The Moderating Effect of Business Intelligence on Tax Avoidance to Maximize Firm Value

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ABSTRACT

Organizations use innovative techniques to improve financial performance in today's ever-changing business environment. A notable trend that is gaining pace is integrating *Tax Avoidance* methods with *Business Intelligence* tools. Previous studies have generally looked at *Tax Avoidance* and *Business Intelligence* in isolation, ignoring the possible combined influence on *Firm Value*. This study filled that gap, attempting to thoroughly explain how *Tax Avoidance* and *Business Intelligence* interact to determine *Firm Value*. We used purposive sampling to evaluate 545 observations of industrial businesses listed on the Indonesian Stock Exchange from 2017 to 2021, using weighted least squares. The results showed that *Tax Avoidance* negatively influences *Firm Value*, whereas *Business Intelligence* has a beneficial effect. Significantly, *Business Intelligence* mitigated the negative impact of *Tax Avoidance* on *Firm Value*. Further investigation demonstrated that *Business Intelligence* reduced the negative impact of *Tax Avoidance*, earning investor confidence. This study created new territory by focusing on *Business Intelligence* as a factor impacting the link between *Tax Avoidance* and *Firm Value*. The study offered insights on strategically integrating *Tax Avoidance* and *Business Intelligence* into financial management, which had significant implications for managerial decision-making in negotiating tax difficulties and increasing *Firm Value*.

CCS CONCEPTS

• Information systems • Information systems applications • Decision support systems • Data analytics

KEYWORDS

Business Intelligence, Firm Value, Tax Avoidance

1 INTRODUCTION

The government expects taxpayers to fulfill their tax obligations fully. However, in practice, many companies choose business strategies to minimize the taxes they owe. Research on *Tax Avoidance* remains an intriguing option due to the tug-of-war between two shareholder perspectives. Traditional shareholders consider *Tax Avoidance* a positive action that benefits investors, potentially enhancing *Firm Value* [1]. Similarly, businesses in Tunisia perceive *Tax Avoidance* in the study by [2] as a valuable strategy for reducing liabilities and optimizing *Firm Value*. In Pakistan, companies engage in *Tax Avoidance* actions to boost short-term profitability. Their *Tax Avoidance* actions have been shown to reduce tax payments.

Furthermore, Pakistani investors positively respond to the increase in profitability, leading to higher *Firm Value* [3]. However, in the context of research in Taiwan, investors perceive *Tax Avoidance* actions negatively as they may increase agency costs and reduce *Firm Value* [4]. The conflicting results from the studies above illustrate that companies face rational and conservative investors in responding to corporate aggressiveness in enhancing *Firm Value* while also providing an opportunity for this study to complement the diversity in previous research findings. Therefore, the development of *Tax Avoidance* research in many studies is beginning to incorporate factors that can influence the relationship between *Tax Avoidance* and *Firm Value*. For example, [5] added corporate governance factors, and [2] added tax risk.

The growing adoption of *Tax Avoidance* strategies can be linked to technological advancements, particularly the emergence of *Business Intelligence* tools. Businesses equipped with proficient tax planning teams are now harnessing the power of *Business Intelligence* to optimize their tax strategies. These tools enable organizations to manage and analyze vast volumes of data

efficiently, transforming raw data into meaningful insights [6]. Businesses can use this capability to understand their financial operations better, spot possible tax savings, and make well-informed decisions to reduce their tax obligations [7]. Additionally, these tools give tax planners instant access to precise and extensive financial data [8], enabling them to conduct in-depth analyses and pinpoint areas where *Tax Avoidance* strategies can be successfully applied.

Additionally, *Business Intelligence* tools facilitate scenario planning and predictive analytics [9], enabling companies to assess the potential outcomes of different *Tax Avoidance* approaches and optimize their strategies accordingly. Moreover, *Business Intelligence* enhances transparency and compliance [9] by ensuring that tax planning decisions are based on reliable data and align with regulatory requirements. The potential effect of *Business Intelligence* moderating *Tax Avoidance* practices on *Firm Value* has been overlooked in previous research, which has concentrated separately on *Business Intelligence* or *Tax Avoidance*. This study attempts to close this gap by examining how *Business Intelligence* mitigates the effects of *Tax Avoidance* practices on *Firm Value*. Our research provides managers and other decision-makers with insightful guidance on *navigating Tax Avoidance* strategies and using *Business Intelligence* to increase *Firm Value*.

