (2020) notes that the service sector is more vulnerable to crises than manufacturing, while Del Rio-Chanona et al. (2020) report that sectors such as transportation and tourism were severely affected by demand shifts during the pandemic, whereas manufacturing primarily faced supply chain disruptions.

Emphasizing efficiency is essential in evaluating a company's operational and financial performance. Financial performance, in particular, is gauged by the returns generated over a given period. A company demonstrates strong financial performance when these returns exceed the associated costs. Egbunike and Okerekeoti (2018) and Mahrani and Soewarno (2018) emphasize that strong financial performance is intrinsically linked to the efficient management of a company's financial resources to achieve optimal returns (Suhadak et al., 2019). Efficient financial performance reflects a company's capability to create economic value and maximize investor profits, which encapsulates the core of the efficiency concept (Al-Sa'eed, 2018). Based on this framework, the following hypotheses are proposed:

**H1** : Firm type significantly affects efficiency score.

**H2** : Firm size significantly affects efficiency score.

**H3** : Firm age significantly affects efficiency score.

**H4** : Beta (systematic risk) significantly affects efficiency score.

**H5** : Business sector significantly affects efficiency score.

## Methods

This study is classified as an explanatory study with a quantitative approach aimed at explaining the impact of financial ratios on stock returns. The research employs hypothesis testing, and data processing is conducted using R as the statistical tool for both classical assumption tests and multiple regression analysis to interpret the results and draw conclusions.

### Data Sources and Research Sample

In the first phase of analysis, secondary data in the form of financial statements for all sample

companies is gathered from the official Indonesia Stock Exchange (IDX) website (https://www.idx.co.id/). Each financial statement must include a balance sheet and an income statement with a standardized structure across sample companies. Therefore, not all business sectors classified by IDX are suitable for sampling. Based on these criteria, this study selects three sectors according to IDX Industrial Classification (IDX-IC): industrials, consumer cyclicals, and consumer non-cyclicals. All samples are drawn from these three sectors, with an initial screening to identify each company's status as family or non-family. In addition to financial statements, daily stock price data is sourced from Yahoo Finance (https://finance.yahoo.com/) for the period 2019–2023.

Sample size determination follows a standard rule for DEA studies. If $p$ is the number of inputs and $q$ the number of outputs, the minimum sample size must satisfy the $3(p+q)$ rule (Nunamaker, 1985; Ozcan, 2014; Raab and Lichty, 2002). Based on this rule, the study selects 30 family firms and 30 non-family firms for balanced representation. The limited number of non-family firms listed on IDX is a key factor in setting the sample size, ensuring equal sample numbers for both firm types.

A company is classified as a family firm if it meets three criteria: (1) ownership by two or more family members with at least 15% ownership; (2) at least one family member serving on the Board of Directors; and (3) at least one family member on the Board of Commissioners (Poza, 2010; Poza and Daugherty, 2014). In contrast, non-family firms do not meet any of these criteria and have no ownership involvement by family members or affiliated entities. Companies that partially meet family or non-family criteria are excluded from the sample. Based on these criteria, Table 1 presents the complete sample, using four-letter codes per IDX nomenclature and categorizing each by company type and sector.

| Sector | Type | Sample | n |
|---|---|---|---|
| Industrials | FF | ABMM, BLUE, EMTK, IMPC, JTPE, KBLM, KONI, MLIA, SKRN, SPTO | 10 |
| | NFF | AMFG, APII, ASGR, ASII, HEXA, IKBI, KOIN, MARK, TOTO, UNTR | 10 |
| Consumer Non-Cyclicals | FF | ANJT, BUDI, CAMP, GGRM, MBTO, MYOR, SIMP, SMAR, ULTJ, WIIM | 10 |
| | NFF | AALI, ADES, BWPT, CEKA, HMSP, KINO, ROTI, TCID, UCID, UNVR | 10 |
| Consumer Cyclicals | FF | ACES, DMND, ERAA, FAST, INDS, MSKY, SHID, SOFA, TFCO, WOOD | 10 |
| | NFF | AUTO, BATA, BAYU, BLTZ, GDYR, MAPB, MAPI, PJAA, PTSP, PZZA | 10 |

Table 1. List Of Publicly Listed Companies in the Sample by Sector

Note: FF for family firms; NFF for non-family firms.

In the second phase of analysis, primary data for the comparative judgment AHP analysis is collected using purposive sampling. This study involves 18 respondents—9 from family firms and 9 from non-family firms—ensuring representation from each sector type, with 3 respondents per sector. The selected respondents come from both publicly listed and privately-owned companies, holding key positions as commissioners, owners, directors, or senior managers. Each

respondent receives an AHP pairwise comparison questionnaire with instructions for completion. In addition, some respondents are invited to participate in face-to-face, in-depth interviews to further enrich the data collection process. It is required that all respondents maintain an active role in their respective positions throughout the research period.

**Measurement of Variables**

In the initial stage of this study, the efficiency score of each listed company, referred to as the Decision-Making Unit (DMU), is calculated using the non-parametric Data Envelopment Analysis (DEA) method (Banker et al., 1984; Charnes et al., 1978), with a bootstrap extension (Simar and Wilson, 2007). Efficiency scores are derived based on selected input and output variables from annual financial statements. Input variables capture the operational costs needed to sustain the business, with lower values indicating better efficiency for a given output level, while output variables measure the benefits gained, with higher values being preferable for a set level of input (Cooper et al., 2007; Wybawa et al., 2023).

To calculate efficiency scores, five input variables are used. The first input ($x_1$) is Cost of Sales, encompassing all expenses related to the primary business operations and production activities. The second input ($x_2$) is Operating Expenses, which includes marketing, promotional, and general administrative costs. The third input ($x_3$) is Finance Costs, covering interest expenses from bank loans and other liabilities, as well as fees and administrative costs. The fourth input ($x_4$) is Total Liability, defined as the company's total obligations to creditors, combining short-term and long-term liabilities. The fifth input ($x_5$) is Fixed Assets, consisting of long-term tangible assets used in business operations, which cannot be converted to cash within a year.

On the output side, five variables are also considered. The first output ($y_1$) is Revenue, representing total income from core business activities. The second output ($y_2$) is Finance Income, related to interest and other financing revenues. The third output ($y_3$) is Other Income, from non-core operations such as foreign exchange gains (or losses). The fourth output ($y_4$) is Profit/Loss Before Income Tax, representing income before tax. The fifth output ($y_5$) is Net Income, which is the remaining revenue after all operational and non-operational expenses, including taxes, interest, and depreciation, have been deducted. These input and output variables are chosen based on prior research in similar sectors (Hou and Li, 2018; Lopez-Penabad et al., 2020; Poldrugovac et al., 2016; Radchobeh et al., 2018; Wybawa et al., 2023).

