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The Moderating Effect of Goodwill and Goodwill Impairment on Global Energy Crisis and Corporate Cash Holding

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Abstract

The global energy crisis caused a price spike in various operational inputs for the companies; sufficient cash is required to ensure the company's operations continue. This study aims to analyze the causal effect of the energy crisis on corporate cash holdings in Indonesia and the role of goodwill and impairment of goodwill in moderating this effect. Goodwill and goodwill impairment are indicators of corporate risk related to the synergy of business combinations. This study uses the differences in differences method. There are 564 companies listed on the Indonesia Stock Exchange, including those in the sample of this study, with a quarterly research period from the 4th quarter of 2020 until the 2nd quarter of 2022. The hypotheses were tested using the linear regression analysis and robustness test. This study found that the global energy crisis has a positive effect on corporate cash holdings for the impacted sub-industry. However, goodwill and goodwill impairment are not moderate influences. This study also discusses its limitations. For further research, it is expected to add more control variables, use another robustness test, and increase the observation period until the global energy crisis is over.

Keywords: *global energy crisis, cash holding, goodwill, goodwill impairment, difference in differences.*

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INTRODUCTION

The global energy crisis, which began in the fourth quarter of 2021, was sparked by significant shifts in the supply and demand for energy commodities. Several nations' decisions to reduce their production of fossil fuels and disruptions in the oil and natural gas supply chain resulting Russia's invasion of Ukraine contributed to the decrease in the supply of energy commodities. The implementation of a global agreement in France regarding the net-zero emissions policy has resulted in a decrease in the supply of oil and fossil fuels. This has prompted several nations to gradually shift to renewable energy and reduce their production of non-renewable energy; however, renewable energy is insufficient to meet global demand from households and businesses (Ozili & Ozen, 2022).

At the same time, energy demand is increasing due to the post-pandemic economic recovery. The pandemic caused energy consumption to decrease by 4.5 percent in 2020, but it suddenly increased to 4.6 percent in 2021 (IEA, 2021). Additionally, when extreme weather results from global warming, heating and cooling equipment consume more energy. The mechanism that causes demand to rise when supply decreases has led to an increase in global energy prices. The global energy index's price will rise by 63.37 percent as a result in 2022. According to Singh (2021), the expansion of fossil fuels is a significant driver of economic growth, industrialization, and human health management. As a consequence, it is anticipated that inflation is expected to remain high in 2022, averaging of 3.9% in developed countries and 5.9% in developing countries (IMF, 2022).

This motivates a variety of businesses to maintain and enhance their financial performance, particularly liquidity. One of the most crucial aspects of surviving a crisis is controlling the company's liquidity. Planning and analysis of liquidity will enable the company to survive the crisis (Alao et al., 2020). The most liquid asset is cash, so the company needs it to complete daily operations, pay suppliers, compensate employees, and fund projects (Faque, 2022). Thus, in times of crisis, management tends to hold more cash under precautionary motives to anticipate unexpected events.

Previous research on cash has demonstrated a positive correlation between the level of a company's cash holdings and a crisis (Qin et al., 2020; Tran, 2019; Lozano & Yaman, 2020; Zhang et al., 2020; Shiau et al., 2018). These studies were carried out with various kinds of crises, such as financial crises (Tran, 2019; Lozano & Yaman, 2020; Shiau et al., 2018), COVID19 (Qin et al., 2020), and the volatility of the oil price (Wu et al., 2021; Zhang et al., 2020). However, there is still a lack of research on how the global energy crisis affects cash holdings. Although, the global energy crisis has occurred numerous times in history. In addition, Lozano & Yaman (2020) stated that it is important to understand whether firms will react similarly (by increasing their cash holdings) during other crisis periods. Thus, this study focuses on how the global energy crisis affects corporate cash holdings.

The majority of these studies were carried out in Industrial countries. According to Sriram (1999), only a few studies have been conducted on cash holdings in developing nations, with the majority of those studies focusing on the industrialized countries. Meanwhile, the characteristics of companies in industrialized countries and developing countries are very

different. Unlike prior studies, this study is carried out in a developing nation such as Indonesia. In Indonesia, generally, empirical research on corporate cash holdings is limited to specific stock indexes or sectors. Therefore, this research was conducted to contribute to the literature on cash-holding policies during crises caused by economic conditions, especially in developing countries such as Indonesia. In addition, this research contributes to the Indonesian government's development of crisis-related financial policies. Additionally, for investors, this study provides guidance for making investment decisions during times of crisis.