2 LITERATURE REVIEW

Prior research has examined the problem of *Tax Avoidance* by examining its causes or consequences. Nonetheless, prior studies have not examined the moderating influence of *Business Intelligence* on the association between *Tax Avoidance* and *Firm Value*.

2.1 Tax Avoidance and Firm Value

Tax Avoidance is the effort made by companies to minimize the tax burden payable to the government by exploiting weaknesses or gaps in tax regulations and policies. According to [10], the tax burden harms companies as it can reduce the net profit. Therefore, *Tax Avoidance* is an issue that companies find difficult to avoid because they aim to maximize their net profit [11]. Consequently, companies always engage in tax planning to minimize the tax paid [12]. However, shareholders can view *Tax Avoidance* negatively because it may incur additional costs for the company if tax planning to minimize taxes paid is not executed effectively [2].

In taxation, agency conflict can be observed in the disparity between a company's earnings and taxable income. It indicates a difference in interests regarding corporate profits. Shareholders want managers to increase earnings so that dividends received by shareholders also increase, thereby maximizing shareholder profits. However, on the other hand, managers engage in *Tax Avoidance* actions by increasing expenses, which can reduce pre-tax income to boost earnings [13].

One important consideration when evaluating a company's financial health is *Tax Avoidance*. Profits may rise momentarily,

but because of related agency problems, *Firm Value* may also be diminished. *Tax Avoidance* and *Firm Value* appear to be negatively correlated; the more avoidance, the lower the value, according to research like that done by [11]. On the other hand, as multiple studies have shown, lower levels of *Tax Avoidance* typically correspond with higher *Firm Value* [4]. The deterrent effect that *Tax Avoidance* practices can have on shareholder investment is highlighted by these findings. However, a contrasting perspective from research like [12] suggests that *Tax Avoidance* might not directly impact *Firm Value*. This contradiction arises because shareholders typically prioritize financial ratios over tax burden assessments. Consequently, we developed hypothesis 1 based on these observations.

H1. *Tax Avoidance* has a negative effect on *Firm Value*.

2.2 Business Intelligence Moderates the Effect of Tax Avoidance on Firm Value

Business Intelligence encompasses all procedures and technologies that convert unprocessed data into significant and valuable insights, facilitating systematic and purposeful examination of an organization and its environment [14]. Implementing *Business Intelligence* aims to simplify the interpretation of large amounts of data and implement effective strategies. Implementing *Business Intelligence* requires the processing, management, and analysis stages to generate helpful information, known as big data analytics [15]. Furthermore, [9] stated that the main reason for using *Business Intelligence* is to optimize business processes within the company with large amounts of data. Humans cannot analyze large amounts of data to produce information.

Based on the Resource-Based View (RBV) theory, companies can achieve a competitive advantage by possessing valuable and non-imitable resources. These resources include all tangible and intangible assets, such as knowledge and information held by a company. Financial reports and stock markets reflect the competitive advantage derived from these intangible assets and capabilities. Therefore, the competitive advantage derived from a company's intangible assets and capabilities can enhance its performance, thus impacting the increase in *Firm Value* [16]. This theory was developed by [17,18]. They all agreed that RBV plays a crucial role in enabling companies to excel in competition. Based on RBV theory, *Business Intelligence* is a tool that can be used to manage company information and achieve excellence in *Firm Value* [19].

The implementation of *Business Intelligence* in managing companies can be a strategic advantage. *Business Intelligence* effectively transforms company data into actionable insights for decision-makers [6]. It provides better insights and understanding of *Tax Avoidance* practices carried out by companies. This information is then processed and analyzed based on the company's original data, ensuring unbiased insights that align with the interests of both agents and principals. From this information, undesirable *Tax Avoidance* practices can be identified, leading to appropriate actions. Companies can better understand how *Tax Avoidance* impacts financial performance

and *Firm Value* by employing proper analytical methods. It enables companies to make better decisions in managing *Tax Avoidance* practices while maintaining optimal *Firm Value*. As a result, the information that has been processed and analyzed can impact the correlation between *Tax Avoidance* and *Firm Value*; this explanation led to the development of hypothesis 2.