In the subsequent phase, regression analysis is used to estimate the effects of selected independent variables on the response variable. The explanatory variables include Firm Size ($z_1 = Size$), Firm Age ($z_2 = Age$), Beta Coefficient ($z_3 = Beta$), Firm Type ($z_4 = Firm$), and Business Sector ($z_5 = Sector$). Prior research supports the relevance of these variables in measuring efficiency. Firm size and firm age represent firm characteristics, measured by total assets and the duration of the company's establishment, respectively (Aryonindito et al., 2020; Burca and Batrinca, 2014; Mallinguh et al., 2020). The beta coefficient reflects systematic risk in the stock market relative to the market portfolio (Boz et al., 2015; Nawaz et al., 2017). Firm type differentiates between family and non-family firms (Cucculelli and Peruzzi, 2020; Santos et al., 2022; Zhou et al., 2017). Business sector is categorized according to IDX classifications—Industrials, Consumer Cyclical, and Consumer Non-Cyclical—which is relevant given the sector's role in influencing company efficiency during crises (Del Rio-Chanona et al., 2020; Fernandes, 2020).

**Efficiency Measurement**

The statistical process in this study consists of two main stages: efficiency measurement and regression analysis. Efficiency testing is conducted using Data Envelopment Analysis (DEA), a method for measuring relative efficiency that uses the production frontier in a non-parametric approach (Peykani et al., 2020). This method is chosen because DEA can handle multiple input and output variables to evaluate a company's efficiency by comparing its performance to similar companies on the efficient frontier (Coelli et al., 2005; Rabar 2017). Among the various DEA models available, this study uses a constant return-to-scale model with an input orientation, considering that during crises, input savings are more feasible than output increases in company operations.

The general equation and constraints for the DEA CRS input-oriented model are presented in Equation (1). Here, $n$ denotes the total number of DMUs, each of which produces $s$ outputs using $m$ inputs. Output $r$ is represented as $y_r$, while input $i$ is represented as $x_i$. The weights applied across the $n$ samples are given by $\lambda_j$, and the efficiency score is represented by $\theta$. To compute a full set of efficiency scores, each DMU must meet the outlined constraints.

$$Min\theta + \varepsilon\left[\sum_{i=1}^{m} s_i^- + \sum_{r=1}^{s} s_r^+\right]$$

$$s.t.\sum_{j=1}^{n} x_{ij}\lambda_j = \theta x_{io} - s_i^-, \qquad i = 1,2,\dots,m;$$

$$\sum_{j=1}^{n} y_{rj}\lambda_j = y_{ro} + s_r^+, \qquad r = 1,2,\dots,s;$$

$$\lambda_j, s_i^-, s_r^+ \geq 0,\ j = 1,\dots,n \qquad (1)$$

To enhance the conventional DEA approach, this study employs the bootstrap technique introduced by Simar and Wilson (2007), running 2,000 iterations. This bootstrapping process is used to eliminate bias inherent in the conventional, deterministic efficiency scores obtained through standard DEA. As DEA is a non-parametric method, substantial bias may remain, potentially impacting the accuracy of subsequent linear regression analysis. Thus, the bias-correction process is crucial, resulting in the bias-corrected efficiency score ($BCES$) (Simar and Wilson, 2007). This $BCES$ serves as the dependent variable in the further regression analysis.

**Hypotheses Testing and Research Model**

Hypothesis testing is conducted to determine whether each independent variable (predictor) has a statistically significant relationship with the dependent variable (outcome), taking into account the correlation within clusters (in this case, combinations of years and companies). A significance level of 5% is established as the cutoff for statistical significance. Within the GEE model, the null hypothesis ($H_0$) suggests that the coefficient of a given independent variable $i$ is zero ($\beta_i = 0$), indicating no effect on the outcome. Conversely, the alternative hypothesis ($H_1$) proposes that the coefficient is different from zero ($\beta_i \neq 0$), implying a statistically significant influence. If the p-value is below 0.05 ($p < 0.05$), $H_0$ is rejected, pointing to a significant

effect; however, if the p-value is 0.05 or higher ($p \geq 0.05$), $H_0$ is not rejected, indicating that the evidence is insufficient to confirm a significant effect.

This research adopts a linear regression model. Bias-corrected efficiency score (BCES) from previous efficiency measurements is used as the dependent variable. The reciprocal style is used to widen the number range $[1, \infty]$, instead of the original score which ranges from 0 to 1, then further called Reciprocal bias-corrected efficiency score (RBCES), estimated by selected predictors such as firm size, firm age, beta (volatility or systematic risk), firm type, and business sector. Additionally, the year of data collection ($Year$), spanning from 2019 to 2023, is used as a dummy variable. Given the global health crisis in 2020, the $Year$ variable may be significant in certain instances.

To choose the right regression model, some classical assumption tests are conducted. The first test is the normality test, which evaluates whether the residuals in the regression model are normally distributed (Saphiro and Wilk, 1965). Since the residuals exhibit a non-normal distribution in this study, a non-parametric regression model is applied to ensure the validity of the results.

In addition to the normality test, a Spearman's rank correlation test is conducted to assess the relationships between the predictor variables (Spearman, 1904, 1961). This test is particularly useful in non-parametric analysis as it measures the strength of monotonic relationships without assuming linearity or normality. The goal is to interpret the regression coefficients rather than merely predict the outcome (dependent variable). Even in non-parametric models, multicollinearity can complicate interpretation because high correlations between predictors make it difficult to isolate their individual effects (Wibowo and Ridha, 2020).

To avoid multicollinearity, the Spearman's rank correlation coefficient (ρ) between any two non-categorical predictors must remain below the absolute value of 0.8. A correlation above this threshold ($|\rho| > 0.8$) suggests strong correlation, leading to redundancy in the model and instability in the regression coefficients (de Winter et al., 2016; Spearman, 1904). Ensuring ρ stays below 0.8 helps the model avoid multicollinearity, allowing for clearer interpretation of each predictor's impact on stock returns.