The phenomenon of the global energy crisis has both positive and negative impacts on Indonesia. The positive impact of this energy crisis in Indonesia is a trade balance surplus due to the increase in the value of Indonesia's non-oil and gas energy commodities exported, such as coal, crude palm oil, and others. Meanwhile, the negative impact of the global energy crisis in Indonesia was the rise in oil and gas commodity prices, such as cooking oil, due to high global demand, which directly boosted prices. As a result, inflation for cooking oil in Indonesia is around 7% in 2021 (Bank Indonesia, 2022). The increased demand caused by a high demand for crude palm oil from various countries that previously consumed sunflower and canola seed oils has led to a return to consuming palm oil due to the crisis. The increase in demand indirectly pushed up the price of cooking oil in Indonesia due to limited supply.

Figure 1. Cooking oil price spike in Indonesia
Source: Bank Indonesia 2021

Since the impact of the global energy crisis in Indonesia varies across industries. It determines various optimal levels of cash holdings based on each industry's characteristics. Holding cash protects the company against liquidity risk, but spending cash allows the company to capitalise on new opportunities (Nason & Patel, 2016). This study takes advantage of various optimal cash holdings by different sector industries that were seriously impacted and not seriously impacted by the crisis to navigate the causal effects of the global energy crisis on corporate cash holdings in Indonesia.

However, goodwill may impede the expansion of cash reserves. A company with high goodwill faces significant risk, necessitating restrictions on external financing. After a business combination, goodwill impairment due to poor synergy performance will send a negative

message to stakeholders and the market. Thus, banks and other creditors will use various forms of information to control and limit financing to companies (Qin et al., 2020). Based on the previous explanation, this paper aims to fill the existing gap by analyzing whether Indonesia's listed companies' cash holdings are affected by the global energy crisis and the role of goodwill and impairment of goodwill in moderating those effects.

A previous study investigated the effect of cash holdings on mitigating the negative risk posed by oil price uncertainty for all non-state-owned manufacturing companies listed on the China Stock Exchange from 2008 to 2018 (Wu et al., 2021). According to the study's findings, oil price uncertainty positively affects cash holdings. The company increases its cash holdings to mitigate the negative effects of oil price uncertainty by avoiding higher external funding costs that exceed internal ones due to the crisis.

H1: Ceteris paribus, the global energy crisis has a positive effect on the corporate cash holdings in Indonesia.

Qin et al. (2020), conducted research on the Shanghai and Shenzen stock exchanges from the first quarter of 2014 to 2020 regarding the pandemic's influence on cash holdings level within the company and the role of goodwill in moderating this effect. This study uses the difference in differences (DiD) method. The results of this study indicate that goodwill reduces COVID-19's impact on the increase in cash holdings. Where high goodwill identifies high business integration risks, this makes creditors limit their financing. Due to debt and scale constraints, businesses cannot increase their cash holdings beyond a certain point.

H2: Ceteris paribus, goodwill weekend the positive effects of the global energy crisis on the cash holdings of Indonesian corporations.

According to Li et al. (2011), goodwill impairment can serve as a primary indicator of future reduced profitability. Because goodwill impairment indicates that the benefits expected from the previous acquisition are overstated on the balance sheet. Also, this could happen if the synergies from previous acquisitions did not work out. Economic or industry factors that affect the business as a whole, a segment, or a reporting unit can also cause impairment.

Fu & Shen (2020), conducted research on Chinese companies from 2014 to 2020 regarding the effect of a pandemic on company performance with goodwill impairment as a moderating variable. This study uses the difference in differences (DiD) model. This study demonstrates that COVID negatively impacted a company's performance and that businesses with goodwill impairments perform worse.

Thus, compared to other companies, those with impaired goodwill face higher unique risk, and their performance will fluctuate more during a crisis. Qin et al. (2020), found that goodwill impairment was able to diminish the pandemic covid impact on the increase of cash holdings.