H2. *Business Intelligence* moderates the negative effect of *Tax Avoidance* on *Firm Value*.

3 METHODS

The methodology adopted in this research is a quantitative method. It employs a causal approach, which investigates cause-and-effect relationships among variables. This method scrutinizes the relationship between one variable and another. Three variables are under examination: the dependent variable is *Firm Value*, the independent variable is *Tax Avoidance*, and the moderating variable is *Business Intelligence*, as delineated in the analytical framework depicted in Figure 1.
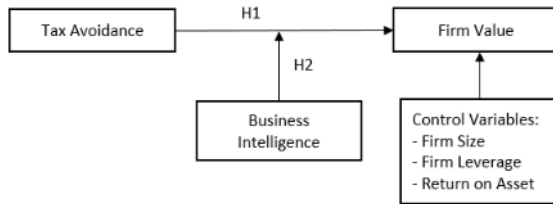

Figure 1: Research framework

3.1 Sample Selection

The study includes manufacturing companies listed between 2017 and 2021 on the Indonesia Stock Exchange. These companies were chosen through purposive sampling based on predefined criteria, such as their membership in the manufacturing sector as per the 2019 Fact Book, their lack of suspension during the study period, the absence of any initial public offerings during the study period, and the availability of complete annual reports for the years 2017 to 2021.

After adjusting the criteria, 122 companies were identified, each spanning five years, resulting in a total sample of 610 companies. Outliers in *Firm Value* and *Firm Size* were detected, leading to the removal of 13 companies (65 data points) to ensure the dataset's integrity. Thus, the final sample comprised 109 companies spanning five years, totaling 545 observations. Data on *Firm Value*, *Tax Avoidance*, *Firm Size*, *Firm Leverage*, and *Return on Assets* were obtained from Osiris, while *Business Intelligence* information was manually collected from annual reports.

3.2 Operational Definition of Variables

3.2.1 Measurement of Firm Value. Based on the study by [21], *Firm Value* can be assessed using Tobin's Q ratio indicator.

Tobin's Q ratio reflects the extent to which investors are interested in allocating investments in a company [22]. The higher Tobin's Q value, the higher the tendency for investors to invest in the company; therefore, the company's value will increase [22].

$$Tobin's\ Q = \frac{Market\ Value\ of\ Equity + Book\ Value\ of\ Liabilities}{Total\ Assets} \quad (1)$$

3.2.2 Measurement of Tax Avoidance. The company's tax reports have a high level of confidentiality and are difficult for the public to access. Therefore, in this study, we employ empirical indicators to estimate corporate tax reports based on publicly available information, as suggested by [23]. *Tax Avoidance* measurement in this study utilizes the Book Tax Difference (BTD) that reflects the extent which reported income can avoid tax payments [23]. BTD is calculated as the difference between pre-tax and taxable income divided by total assets [24,25]. Generally, higher BTD levels are often detected in business entities exhibiting more significant *Tax Avoidance* behavior [26].

$$BTD = \frac{(Income\ Before\ Tax \times Tax\ Rate) - Income\ Tax}{Total\ Assets} \quad (2)$$

3.2.3 Measurement of Business Intelligence. The *Business Intelligence* variable is measured by summing up dummy variables representing keywords related to *Business Intelligence*. The *Business Intelligence* keywords are compiled based on questions in the questionnaire used in previous studies. These keywords consist of optimization, regression, simulation, data visualization, dashboard [15], open system network [27], data warehouse, big data, data visualization, cloud-based service, SQL [28], and data mining [29].

3.2.4 Measurement of control variables. This study uses five control variables, i.e., *Firm Size*, *Firm Leverage*, *Return on Asset*, and Intangible Asset. According to [10], *Firm Size* is the natural logarithm of total assets. *Firm Leverage* represents the level of debt a company uses in financing [7], which is calculated by dividing total debt by total assets. *Return On Asset* is utilized to assess a company's profitability by measuring the profit before tax from its assets [2].