With non-normal residuals confirmed, the study employs a non-parametric regression model using the Generalized Estimating Equations (GEE) method (Zeger and Liang, 1986). GEE is an extension of the Generalized Linear Model (GLM) and is particularly suited for analyzing correlated data, such as panel or longitudinal data with repeated measurements over time. GEE accounts for the correlation between repeated observations and provides robust estimates, even when the exact correlation structure is unknown (Nikita, 2014; Owusu-Darko et al., 2014). This method enables the study to analyze the effects of financial ratios on stock returns while controlling for within-group correlations. The regression model in this research is formulated in Equation (2):

$$RBCES_{it} = \beta_0 + \beta_1 \ln (Size)_{it} + \beta_2 \ln (Age)_{it} + \beta_3 Beta_{it} + \beta_4 Firm_i + \beta_5 Sector_{i,1} + \beta_6 Sector_{i,2} + \beta_7 Year_{t,1} + \beta_8 Year_{t,2} + \beta_9 Year_{t,3} + \beta_{10} Year_{t,4} + \varepsilon_{it} \quad (2$$

The equation models the bias-corrected efficiency score (RBCES) as a function of continuous and categorical variables. The dependent variable, $RBCES_{it}$, represents the bias-corrected efficiency score for firm $i$ at time $t$. The continuous predictors include $\ln (Size)_{it}$, which is the natural log of firm size, $\ln (Age)_{it}$ the natural log of firm age, and $Beta_{it}$ representing the

systematic risk or Beta for each firm $i$ over time $t$. These continuous variables are included to capture the impact of firm characteristics and market risk on efficiency.

The model also includes several categorical variables, namely Firm, Sector, and Year. The Firm variable distinguishes family firms from non-family firms, with a binary coding: 1 for family firms and 0 for non-family firms. The Sector variable, representing the business sector of each firm, is coded using a dummy matrix: Industrials is the reference category (coded as $(0,0)$), Consumer Cyclicals is represented as $(1,0)$, and Consumer Non-Cyclicals as $(0,1)$. This dummy coding allows for comparison across sectors, with Industrials serving as the baseline. The *Year* variable captures temporal effects and is treated as a categorical variable to account for changes across different years in the study period. Each year from 2020 to 2023 is represented by a dummy variable, while 2019 serves as the reference year, coded as $(0,0,0,0)$. Specifically, the years are coded as follows: 2020 as $(1,0,0,0)$, 2021 as $(0,1,0,0)$, 2022 as $(0,0,1,0)$, and 2023 as $(0,0,0,1)$. This structure allows the model to assess the impact of each year relative to the baseline (2019). The model also includes an error term, $\varepsilon_{it}$, which captures the unexplained variance for each firm $i$ at time $t$. Each coefficient associated with these variables (e.g., $\beta_1$ for $\ln(Size)$, $\beta_4$ for Firm, $\beta_5$ and $\beta_6$ for Sector, and $\beta_7$ to $\beta_{10}$ for Year) reflects the specific effect of that predictor on $RBCES$, controlling for all other variables. Overall, this model provides a structured approach to understand how firm characteristics, business sectors, and year-to-year variations influence efficiency scores in the context of panel data.

**AHP-based Hierarchical Framework**

In the final stage of this study, a semi-quantitative method is applied to identify priority strategies for maintaining the efficiency of family and non-family firms during economic crises. The hierarchy diagram used in this research is constructed by combining the concepts of Socio-Emotional Wealth (SEW) (Gomez-Mejia et al., 2007; 2011) and dynamic capabilities (Eisenhardt and Martin, 2000; Teece, 1997; Wang and Ahmed, 2007). This combination provides a framework for explaining the strategic differences between family and non-family firms, particularly in sustaining economic resilience during crises.

The integration of SEW and dynamic capabilities (DC) is further categorized into four core values of the firm: value proposition, value creation, value capture, and value exchange, drawing on previous studies by Ren (2024). Value proposition emphasizes how the firm offers something unique to the market, often driven by long-term orientation and family values in family firms. Value creation involves developing internal resources and innovation, focusing on value generation through resource renewal and opportunity-taking. Value capture describes how firms secure benefits from created value, while value exchange centers on how this value is shared between the firm and external stakeholders.

A pairwise comparison matrix is used to determine the relative contribution or influence of each element toward its respective goal or criterion at the next level. Decision-makers assess the importance of one element over another using a scale from 1 (equal importance) to 9 (extreme importance), as established by Saaty (2000, 2008). The results from the pairwise comparison matrix are normalized by dividing each element's value by the total column value, and eigenvectors are then calculated to represent the relative weights of each element. A consistency check is conducted to validate the results; if the inconsistency index exceeds 10%, the evaluation process must be repeated or adjusted to ensure consistency. This approach ensures that the outcomes are reliable and valid. The AHP hierarchy structure used in this study is illustrated in

Table 1.

| | | | | |
|---|---|---|---|---|
| **Level 1:** Goal | 1A. Priority Strategy Analysis for Family and Non-Family Firms in Maintaining Efficiency During Crises | | | |
| **Level 2:** Purpose | 2A. Organizational Purpose (Highlighting Relationships) | | 2B. Commercial Purpose (Highlighting on Economic Objectives) | |
| **Level 3:** Strategic Values (in clustered alternatives) | 3A. Value Proposition | 3B. Value Creation | 3C. Value Capture | 3D. Value Exchange |
| | $3A_1$. Focus on key products and customer loyalty (SEW) | $3B_1$. Stable growth with resilience and specialization (DC) | $3C_1$. Rapid commercial profit growth (DC) | $3D_1$. Strong connection and loyalty with stakeholders (SEW) |
| | $3A_2$. Legacy of success and achievements (SEW) | $3B_2$. Long-term organizational leadership (SEW) | $3C_2$. Majority ownership and commitment (SEW) | $3D_2$. Effective communication and new idea exchange (SEW) |
| | $3A_3$. Historical continuity and organizational identity (SEW) | $3B_3$. Stable workforce and specialized skills (DC) | $3C_3$. Competitive strategies and strategic partnerships (DC) | $3D_3$. Strong external partnership and investor relations (DC) |

Table 1. Research Hierarchy Structure

## Result

The results of this study are presented in two main sections. The first part covers the efficiency measurement, including an evaluation of efficiency scores for the sampled firms and a presentation of the research model that outlines the methodological framework used. The second part provides a summary of the prioritized alternatives obtained from the pairwise comparison matrix. This structure offers a comprehensive view of the data analysis and the key findings from the study.