H3: Ceteris paribus, goodwill impairment weakens the positive effects of the global energy crisis on the cash holdings of Indonesian corporations.

RESEARCH METHOD

This study employs a quasi-experimental research design in a quantitative research methodology. The difference in differences (DiD) method is used to analyze the data. The DiD method is a strategy for modeling the role of pre-treatment outcomes. Since the crisis effects are generally distinctive, it is challenging to ensure that the sample distribution between the high and low-impact groups is completely random. Qin et al. (2020) make inquiries about the effects of the COVID-19 pandemic outbreak on listed companies in the Shanghai and Shenzhen stock exchanges using the DiD model. The results from the natural experiment serve as the exact foundation for the DiD model. The DiD model can successfully isolate the true impact of the crisis and control for ex-ante differences between research subjects (i.e., treated and control groups).

Sampling Method

All companies listed on the Indonesia Stock Exchange (IDX) between 2020 and 2022 were subjects of this study. There are 564 sample companies obtained through the purposive sampling technique.

Table 1. Research Sampling Criteria

No	Criteria	Total
1	Companies on Indonesia Stock Exchange 2020-2022	773
2	Companies delisting from Indonesia Stock Exchange 2020-2022	(65)
3	Companies that do not present financial balance sheets in Rupiah	(90)
4	Companies that present incomplete financial statement information	(54)
	Total Sample	564
	Total Sample data for 7 periods (564 x 7)	3,948

Source: Secondary data processed (2022)

It is assumed that the impact varies across industries depending on their unique characteristic. Based on several theoretical perspectives, eight industries are identified as seriously impacted industry. These include the oil, gas & coal industry, food & beverage industry, cigarettes industry, clothing & luxury goods industry, retail trade industry, pharmaceutical & health research industry, banks industry, and holding & investment industry. These eight industries are classified as a treatment group, while the remaining industries are classified as a control group. In addition, differences in performance are observed before and after the global energy crisis. Thus, the observation periods are classified quarterly into the period before and after the global energy crisis. The fourth quarter of 2020 to the fourth quarter of 2021, referred to as the "before" period, and the fourth quarter of 2021 to the second quarter of 2022, referred to as the "after" period.

Measurement

The variables in this study are measured using ratios and a dummy scale. This study's dependent variable is the cash holding level. The independent variables are time variables and group variables. This study's control (explanatory) variables are size, leverage, growth, return on assets, cash flow returns on assets, and net working capital. The moderating variables in this

study are goodwill and goodwill impairment. Table 2 presents the definitions and measurements of each variable.

Table 2. Variables Measurement

Variables	Equation	Sources
Dependent Variables		
Cash Holding	The corporate cash holdings level, measured by cash/operating income	Zhang et al. (2020) Ranajee & Pathak, (2019)
Independent Variables		
Treated	The dummy variable "global energy crisis impacted industries degree". If the company is in a serious impact industry, is set to 1, otherwise, it is set to 0.	
Period	The "global energy crisis time" dummy variable. If the global energy crisis occurs after the fourth quarter of 2021, the value is 1, otherwise, it is 0.	
Control Variables		
Size	The log of total assets	Hartono (2012:14)
Leverage	The debt ratio is calculated as the ratio of total assets to total liabilities.	Sudana (2015:23)
Grow	The difference between the company's current and previous operating incomes is used to calculate the operating income growth rate, which is then divided by the previous operating income.	Fu & Shen (2020)
Return on Asset	The company's profitability is determined by dividing net income by average total assets.	Sudana (2015:25)
Cash return on Asset	Cash from operating activities is divided by total assets.	Bhandari & Iyer (2013)
Net Working Capital	Also known as the company's liquidity level. Net working capital is determined by assets minus liabilities divided by total assets	Weidemann (2018)
Moderating Variables		
GW	Company goodwill, existence is 1, otherwise is 0. GWIM Company of goodwill impairment, existence is 1, otherwise is 0.	