3.3 Regression Models

This research aims to investigate the influence of *Tax Avoidance* on *Firm Value* and the moderating role of *Business Intelligence* in the association between *Tax Avoidance* and *Firm Value*. To achieve this, we have developed a hypothesis stating that *Tax Avoidance* negatively affects *Firm Value*. Still, when *Business Intelligence* supports *Tax Avoidance* practices, *Business Intelligence* can mitigate the negative impact of *Tax Avoidance* on *Firm Value*. Therefore, our model is defined as follows:

Model 1:
$$FV_{i,t} = \beta_0 + \beta_1 TA_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 ROA_{i,t} + \epsilon_{i,t} \quad (3)$$

Model 2:
$$FV_{i,t} = \beta_0 + \beta_1 TA_{i,t} + \beta_2 BI_{i,t} + \beta_3 TA \times BI_{i,t} + \beta_4 SIZE_{i,t} + \beta_5 LEV_{i,t} + \beta_6 ROA_{i,t} + \epsilon_{i,t} \quad (4)$$

Based on our second hypothesis, we predict a negative coefficient on *Tax Avoidance* ($\beta_1 < 0$), a positive coefficient on *Business Intelligence* ($\beta_2 > 0$), and a negative coefficient on the

$TA{\times}BI$ interaction ($\beta_3 < 0$). Note that:

β_0	= constant
$\beta_1 - \beta_6$	= regression coefficients for each variable
i	= company
t	= book years 2017-2021
FV	= Firm Value
TA	= Tax Avoidance
BI	= Business Intelligence
$SIZE$	= Firm Size
LEV	= Firm Leverage
ROA	= Return on Asset
ε	= Error

4 RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Descriptive statistical analysis provides an insightful understanding of the characteristics of each variable in this research, as shown in Table 1. Firstly, the *Firm Value* variable demonstrates a normal distribution with a mean of 0.264 and a standard deviation of 0.441, and it has a diverse range of values from -1.444 to 0.872. It indicates the variability in *Firm Value* among the sampled companies. Furthermore, the *Tax Avoidance* variable exhibits lower variation, with a mean of -0.004 and a standard deviation of 0.020. Subsequently, the *Business Intelligence* variable shows more significant variation, with a mean of 0.095 and a standard deviation of 0.112. The range of *Business Intelligence* values ranges from 0.000 to 0.546, indicating significant differences in implementing this information technology among companies. The interaction between *Tax Avoidance* and *Business Intelligence* ($TA{\times}BI$) has a relatively tiny variation, with a narrow range of values from -0.054 to 0.004. The utilization of *Business Intelligence* in managing *Tax Avoidance* practices is not yet prevalent among the examined companies.

Table 1: Summary statistics of the sample

	N	Mean	SD	Min	Max
FV	545	0.264	0.441	-1.444	0.872
TA	545	-0.004	0.020	0.259	0.170
BI	545	0.095	0.112	0.000	0.546
$TA{\times}BI$	545	-0.001	0.004	-0.054	0.004
$SIZE$	545	12.290	1.567	8.794	17.060
LEV	545	0.524	0.531	0.003	5.168
ROA	545	0.032	0.101	-0.642	1.103

Control variables such as *Firm Size*, *Firm Leverage*, and *Return on Asset* also exhibit significant variation within the sample. *Firm Size* demonstrates a substantial range of values from 8.794 to 17.060, while *Firm Leverage* exhibits considerable variation with a range of values from 0.003 to 5.168. The *Return on Asset* also shows considerable variation, with a range of values from -0.642 to 1.103. This analysis provides a comprehensive overview of the characteristics of the variables in this study, which is crucial for understanding the dynamics of the relationships between these variables.

4.2 Regression Results and Discussion

Table 2 shows the regression results for Model 1 and Model 2.