### Efficiency Score

This study includes 300 observations derived from 60 DMUs over 5 years. Descriptive statistics for all research variables $(x_i, y_i, z_i)$ are presented by year, covering maximum, minimum, standard deviation, mean, and median values. The maximum and minimum reflect the range, showing the spread between the highest and lowest values. Standard deviation indicates data variability, while the mean represents central tendency. A comparison between the mean and median reveals any skewness in the data distribution. Together, these statistics provide a detailed overview of data distribution and variability, serving as a foundation for further analysis. The descriptive results are provided in Table 2.

The efficiency score for each DMU across each year is calculated using DEA tools implemented through the R package with R-Studio as the interface. This analysis is performed annually, constructing five separate production frontiers that represent the highest efficiency level ($\theta = 1$), serving as benchmarks for other, less efficient DMUs to target for improvement in each research year. To adjust for bias, a bootstrap process with 2000 iterations is applied using the same statistical software, correcting the deterministic efficiency scores produced by the conventional DEA method. Table 3 displays both the bias-corrected efficiency scores for all 60 DMUs, organized by firm and sector type.

| **Sector** | **Non-Family Firms** | | | | | | **Family Firms** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **DMU** | **BCES** | | | | | **DMU** | **BCES** | | | | |
| | | **2019** | **2020** | **2021** | **2022** | **2023** | | **2019** | **2020** | **2021** | **2022** | **2023** |
| IND | AMFG | 0.987 | 0.833 | 0.871 | 0.904 | 0.932 | ABMM | 0.915 | 0.928 | 0.970 | 0.972 | 0.988 |
| | APII | 0.989 | 0.984 | 0.986 | 0.944 | 0.989 | BLUE | 0.987 | 0.981 | 0.984 | 0.972 | 0.989 |
| | ASGR | 0.987 | 0.976 | 0.973 | 0.970 | 0.988 | EMTK | 0.987 | 0.975 | 0.971 | 0.971 | 0.988 |
| | ASII | 0.971 | 0.990 | 0.989 | 0.979 | 0.985 | IMPC | 0.990 | 0.982 | 0.944 | 0.976 | 0.988 |
| | HEXA | 0.987 | 0.975 | 0.971 | 0.971 | 0.989 | JTPE | 0.989 | 0.988 | 0.926 | 0.914 | 0.988 |
| | IKBI | 0.987 | 0.974 | 0.970 | 0.971 | 0.989 | KBLM | 0.988 | 0.980 | 0.976 | 0.904 | 0.988 |
| | KOIN | 0.986 | 0.975 | 0.971 | 0.972 | 0.988 | KONI | 0.988 | 0.980 | 0.979 | 0.979 | 0.988 |
| | MARK | 0.987 | 0.976 | 0.972 | 0.984 | 0.988 | MLIA | 0.962 | 0.933 | 0.957 | 0.986 | 0.972 |
| | TOTO | 0.987 | 0.915 | 0.860 | 0.935 | 0.962 | SKRN | 0.987 | 0.976 | 0.984 | 0.914 | 0.989 |
| | UNTR | 0.987 | 0.974 | 0.971 | 0.972 | 0.989 | SPTO | 0.986 | 0.989 | 0.912 | 0.940 | 0.993 |
| NCYC | AALI | 0.916 | 0.989 | 0.963 | 0.937 | 0.933 | ANJT | 0.951 | 0.891 | 0.959 | 0.975 | 0.985 |
| | ADES | 0.951 | 0.954 | 0.958 | 0.963 | 0.973 | BUDI | 0.959 | 0.975 | 0.934 | 0.958 | 0.982 |
| | BWPT | 0.739 | 0.787 | 0.865 | 0.947 | 0.980 | CAMP | 0.952 | 0.954 | 0.957 | 0.961 | 0.971 |
| | CEKA | 0.951 | 0.952 | 0.958 | 0.962 | 0.970 | GGRM | 0.977 | 0.963 | 0.958 | 0.933 | 0.949 |
| | HMSP | 0.951 | 0.953 | 0.958 | 0.962 | 0.971 | MBTO | 0.953 | 0.952 | 0.958 | 0.963 | 0.971 |
| | KINO | 0.923 | 0.788 | 0.895 | 0.796 | 0.871 | MYOR | 0.898 | 0.917 | 0.885 | 0.927 | 0.926 |
| | ROTI | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | SIMA | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 |

| Sector | Non-Family Firms | | | | | | Family Firms | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DMU | BCES | | | | | DMU | BCES | | | | |
| | | 2019 | 2020 | 2021 | 2022 | 2023 | | 2019 | 2020 | 2021 | 2022 | 2023 |
| | I | 49 | 54 | 65 | 70 | 75 | P | 73 | 90 | 37 | 76 | 71 |
| | TCID | 0.881 | 0.856 | 0.833 | 0.852 | 0.973 | SMAR | 0.886 | 0.915 | 0.895 | 0.959 | 0.891 |
| | UCID | 0.860 | 0.888 | 0.886 | 0.889 | 0.895 | ULTJ | 0.952 | 0.954 | 0.958 | 0.961 | 0.971 |
| | UNVR | 0.951 | 0.954 | 0.959 | 0.964 | 0.972 | WIIM | 0.942 | 0.974 | 0.972 | 0.962 | 0.972 |
| CYC | AUTO | 0.990 | 0.980 | 0.966 | 0.974 | 0.969 | ACES | 0.989 | 0.959 | 0.969 | 0.974 | 0.969 |
| | BATA | 0.980 | 0.755 | 0.907 | 0.895 | 0.858 | DMND | 0.990 | 0.952 | 0.964 | 0.975 | 0.968 |
| | BAYU | 0.989 | 0.950 | 0.964 | 0.974 | 0.969 | ERAA | 0.989 | 0.953 | 0.969 | 0.978 | 0.984 |
| | BLTZ | 0.971 | 0.582 | 0.715 | 0.899 | 0.871 | FAST | 0.989 | 0.960 | 0.970 | 0.973 | 0.972 |
| | GDYR | 0.933 | 0.931 | 0.956 | 0.952 | 0.984 | INDS | 0.989 | 0.966 | 0.987 | 0.986 | 0.990 |
| | MAPB | 0.989 | 0.966 | 0.977 | 0.975 | 0.969 | MSKY | 0.991 | 0.972 | 0.882 | 0.840 | 0.800 |
| | MAPI | 0.989 | 0.878 | 0.931 | 0.986 | 0.987 | SHID | 0.989 | 0.976 | 0.980 | 0.983 | 0.989 |
| | PJAA | 0.989 | 0.957 | 0.967 | 0.974 | 0.969 | SOFA | 0.989 | 0.954 | 0.964 | 0.975 | 0.969 |
| | PTSP | 0.980 | 0.986 | 0.987 | 0.976 | 0.972 | TFCO | 0.989 | 0.952 | 0.966 | 0.973 | 0.969 |
| | PZZA | 0.989 | 0.961 | 0.968 | 0.982 | 0.986 | WOOD | 0.989 | 0.968 | 0.975 | 0.980 | 0.958 |