Source: Previous research - processed

Hypothesis Testing Method
Since the global energy crisis has different levels of impact across industries, the difference-in-differences (DiD) model is employed to estimate the causal effect of the global energy crisis and corporate cash holding. The DiD model estimates treatment effects by comparing changes in outcomes over time between the treatment group (firms affected by the crisis) and a control group (firms not affected). Thereby, the DiD approach is suitable for measuring the effect of the global energy crisis on corporate cash holding because it accounts for pre-treatment outcomes and uses a control group as a counterfactual to estimate the impact more precisely.

Two main assumption tests are conducted before applying the DiD model. First, a unit root test is performed to ensure that the data are stationary. Following the method proposed by Levin, Lin, and Chu, the unit root test examines whether the statistical properties of the data remain constant over time. Stationary data are characterized by three criteria: The variance (covariance) between two-time series data only depends on the lag between the two time periods; the mean (average) and its variance are constant over time. Second, parallel trend test. It assumes that the treated and control groups followed similar trends in the dependent variable before the treatment period.

The Z statistical test is employed to test the research hypotheses. The tests are conducted using two multiple linear regression models, one without moderation and one with moderation. The following models are used in this study:

$$Cashholdings_{it} = \beta 0 + \beta 1 Treated_{it}.Period_{it} + \beta 2 Treated_{it} + \beta 3 Period_{it} + \beta 4 SIZE_{it} + \beta 5 LEV_{it} + \beta 6 GROWTH_{it} + \beta 7 ROA_{it} + \beta 8 CFTA_{it} + \beta 9 NWC_{it} + \varepsilon_{it} \quad (1)$$

$$Cashholdings_{it} = \beta 0 + \beta 1 GW.Treated_{it}.Period_{it} + \beta 2 Treated_{it}.Period_{it} + \beta 3 Treated_{it} + \beta 4 Period_{it} + \beta 5 GW_{it} + \beta 6 SIZE_{it} + \beta 7 LEV_{it} + \beta 8 GROW_{it} + \beta 9 ROA_{it} + \beta 10 CFTA_{it} + \beta 11 NWC_{it} + \varepsilon_{it} \quad (2)$$

$$Cashholdings_{it} = \beta 0 + \beta 1 GWIM.Treated_{it}.Period_{it} + \beta 2 Treated_{it}.Period_{it} + \beta 3 Treated_{it} + \beta 4 Period_{it} + \beta 5 GWIM_{it} + \beta 6 SIZE_{it} + \beta 7 LEV_{it} + \beta 8 GROW_{it} + \beta 9 ROA_{it} + \beta 10 CFTA_{it} + \beta 11 NWC_{it} + \varepsilon_{it} \quad (3)$$

Robustness Test Method
In this study, kernel propensity score matching (PSM) is employed as a robustness test. Two main assumptions must be satisfied before applying propensity score matching regression. First, the selection on observables assumption means that the treatment group characteristic is determined entirely by observable characteristics. Second, common support means that there are control individuals with similar characteristics to the treatment individuals. Thus, a weighting scheme is carried out in which estimates for each covariate (control variable) are formed using a parametric model, probit, or logit. The probit or logit regression yields a propensity score for each control and control individual. Subsequently, treated and control observations are matched based on their propensity scores. This matching procedure improves the quality of the comparison used to estimate the average treatment effect (ATE). Furthermore,

the statistical significance of the ATE is assessed using the Z test, with significance levels of 1%, 5%, and 10%.

RESULTS AND DISCUSSION

Result

Table 3 shows the descriptive statistical analysis test result. The variable cash holding has an average of 0.089 and a standard deviation of 0.118. This shows that the variation/distribution of the variable data at the level of cash ownership differs from the average. Meanwhile, the average (standard deviation) for size is 28.455 (1.961), which shows that the variation/distribution of the variable data is diverse from the average. The average (standard deviation) for leverage is 0.489927 (0.329262). This shows that the variation/distribution of the variable data is diverse from the average.

The average (standard deviation) for growth is 0.603711 (8.377061). This shows that the variation/distribution of the variable data is diverse from the average. The average (standard deviation) for return on assets is 0.011211 (0.080511), which shows that the variation/distribution of the variable data is diverse from the average. The average (standard deviation) for cash flow return on assets is 0.026575 (0.096778), which shows that the variation/distribution of the variable data is diverse from the average. The average (standard deviation) for net working capital is 0.310939 (0.37746). This shows that the variation/distribution of the variable data is diverse from the average.