Table 2: Regression results using weighted least squares for the two models

FV	Model 1				Model 2		
	Coef.	p>t		Collinearity	Coef.	p>t	Collinearity
TA	-7.094	0.000	***	1.689	-5.478	0.000 ***	2.390
BI					0.357	0.008 ***	1.348
$TA{\times}BI$					-11.518	0.023 **	1.974
$SIZE$	0.043	0.000	***	1.021	0.031	0.001 ***	1.257
LEV	-0.186	0.000	***	1.102	-0.194	0.000 ***	1.105
ROA	0.027	0.000	***	1.782	0.027	0.000 ***	1.796
Cons	-0.710	0.000	***		-0.700	0.000 ***	
$Prob{>}F$	0.000				0.000		
R^2	0.368				0.386		

Note(s): ***, ** and * are significant levels at 1%, 5% and 10%, respectively.

OLS regression was performed, and the results were adequate, suggesting alternative fixed effects. Consequently, the Breusch-Pagan test supported alternative random effects. The Hausman test confirmed consistency and preferred the fixed effects model over the OLS. As a result, this study adopted the fixed effects method for estimating. Multicollinearity was measured using the variance inflation factor, and panel-weighted least squares addressed heteroskedasticity. Table 2 (columns 4 and 7) showed no multicollinearity concerns, i.e., correlation coefficients < 2.40, indicating the model's robustness and reliability.

4.2.1 Tax Avoidance and Firm Value. The regression analysis in Table 2, Model 1 reveals a significant relationship between the independent and dependent variables, *Firm Value*. The *Tax Avoidance* variable significantly negatively influences *Firm Value*, with a regression coefficient β_1 of -7.094 and a significance level of $p < 0.001$. It indicates that any increase in *Tax Avoidance*

practices will lead to a significant decrease in *Firm Value*. This result confirms our first hypothesis and is consistent with the findings of [4]. The findings of this study suggest that while *Tax Avoidance* may boost cash flow and net profit, thereby enhancing the company's overall value, it may also contribute to agency problems [12].

Conversely, the *Firm Size* exhibits a significant positive effect on *Firm Value*, with a regression coefficient β_2 of 0.043 and a significance level of $p < 0.001$. It suggests that a larger *Firm Size* tends to be associated with higher *Firm Value*. This finding is consistent with previous [11]. The positive coefficient of *Firm Size* in the relationship between *Tax Avoidance* and *Firm Value* can be attributed to the advantageous position of large firms. Larger companies often demonstrate lower bankruptcy risks and greater transparency in information compared to smaller businesses. These characteristics enable large firms to easily access external capital markets at lower borrowing costs. Consequently, they can effectively utilize tax shields to maximize profits. This advantageous position allows large firms to optimize their *Tax Avoidance* strategies, thereby contributing positively to their *Firm Value*.

Firm Leverage also exhibits a significant yet negative effect on *Firm Value*, with a regression coefficient β_3 of -0.186 and a significance level of $p < 0.001$. It implies that higher levels of corporate debt correspond to lower *Firm Value*. This finding aligns with previous research by [4, 2]. It suggests that higher debt levels negatively impact a company's overall value. Increased leverage often signifies higher financial risk and can lead to concerns among investors about the firm's ability to meet its debt obligations. Consequently, firms with higher leverage may experience lower valuations in the market, reducing their overall *Firm Value*. In the context of *Tax Avoidance*, higher leverage may amplify these negative effects, as it indicates a greater reliance on debt financing, which can further exacerbate financial risks and diminish *Firm Value*.

Lastly, the *Return on Asset* exhibits a significant positive effect on *Firm Value*, with a regression coefficient β_4 of 0.027 and a significance level of $p < 0.001$. It indicates that companies with better asset performance tend to have higher values. This finding aligns with previous research by [4, 11]. A higher *Return on Asset* indicates that a company generates more earnings than its total assets. It indicates a healthier financial performance and reflects positively on the company's profitability. Investors are more likely to favorably view companies with higher *Return on Asset*, as it signals efficiency in asset utilization and overall financial health. As a result, firms with higher *Return on Asset* tend to have higher market valuations, leading to a positive relationship between *Return on Asset* and *Firm Value* in the context of *Tax Avoidance*.