Table 2. Bias-Corrected Efficiency Scores (BCES)

| Year | Parameter | Input Variables (million IDR) | | | | | Output Variables (million IDR) | | | | | Explanatory Variables | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $y_1$ | $y_2$ | $y_3$ | $y_4$ | $y_5$ | $z_1$ | $z_2$ | $z_3$ |
| **2019** | Min | 15,975 | 6,511 | 443 | 7,112 | 14,658 | 24,693 | 1 | -426,885 | -1,444,060 | -2,343,106 | 23.99 | 1.79 | -1.49 |
| | Max | 186,92 | 24,055 | 4,382, | 165,195,000 | 62,337 | 237,166,000 | 1,953, | 10,299 | 34,054 | 26,621 | 33. | 4. | 2. |

| Year | Parameter | Input Variables (million IDR) | | | | | Output Variables (million IDR) | | | | | Explanatory Variables | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $y_1$ | $y_2$ | $y_3$ | $y_4$ | $y_5$ | $z_1$ | $z_2$ | $z_3$ |
| | | 7,000 | ,000 | 000 | | ,000 | | 000 | ,000 | ,000 | ,000 | 49 | 63 | 17 |
| | Std.Dev. | 28,910,392 | 3,787,791 | 648,673 | 22,301,583 | 9,451,947 | 36,970,256 | 299,744 | 1,333,830 | 5,625,775 | 4,339,803 | 1.70 | 0.54 | 0.60 |
| | Mean | 11,124,412 | 1,840,743 | 227,010 | 6,944,586 | 4,267,621 | 14,700,591 | 85,112 | 208,142 | 1,801,680 | 1,294,924 | 28.90 | 3.49 | 0.38 |
| | Median | 2,210,349 | 460,868 | 23,460 | 1,231,703 | 1,275,199 | 2,796,242 | 10,053 | 3,244 | 186,328 | 114,119 | 28.79 | 3.54 | 0.26 |
| **2020** | Min | 9,143 | 7,839 | 15 | 7,975 | 19,226 | 23,986 | 7 | -501,397 | -1,150,060 | -1,108,389 | 24.95 | 1.95 | -0.15 |
| | Max | 136,488,000 | 25,688,000 | 3,408,000 | 142,749,000 | 59,230,000 | 175,046,000 | 2,342,000 | 9,937,000 | 21,741,000 | 18,571,000 | 33.45 | 4.64 | 1.69 |
| | Std.Dev. | 23,874,945 | 3,928,418 | 503,800 | 19,157,251 | 9,070,242 | 29,954,303 | 327,151 | 1,320,596 | 3,632,053 | 2,996,247 | 1.64 | 0.52 | 0.49 |
| | Mean | 9,868,976 | 1,800,325 | 205,258 | 6,539,532 | 4,372,063 | 12,762,794 | 87,351 | 202,448 | 1,178,035 | 888,788 | 28.95 | 3.53 | 0.57 |
| | Median | 1,953,465 | 412,323 | 43,058 | 1,227,844 | 1,638,567 | 2,256,646 | 7,224 | 1,975 | 66,516 | 42,585 | 28.84 | 3.57 | 0.46 |
| **20** | Min | 22,907 | 16,171 | 4 | 8,747 | 18,900 | 37,446 | 6 | -1,4 | -1,9 | -1,4 | 24. | 2. | -0. |

| Year | Parameter | Input Variables (million IDR) | | | | | Output Variables (million IDR) | | | | | Explanatory Variables | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $y_1$ | $y_2$ | $y_3$ | $y_4$ | $y_5$ | $z_1$ | $z_2$ | $z_3$ |
| **21** | | | | | | | | | 96,503 | 26,895 | 17,294 | 88 | 08 | 51 |
| | Max | 182,452,000 | 25,500,000 | 2,288,000 | 151,696,000 | 55,349,000 | 233,485,000 | 2,553,000 | 6,552,000 | 32,350,000 | 25,586,000 | 33.54 | 4.65 | 1.42 |
| | Std.Dev. | 29,944,260 | 3,915,076 | 363,839 | 20,601,214 | 8,607,545 | 37,207,883 | 349,304 | 1,094,059 | 4,829,129 | 3,789,733 | 1.66 | 0.50 | 0.41 |
| | Mean | 12,057,432 | 1,889,742 | 170,682 | 6,972,436 | 4,254,003 | 15,532,284 | 86,601 | 185,936 | 1,687,207 | 1,311,078 | 29.01 | 3.56 | 0.48 |
| | Median | 2,339,601 | 445,225 | 36,589 | 1,299,800 | 1,627,125 | 3,292,329 | 7,571 | 4,264 | 233,588 | 181,972 | 28.89 | 3.60 | 0.40 |
| **2022** | Min | 26,559 | 18,327 | 14 | 8,019 | 19,656 | 47,026 | 4 | -501,272 | -917,094 | -950,289 | 24.85 | 2.20 | -0.111 |
| | Max | 231,291,000 | 27,887,000,000 | 2,107,000 | 169,577,000 | 59,536,000 | 301,379,000 | 2,535,000 | 7,761,000 | 50,390,000 | 40,420,000 | 33.66 | 4.66 | 1.56 |
| | Std.Dev. | 36,613,333 | 4,247,194 | 354,272 | 23,093,979 | 9,291,659 | 46,415,029 | 351,293 | 1,244,265 | 7,562,951 | 6,029,551 | 1.68 | 0.48 | 0.36 |
| | Mean | 14,437,618 | 2,061,219 | 171,477 | 7,761,363 | 4,556,190 | 18,646,804 | 85,960 | 300,994 | 2,363,619 | 1,858,903 | 29.08 | 3.59 | 0.48 |
| | Median | 2,901,562 | 475,998 | 38,408 | 1,371,361 | 1,725,190 | 3,621,885 | 6,922 | 6,344 | 281,449 | 222,720 | 28. | 3. | 0. |