Based on Table 3, the cash holdings level has a minimum value of 0.0000000108 and a maximum value of 0.968216. This minimum value shows that less than 1% of the company's assets are in cash, suggesting a high level of liquidity risk. The maximum value shows that 96% of some company assets are in the form of cash. It shows the high level of company liquidity.

Table 3. Descriptive Statistic Tests

Variable	N	Mean	Std. Deviation	Minimum	Maximum
Cash holding	3,948	0.089249	0.118994	1.08E-07	0.968216
Size	3,948	28.45518	1.961241	22.57565	35.11859
Leverage	3,948	0.489927	0.329262	8.00E-06	3.138601
Growth	3,948	0.603711	8.377061	-22.2462	298.1355
Return on Asset	3,948	0.011211	0.080511	-1.04252	1.932827
Cash return on asset	3,948	0.026575	0.096778	-0.66639	1.928885
Net Working Capital	3,948	0.310939	0.37746	-2.86442	0.994987
Goodwill	3,948	0.247214	0.431447	0	1
Goodwill Impairment	3,948	0.018744	0.135636	0	1

Source: Secondary data processed (2022)

Assumption Test

The unit rooting test results using the Levin, Lin, and Chu model are presented in Table 4. It demonstrates that research variables remain stable below 1%. As a result, every variable is stationary. This indicates that the data already has a constant variance and mean (average) value over time, and that the covariance between two time series only depends on the time lag between the two periods.

Table 4. Levin, Lin & Chu Unit Rooting Test

Variable	Levin, Lin & Chu	Stationary
Cash holding	-82,3975***	Stable
Size	-61,8254***	Stable
Leverage	-8,1e+02***	Stable
Growth	-67,7755***	Stable
Return on Asset	-46,8779***	Stable
Cf return on asset	-53,1195***	Stable
Net Working Capital	-53,2395***	Stable

** p<10%, ** p<5%, and *** p<1%.*

Source: Secondary data processed (2022)

Figure 2 shows the graphic results of the linear trend test. It can be seen that the treatment and control groups before the treatment period (from the 4th quarter of 2020 until the beginning of the global energy crisis, the 4th quarter of 2021) show similar trends, and the trend changed drastically after receiving treatment (after the 4th quarter of 2021). That means, this model passed the linear trend test Hence, the difference in differences estimation model is suitable for our analysis.

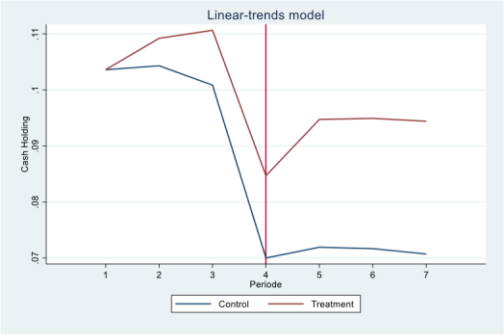


Figure 2. Parallel trend test

Source: Secondary data processed (2022)

Hypotheses Tests

After passing all the assumptions, we estimate the difference-in-differences model using regression and report the results in Table 5. There are 3 columns, and each column shows the

result of the regression models using models 1, 2, and 3 which have been mentioned before in the research method section.