4.2.2 Business Intelligence moderates the effect of Tax Avoidance on Firm Value. Model 2 is a sophisticated regression model that considers control variables like *Firm Size*, *Firm Leverage*, and *Return on Asset*, as well as the relationship between *Tax Avoidance* and *Business Intelligence* on *Firm Value*. Based on a regression coefficient beta β_1 of -5.478 and significance at the

1% level, the results show that *Tax Avoidance* significantly reduces *Firm Value*. It suggests that each unit increase in *Tax Avoidance* practices decreases *Firm Value* by 5.478 units, independently of other variables in the model. *Tax Avoidance* also had a negative impact on *Firm Value*, which is consistent with Model 1's findings.

In addition, *Business Intelligence* considerably increases *Firm Value*, with a regression coefficient of 0.357 and 1% significance, implying that its implementation can increase *Firm Value* by 0.357. These findings support a previous study [6], which found that adopting *Business Intelligence* provides competitive advantages, enhances decision-making, promotes cost reductions, transparency, and better risk management. It emphasizes the critical role of *Business Intelligence* in improving operational efficiency, strengthening enterprises' competitive position, and mitigating the negative consequences of *Tax Avoidance* practices. This convergence with RBV theory highlights the necessity of leveraging technological resources, such as *Business Intelligence* tools, to create and sustain value in dynamic marketplaces [9].

Even more intriguing, *Tax Avoidance* and *Business Intelligence* (*TA×BI*) considerably impact *Firm Value*, with a regression coefficient of -11.518 and 5% significance. Moderator *Business Intelligence* reduced the negative impact of *Tax Avoidance* on *Firm Value*. *Business Intelligence* helps decision-making by giving timely insights [6], allowing businesses to better comprehend the ramifications of *Tax Avoidance* schemes and make informed risk-mitigation decisions. It also improves financial reporting clarity, which reduces regulatory scrutiny and reputational damage caused by aggressive *Tax Avoidance*.

Furthermore, *Business Intelligence* enhances operational efficiency and effectiveness, allowing companies to optimize their resource allocation and identify areas for improvement [9]. This increased operational efficiency can offset any adverse effects of *Tax Avoidance* on *Firm Value* by driving productivity gains and cost savings. Additionally, *Business Intelligence* allows organizations to predict and adjust to changes in the regulatory landscape, facilitating their more efficient navigation of intricate tax laws and regulations. Overall, the moderation effect of *Business Intelligence* on the relationship between *Tax Avoidance* and *Firm Value* stems from its ability to provide companies with the necessary tools and insights to manage the inherent risks and challenges associated with *Tax Avoidance* strategies. By leveraging *Business Intelligence* effectively, firms can mitigate the negative consequences of *Tax Avoidance* on *Firm Value* and maintain stakeholder trust and confidence in the long run.

Finally, control variables, such as *Firm Size*, *Firm Leverage*, and *Return on Asset*, also significantly influence *Firm Value* in this model. Model 2's R-squared (R^2) is 0.386, meaning that the model's variables account for about 38.6% of the variation in *Firm Value*. Thus, the regression result provides valuable insights into the complex relationship between *Tax Avoidance*, *Business Intelligence*, and *Firm Value*.

5 CONCLUSION

This study successfully identified significant relationships between *Tax Avoidance*, *Business Intelligence*, and other control variables on *Firm Value*. Our main findings indicate that *Tax Avoidance* practices significantly negatively impact *Firm Value* while adopting *Business Intelligence* has a significant positive impact. Importantly, our study underscores the importance of implementing *Tax Avoidance* practices carefully and leveraging *Business Intelligence* to mitigate associated risks effectively. Additionally, we found that *Firm Size*, *Firm Leverage*, and *Return on Asset* are essential in determining *Firm Value*, highlighting the multifaceted nature of factors influencing firm performance.

This research notes limitations for future studies. Firstly, the narrow scope of *Business Intelligence* keywords, restricted to eleven terms, may have limited our analysis. Future research could broaden the range of keywords for a more comprehensive view. Additionally, relying solely on annual reports may limit understanding, prompting exploration of alternative data sources like company websites. Our study focused solely on Indonesia's manufacturing sector, limiting generalizability. Comparative studies across sectors or regions could enhance insights. Longitudinal analyses are needed to track changes, considering factors like COVID-19. Integrating qualitative methods can deepen understanding. Addressing these suggestions will enrich our grasp of the impact of *Business Intelligence*.

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