| Year | Parameter | Input Variables (million IDR) | | | | | Output Variables (million IDR) | | | | | Explanatory Variables | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $x_1$ | $x_2$ | $x_3$ | $x_4$ | $x_5$ | $y_1$ | $y_2$ | $y_3$ | $y_4$ | $y_5$ | $z_1$ | $z_2$ | $z_3$ |
| | | | | | | | | | | | | 92 | 62 | 40 |
| **2023** | Min | 23,252 | 22,586 | 2 | 13,292 | 21,946 | 46,643 | 21 | -281,089 | -369,922 | -418,212 | 24.88 | 2.30 | -0.40 |
| | Max | 243,255,000 | 29,042,000 | 3,112,000 | 195,261,000,000 | 72,911,000 | 316,565,000,000 | 3,053,000 | 10,520,000,000 | 54,729,000,000 | 44,501,000,000 | 33.73 | 7.59 | 1.68 |
| | Std.Dev. | 37,759,575 | 4,501,462 | 529,463 | 26,804,171 | 10,922,219 | 48,111,541 | 424,673 | 1,414,979 | 7,999,327 | 6,433,159 | 1.68 | 0.69 | 0.43 |
| | Mean | 14,767,446 | 2,177,002 | 228,111 | 8,425,989 | 5,057,093 | 19,093,275 | 111,742 | 272,984 | 2,305,703 | 1,820,688 | 29.12 | 3.69 | 0.49 |
| | Median | 2,686,662 | 449,023 | 40,329 | 1,442,617 | 1,797,655 | 3,811,213 | 11,277 | 6,269 | 211,519 | 175,246 | 28.93 | 3.65 | 0.44 |

Table 3. Descriptive Statistics of Non-Categorical Variables

Notes:

Input variables consist of x_1: Cost of Sales, x_2: Operating Expenses, x_3: Finance Costs, x_4: Total Liability, x_5: Fixed Assets.

Output variables consist of y_1: Revenue, y_2: Finance Income, y_3: Other Income, y_4: Profit/Loss Before Income Tax, y_5: Net Income.

Explanatory variables consist of z_1: Firm Size, z_2: Firm Age, z_3: Beta (systematic risk),

To eliminate the effect of exchange rate fluctuations in the efficiency analysis, all monetary values are presented in Indonesian Rupiah (IDR).

**Research Model**

The normality test serves as an initial step to determine the appropriate regression model for analysis. This test checks if the residuals from the regression model conform to a normal

distribution. The W-statistic and corresponding p-value, assesses normality; a significant p-value ($p < 0.05$) suggests that the residuals deviate from a normal distribution. Consequently, the OLS model is unsuitable, and a non-parametric regression model is used as an alternative. Table 4 provides the Shapiro-Wilk test results for residual normality (Shapiro and Wilk, 1965; Shapiro and Francia, 1972).

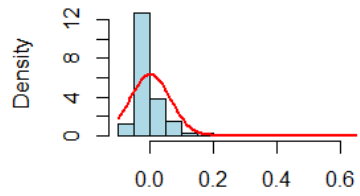
| **Indicator** | | **Histogram** |
|---|---|---|
| **Variable** | residuals |  |
| **Obs** | 300 | |
| **W** | 0.640 | |
| **p-value** | 0.000 | |



Table 4 Shapiro-Wilk Test for Normality of Residuals

The p-value of 0.000, which is below the 0.05 threshold, leads to the rejection of the null hypothesis of normality, indicating that the residuals do not follow a normal distribution and thus violate a key assumption of OLS regression. To address this non-normality, the Generalized Estimating Equations (GEE) model has been chosen for the regression analysis in this study. GEE is particularly suitable for panel data as it accounts for correlations within repeated observations over time. This model is preferred over other non-parametric or robust alternatives due to its capacity to provide reliable parameter estimates while handling within-cluster correlation, making it the best fit for this research.

Additionally, Spearman's rank correlation coefficients ($\rho$) have been calculated to evaluate the relationships between financial predictors. None of the correlation coefficients exceed the threshold of $|\rho| > 0.8$, indicating the absence of multicollinearity between variables that could potentially affect measurement accuracy.

Table 5 shows the results of Generalized Estimating Equations (GEE) model (Liang and Zeger, 1986), assessing the impact of financial ratios and firm characteristics on stock returns. The table presents the estimated coefficients, standard errors, Wald statistics, and p-values for each predictor. The GEE model uses an exchangeable correlation structure, with 27 clusters representing the total number of listed companies used as the sample in this research, and a maximum of five clusters, reflecting the research period from 2019 to 2023, which applies evenly across all samples.

Table 5 presents the results of the Generalized Estimating Equations (GEE) model (Liang and Zeger, 1986), which assesses the impact of firm characteristics and other variables on the reciprocal bias-corrected efficiency score (RBCES). Since RBCES is the inverse of the efficiency score, a higher RBCES implies lower efficiency, whereas a lower RBCES suggests higher efficiency. The table provides estimated coefficients, standard errors, Wald statistics, and p-values for each predictor. The GEE model employs an exchangeable correlation structure with 60 clusters, representing the total number of DMUs (Decision-Making Units) used in this study, with a maximum cluster size of 5, corresponding to the 5-year research period from 2019 to 2023.

| **Predictor** | **Estimate** | **Std. err** | **Wald** | **Pr(>\|W\|)** | |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| FirmFF | -0.0232 | 0.0117 | 3.9414 | 0.0471 | * |
| SectorCYC | 0.0184 | 0.0144 | 1.6286 | 0.2019 | |
| SectorNCYC | 0.0387 | 0.0109 | 12.5146 | 0.0004 | *** |
| ln(Age) | -0.0083 | 0.0102 | 0.6654 | 0.4147 | |
| ln(Size) | 0.0021 | 0.0026 | 0.6625 | 0.4157 | |
| Beta | -0.0052 | 0.0069 | 0.5709 | 0.4499 | |
| Year2020 | 0.0309 | 0.0140 | 4.8469 | 0.0277 | * |
| Year2021 | 0.0194 | 0.0090 | 4.6485 | 0.0311 | * |
| Year2022 | 0.0105 | 0.0085 | 1.5306 | 0.2160 | |
| Year2023 | -0.0014 | 0.0088 | 0.0262 | 0.8713 | |
| Intercept | 1.0036 | 0.0599 | 280.5354 | 0.0000 | *** |

Table 5 GEE Model Results

Notes: Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Dependent variable = RBCES (Reciprocal Bias-Corrected Efficiency Scores)

Correlation structure = exchangeable;

Estimated correlation parameters (α) = 0.3544 with Std. err = 0.0385

Number of clusters: 60; Maximum cluster size: 5

Categorical variables, including Firm Type (Firm), Sector, and Year, are included to capture variations in efficiency across different firm types, sectors, and time periods. The Wald test is used to determine the significance of each predictor, testing the null hypothesis that each coefficient equals zero, which would indicate no effect on RBCES. For significant predictors ($p < 0.05$), FirmFF has a negative coefficient (Estimate = -0.0232, $p = 0.0471$), suggesting that family firms have a lower RBCES (i.e., higher efficiency) compared to non-family firms.