Table 5. The Regression Result

	1	2	3
	Base	Goodwill	Goodwill Impairment
*Treated*Period*	0.0158**	0.0155**	0.0159**
	2.39	1.93	2.38
*GW*Treated*Period*		0.0009	
		0.09	
*GWIM*Treated*Period*			-0.0059
			-0.55
Goodwill		-0.0012	
		-0.09	
Goodwill Impairment			0.0004
			0.07
Treat	-0.2914**	-0.2909**	-0.2916*
	(-2.01)	(-2.02)	(-1.9)
Period	-0.005***	-0.005***	-0.005***
	(-3.7)	(-3.68)	(-4.24)
Size	0.0049	0.005	-0.0313*
	(-0.35)	(0.4)	(-1.88)
Leverage	-0.0313**	-0.0314*	0.0049
	(-2.2)	(-1.77)	(0.31)
Growth	0.0001	0.0001	-0.0585***
	(-0.26)	(0.24)	(-5.16)
Return on Asset	0.0105	0.0105	0.0104
	(-0.82)	(0.67)	(0.72)
Cash return on asset	0.0924***	0.0924***	0.0924***
	(-3.79)	(3.39)	(4.28)
Net Working Capital	-0.0585***	-0.0585***	0.0001
	(-4.86)	(-4.76)	(0.2)
Constant	0.2322	0.2295	0.2334
	(-0.56)	(-0.59)	(-0.61)
Adjusted - R2	0.8714	0.8714	0.8714

In parentheses, a Z-statistic is mentioned. *, **, and *** signify significance levels of 10%, 5%, and 1%, respectively.

Source: Secondary data processed (2022)

Table 5, column 1, reports the effect of the global energy crisis on corporate cash holdings without any moderation. The β1 (Treated*Period) coefficient is the value of the difference in differences estimate. The value of β1 is 0.0158, which is significant at the 0.05 level. It indicates that every company in the treatment group has higher cash holdings than companies in the control group after the global energy crisis. This result supports the first research hypothesis.

Table 5 column 2, reports the result of the goodwill on moderating the global energy crisis effect on corporate cash holding. The coefficient β1(GW*Treated*Period) is the estimated moderating effect of goodwill. The value of the regression coefficient β1 is 0.0009. However, because the p-value exceeded 10%, this result is not statistically significant. It suggests that form-level cash holdings are not diminished by the global energy crisis due to goodwill. This result does not support the study's second hypothesis.

Table 5, column 3, reports the result of the impairment of goodwill on moderating the global energy crisis effect on corporate cash holdings. The β1 (GWIM*Treated*Period) is the value of the estimated moderating effect of the impairment of goodwill. The β1 is -0.0059. However, because the p-value exceeded 10%, this result is not statistically significant. It indicates that the effect of the global energy crisis on form-level cash holding is not diminished by goodwill impairment. This result does not support the study's second hypothesis.

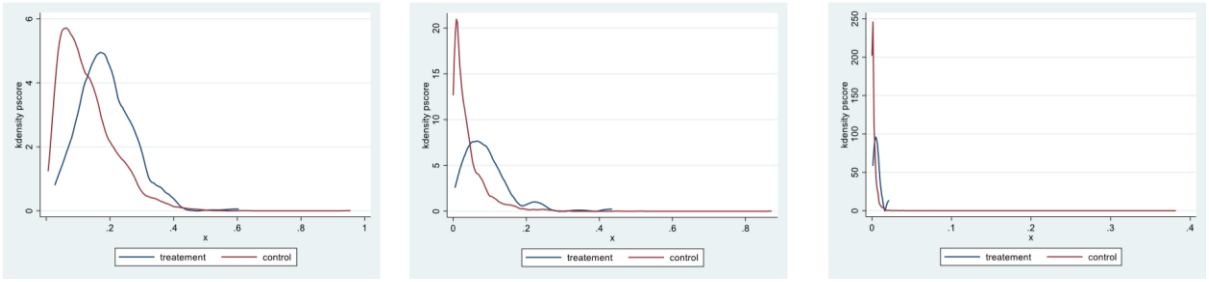
Robustness Test

Assumption 1: Selection on observables. Since the treatment group must be compared to the control group on the observed covariates (control variables), the control variable that describes the treatment variable's characteristics must be observable.

Table 6. Pseudo R^2 value of co-variate probit regression

Variable	1 - base	2 - GW	3 - GWIM
Pseudo-R^2	0,0785	0,1262	0,0938

Source: Secondary data processed (2022)



K-density 3. model graph 1 *K-density model graph 2* *K-density model graph 3*

Figure 3. Score Matching Graph
Source: Secondary data processed (2022)

The probit regression results are presented in Table 6, which reveals that the pseudo-R2 values for models 1, 2, and 3 were 7%, 12%, and 9%, respectively. This means that if the control variable is included in the regression model, the impact is only 7%, 12%, and 9% higher than the regression model without a control variable. It indicates that the character of the control variable for the treatment group in this study is not fully observable. Thus, the first assumption was rejected.

Assumption 2, common support, where the k-density value between the treatment group and the non-treatment group overlaps. The common support area represents the similarity of

characteristics between the 2 groups based on the similarity of the distributions of the propensity values, that the model is suitable or matched based on the trend score.

Table 7. Kernel-Propensity Score Matching Regression Result

Variable	1 - Base	2 - GW	3 - GWIM
*Treated*Period*	0,0002257		
	(0,964)		
*GW*Treated*Period*		0,0104834 (1,42)	
*GWIM*Treated*Period*			0,0115181
			(0,41)
Size	0,1279***	0,1780***	0,1204***
	(9,45)	(9,02)	(2,21)
Leverage	-0,2502**	-0,1951***	-0,3498
	(-2,55)	(-1,39)	(-0,94)
Growth	0,0013	-0,0074	0,0008
	(0,46)	(-0,41)	(-,0,04)
Return on Asset	0,8824***	1,3846***	-16,468
	(2,57)	3,04	(-1,23)
Cash return on asset	-0,4156	-1.1555	0,7840
	(-1,38)	(-2,32)	(-0,04)
Net Working Capital	-0,9398***	-1,035***	-0,8009***
	(-11,08)	(-8,07)	(-2,83)
Constant	-4,4161***	-6,5717***	-5,9782
	(-11,59)	(-11,6)	(-3,82)
R^2	0,0785	0,1262	0,0938

In parentheses, a Z-statistic is mentioned. *, **, and *** signify significance levels of 10%, 5%, and 1%, respectively.

Source: Secondary data processed (2022)

Figure 3 shows an overlap between the k-density probability scores for the treatment and control groups. This indicates that there are control individuals with characteristics similar to those of each. Thus, assumption 2 is accepted. However, because assumption 1 is rejected, the results of the probability score matching are likely to be biased.

Based on Table 7 column (1), the Treated*Period value is 0.000225672 and has a significance level greater than 10%. The results are not significant. This indicates that the global energy crisis does not affect Indonesia's corporate cash holdings. These results are inconsistent with the hypothesis test, which states that the energy crisis has a positive effect on cash holding level. However, this result is also biased because during the first assumption test (selection on observables), the pseudo-R2 value is only 7%, which means the first assumption test is rejected. Therefore, the use of the PSM model as a robustness test is not effective, and the results cannot be considered reliable.

Based on Table 7 column (2), the GW*Treated*Period value is 0.010483 with a significance value greater than 0.1, indicating that the results are not significant. This reveals that goodwill does not moderate the global energy crisis's effect on the increase in sensitive corporate cash holdings. These results are consistent with the model 2 hypothesis test. However, these results are also biased because during the first assumption test (selection on observables), the pseudo-R2 value is only 12%, which means the first assumption test is rejected. Therefore, the PSM model does not provide strong robustness evidence, and the results should be interpreted with caution.

Based on Table 7, column (3), the GWIM*Treated*Period value is 0.0115 with a significance value greater than 0.1, indicating that the results are not significant. This suggests that goodwill impairment does not moderate the effect of the global energy crisis on the increase in sensitive corporate cash holdings. These results are consistent with the hypothesis test in Model 3 and support the findings of Model 3. However, these results are also biased because during the first assumption test (selection on observables), the pseudo-R2 value is only 9%, which means the first assumption test is rejected. Therefore, using the PSM model as a robustness test is not effective, and the results cannot be considered reliable.

Discussion

The global energy crisis affects the level of cash holdings

Based on Table 5, column (1), the Treated* Period value is positive at 0.0158. With a significance level of less than 0.05, these findings are significant. This indicates that the global energy crisis has led companies in the treatment group to hold more cash compared to companies in the control group. However, this result is not supported by the robustness test conducted using the PSM method. The PSM results show that the coefficient of the treatment effects is positive at 0.000225672, with a significance value greater than 0.1, indicating that the results is not statistically significant. Nevertheless, the PSM results are not considered in strengthening the model because they do not pass the first assumption test (selection on observables). Therefore, the findings of this study suggest that the global energy crisis has a positive impact on corporate cash holdings. Thus, the results support the first hypothesis of this study.