Sector variables show mixed effects. Specifically, the Consumer Cyclicals sector (SectorCYC) has a non-significant positive coefficient (Estimate = 0.0184, $p = 0.2019$), indicating no statistically significant difference in efficiency compared to the reference sector, Industrials. In contrast, the Consumer Non-Cyclicals sector (SectorNCYC) has a significant positive coefficient (Estimate = 0.0387, $p = 0.0004$), indicating that firms in this sector have a higher RBCES (i.e., lower efficiency) compared to those in the Industrials sector.

The Year variables show significant effects for 2020 and 2021. Both 2020 (Year2020 Estimate = 0.0309, $p = 0.0277$) and 2021 (Year2021 Estimate = 0.0194, $p = 0.0311$) have positive coefficients, indicating higher RBCES values (lower efficiency) in these years compared to the baseline year (2019). This suggests that firms experienced reduced efficiency in 2020 and 2021. The coefficients for 2022 (Estimate = 0.0105, $p = 0.2160$) and 2023 (Estimate = -0.0014, $p = 0.8713$) are not significant, indicating no meaningful efficiency changes in these years relative to 2019.

Other continuous variables, such as Firm Age (ln(Age)), Firm Size (ln(Size)), and Beta, do not show significant effects on RBCES, as evidenced by their higher p-values ($p > 0.05$). This indicates that these firm characteristics do not have a statistically meaningful impact on efficiency within this model. Overall, the results suggest that firm type, certain business sectors,

and specific years (2020 and 2021) significantly influence efficiency, while other characteristics, such as age, size, and market risk, do not show a notable effect in this model.

Prioritized Strategies Derived from the Pairwise Comparison Matrix

This section examines the prioritized strategies employed by both family and non-family firms during crises to maintain efficiency through a comparative judgment analysis using the AHP technique. The analysis identifies alternative strategies with the highest eigenvector values, conducted separately for each firm type. Strategies are organized into clusters representing specific value criteria—proposition, creation, capture, or exchange—based on the framework outlined in Ren (2024), with added elements that integrate SEW (socio-emotional wealth) and DC (dynamic capability) to enhance the study's depth. Table 6 displays the eigenvector values of each component within the hierarchy, showing the prioritized alternative rankings for both family and non-family firms in relation to the study's objectives.

| Code | Component | Non-Family Firm | | Family Firm | |
|---|---|---|---|---|---|
| | | Eigen vector | Rank by Cluster | Eigen vector | Rank by Cluster |
| 2A | Organizational purpose (highlighting relationships) | 0.119 | 2 | 0.750 | 1 |
| 2B | Commercial purpose (highlighting on economic objectives) | 0.881 | 1 | 0.250 | 2 |
| 3A | Value proposition | 0.156 | 4 | 0.335 | 1 |
| 3B | Value creation | 0.289 | 1 | 0.302 | 2 |
| 3C | Value capture | 0.286 | 2 | 0.233 | 3 |
| 3D | Value exchange | 0.269 | 3 | 0.130 | 4 |
| $3A_1$ | Focus on key products and customer loyalty | 0.097 | 4 | 0.110 | 4 |
| $3A_2$ | Legacy of success and achievements | 0.035 | 11 | 0.146 | 2 |
| $3A_3$ | Historical continuity and organizational identity | 0.024 | 12 | 0.081 | 7 |
| $3B_1$ | Stable growth with resilience and specialization | 0.093 | 6 | **0.179** | **1** |
| $3B_2$ | Long-term organizational leadership | 0.102 | 3 | 0.037 | 10 |
| $3B_3$ | Stable workforce and specialized skills | 0.095 | 5 | 0.085 | 6 |
| $3C_1$ | Rapid commercial profit growth | **0.138** | **1** | 0.041 | 9 |
| $3C_2$ | Majority ownership and commitment | 0.062 | 9 | 0.074 | 8 |
| $3C_3$ | Competitive strategies and strategic partnerships | 0.085 | 7 | 0.117 | 3 |
| $3D_1$ | Strong connection and loyalty with stakeholders | 0.073 | 8 | 0.014 | 11 |
| $3D_2$ | Effective communication and new idea exchange | 0.135 | 2 | 0.104 | 5 |
| $3D_3$ | Strong external partnership and investor relations | 0.061 | 10 | 0.012 | 12 |

Table 6. Comparison of Eigenvector Values and Ranking of Strategic Priorities for Family and Non-Family Firms in Maintaining Efficiency During Crises

Note: The eigenvector shows normalized value by cluster

For non-family firms, the primary focus is on commercial objectives, emphasizing economic goals over relational ones, as indicated by a high eigenvector of 0.8811. Strategically, these firms prioritize value creation through resilience and specialization, reflecting a strong commitment to efficient and effective growth (eigenvector 0.2489). Among specific strategies, the top three priorities are rapid commercial profit growth (eigenvector 0.1381), competitive strategies and strategic partnerships (eigenvector 0.0989), and building strong connections and loyalty with stakeholders (eigenvector 0.0783). These choices underscore a focus on immediate profitability, establishing competitive advantages, and fostering loyalty among key stakeholders.

For family firms, the emphasis is on organizational relationships, placing high importance on relational goals, as shown by an eigenvector of 0.7560. Family firms' top strategic priority lies in value proposition, particularly in cultivating customer loyalty and building a lasting brand identity, with an eigenvector of 0.5336. The leading strategies for these firms include stable growth supported by resilience and specialized skills (eigenvector 0.1799), a focus on key products and customer loyalty (eigenvector 0.1666), and long-term organizational leadership (eigenvector 0.0837). These priorities reflect a strong commitment to sustainable growth, customer loyalty, and enduring leadership, aligning closely with family firms' dedication to legacy and relationship-driven values.

## Discussion

The global health crisis in 2020 posed unprecedented challenges, testing the resilience and adaptability of businesses worldwide. Family and non-family firms, characterized by different organizational goals and structures, responded to these challenges in distinct ways. Family firms, often anchored by socio-emotional wealth (SEW) and guided by a long-term orientation, demonstrated a marked advantage in efficiency and adaptability. As observed by Gomez-Mejia et al. (2007) and Berrone et al. (2010), family firms' resilience often stems from their relational and legacy-focused approach, which emphasizes the preservation of the family name, stability, and internal trust. This SEW-driven focus facilitates rapid and flexible decision-making without the need for extensive bureaucratic processes (Miller et al., 2015; Minichilli et al., 2016), allowing family firms to mobilize resources quickly during economic downturns and sustain operations with minimal disruption. Consistent with these findings, the negative coefficient for the family firm variable in this study's GEE model underscores that family firms maintained lower Reciprocal Bias-Corrected Efficiency Scores (RBCES), indicating higher efficiency than their non-family counterparts. This advantage aligns with research by Cucculelli and Peruzzi (2020) and Zhou et al. (2017), which demonstrates that family firms' close-knit decision-making structures and social capital enable them to operate efficiently and maintain stability even during crises.

When examining sectoral differences, the industrial and consumer cyclical sectors displayed higher efficiency compared to non-cyclical sectors, a result that may initially appear counterintuitive. Typically, non-cyclical sectors, or "inelastic" sectors such as healthcare and utilities, are seen as more resilient due to their association with essential goods and services that retain demand regardless of economic shifts (Carletti et al., 2020). However, during the pandemic, industrial and consumer cyclical sectors—industries that directly felt the economic

strain, such as tourism, automotive, and construction—responded with aggressive cost-reduction measures, focusing on minimizing production expenses and restructuring operations to preserve cash flow. By contrast, non-cyclical firms, while benefiting from stable demand, faced fewer incentives to adapt aggressively, resulting in relatively lower efficiency gains. The proactive measures in cyclical and industrial sectors allowed firms to enhance efficiency despite the economic downturn, aligning with findings by Albuquerque et al. (2020) and Fahlenbrach et al. (2021), which suggest that firms more directly impacted by market fluctuations often adapt rapidly to sustain efficiency.

The GEE results also revealed temporal variations in efficiency, with inefficiencies peaking in 2020 and 2021 before stabilizing in 2022 and 2023. These fluctuations correlate with the pandemic's impact on business operations, as companies faced severe disruptions in supply chains, shifts in consumer demand, and regulatory restrictions that collectively undermined efficiency in the early years of the crisis (UNDP, 2022). Over time, however, firms adjusted to the "new normal" by optimizing workflows and refining operational strategies. This recovery trend, evident in the 2022 and 2023 efficiency scores, indicates that companies gradually recalibrated to post-pandemic conditions, consistent with studies highlighting businesses' long-term adaptation to economic shocks (Li et al., 2021; Ding et al., 2021).

In analyzing the strategic priorities of family and non-family firms during crises, a notable distinction emerges. Family firms, primarily guided by SEW considerations, prioritize organizational resilience and legacy preservation, focusing on relational governance that emphasizes cohesion, loyalty, and interpersonal relationships (Chirico and Salvato, 2008). This approach, supported by research from Miller et al. (2015) and Berrone et al. (2010), fosters an adaptive workforce that can maintain continuity during turbulent times. Family firms' commitment to organizational purpose, such as workforce stability and internal trust, becomes a central component of their crisis management strategy, buffering them against market volatility while preserving efficiency. Conversely, non-family firms, motivated by shareholder expectations and economic objectives, focus on commercial profit-driven strategies that prioritize rapid financial gains and market expansion. This profit-centric approach, discussed by Santos et al. (2022), reflects non-family firms' preference for transactional governance and performance-based objectives, particularly during crises when maximizing returns and preserving revenue growth take precedence over relational values (Villalonga and Amit, 2006; Cucculelli and Peruzzi, 2020).

These differences in strategic priorities underscore contrasting crisis management styles: while family firms leverage internal cohesion and SEW-aligned goals to sustain efficiency, non-family firms adopt a more profit-driven focus, aiming to secure immediate financial results. The divergence in approach not only highlights the adaptability of family firms but also demonstrates how different organizational objectives drive strategic choices during economic crises. This variation in focus aligns with literature showing that family firms' resilience and relational orientation give them a distinct advantage in navigating crises efficiently, in contrast to non-family firms' emphasis on economic performance and shareholder satisfaction.

Family firms' resilience during crises is further underpinned by their dynamic capabilities (DC), which complement SEW by enhancing the firm's adaptability and capacity to manage evolving challenges. Dynamic capabilities, as discussed by Teece (1997) and Eisenhardt and Martin (2000), refer to a firm's ability to sense, seize, and transform in response to changes in the external environment. Family firms' long-term orientation and desire for continuity encourage

investments in adaptive processes and resource optimization, essential traits in times of crisis. The combination of SEW and DC allows family firms to maintain stable relationships and retain valuable human capital, as they are often reluctant to downsize or disrupt established connections with employees and suppliers (Chirico et al., 2011). Additionally, their ability to streamline decision-making processes due to less bureaucratic complexity enables family firms to adapt swiftly and efficiently, securing their position in a competitive landscape (Casillas et al., 2019). This swift decision-making is particularly advantageous in times of crisis, when immediate adjustments are required to navigate uncertainty.

## Conclusion

The findings from both the GEE and AHP analyses reveal that family and non-family firms adopt distinctly different strategies to sustain efficiency during crises. Family firms demonstrate greater resilience, as shown by their long-term orientation and relational governance, which prioritizes stability and cohesion over immediate financial gains. Conversely, non-family firms focus on financial adaptability, especially in sectors where demand fluctuates significantly. These results underscore the influence of ownership structure on strategic decision-making and provide valuable insights into how varying governance models contribute to a firm's resilience during economic downturns.

Despite its contributions, this study has certain limitations. The sample is limited to firms listed on the Indonesia Stock Exchange, which may not fully capture the diversity of both family and non-family firms in other geographic or regulatory contexts. Moreover, this research does not account for privately owned companies in measuring efficiency scores, potentially omitting insights from a significant portion of firms outside the public domain. Additionally, the focus on efficiency as a single measure could overlook other dimensions of organizational resilience, such as innovation or adaptability, which are also critical during crises. Future research could expand this analysis to a broader, cross-country dataset and incorporate additional metrics to provide a more comprehensive understanding of how family and non-family firms maintain stability and navigate through crises.

The practical implications of these findings suggest that aligning crisis strategies with core organizational values can bolster resilience. Family firms may benefit from leveraging socio-emotional wealth and enhancing internal cohesion, while non-family firms could capitalize on financial adaptability to navigate fluctuating markets effectively. Understanding these strategic differences allows managers and policymakers to better support firms across ownership types, enabling them to adapt and thrive in a range of economic conditions.

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