The results of this test are consistent with the precautionary motive theory of cash holding proposed by Keynes (1936), which stated that companies need to maintain a certain level of cash to deal with emergencies and ensure the continuity of their operations. Industries such as food & beverage, clothing & luxury goods, retail trade, pharmaceutical & health research typically increase their cash holdings in response to the global energy crisis to reduce the risk of rising operating costs and declining consumer purchasing power due to inflation. The results of this study are supported by Qin et al. (2020), who find that the pandemic had a significant positive effect on corporate cash holdings. Firms in China tended to increase their cash holdings as a precaution to mitigate the potential economic impacts of the pandemic. Furthermore, several studies have confirmed that the increases in corporate cash holdings are under precautionary motives (Honda & Uesugi, 2022)

The increase in production operating costs in the food and beverage sector due to rising cooking oil prices and other food prices has encouraged firms in this industry to increase their cash holdings to ensure the continuity of their operations. These findings are supported by

Zhang et al. (2020), whose study shows that cash holdings increase as oil price uncertainty rises. In addition, Wu et al. (2021) find a positive correlation between cash holdings and exposure to oil price uncertainty, indicating that firms tend to increase cash holdings as a hedge against rising oil prices. Furthermore, several recent studies have also supported the positive effect of oil price uncertainty on company cash holdings. (Bugshan, 2022; Alomran & Alsubaiei, 2022)

The results of this test are also consistent with the transaction motives of of money demand proposed by Keynes (1936), which stated that the company's cash holdings are driven by the need for cash for current business and exchange transactions. Thus, in the company's operational process, firms require additional cash to manage or purchase raw materials and equipment, pay wages, and cover increases in other utility costs from higher production or sales. Consequently, the companies experienced sales due to higher market demand during the energy crisis, and companies engaged in the energy sector tend to increase their cash holdings. This finding is in line with Jamil et al. (2016), who state that the drivers of cash holdings for Pakistani companies may be explained by transaction motives.

This result is also consistent with the transaction cost theory proposed by Coase (1937). According to this theory, companies' non-operational costs are related to the coordination, control, and management of transactions. These costs include expenses related to negotiating and renegotiating contracts, as well as costs for contract enforcement. During the global energy crisis, uncertainty about economic policies across countries also increased. This situation triggered global uncertainty, which could generate transaction costs beyond normal operational costs. Consequently, companies that depend on imports, such as those in the pharmaceutical & health sector, and clothing & luxury goods sectors, may experience changes in contracts or negotiations with external parties. As a result, companies in these sectors may increase their cash holdings level.

The finding is in line with the theory of money as an asset approach proposed by Tobin (1958), which explains that money is held as an asset to maintain liquidity within a wealth portfolio, as other investment assets tend to be associated with market volatility. Therefore, companies operating in the banking sector and holding & investment companies tend to increase their cash holdings as a form of liquidity preference amid global uncertainty. This finding is supported by Tran (2019), who finds that a culture of avoiding uncertainty positively affects the company's cash holdings.

The role of goodwill in moderating the global energy crisis effect on corporate cash holdings

Based on Table 5, column (2), the GW*Treated*Period is positive at 0.0008665. However, with a significance level greater than 0.05, these findings are not significant. This indicates that goodwill does not moderate the effect of the global energy crisis on the level of cash holdings. A robustness test using the PSM method shows that the coefficient of the treatment effect value was 0.000225672, with a significance level greater than 0.05, so the results were not statistically significant. Therefore, it can be deduced that the global energy crisis's positive effect on corporate cash holdings is not moderated by goodwill. As a result, the study's second hypothesis is rejected.

Goodwill refers to the acquirer's overpayment above the fair value of the acquired company's net assets. According to a lot of literature, a company's goodwill poses a risk, particularly when mergers and acquisitions fail to generate the expected synergies. This has an impact on the assessment of creditors or banks related to financing, which can reduce the level of company cash holdings. However, in this study, goodwill was found not to affect corporate cash holding because the significance value of the goodwill variable is greater than 0.05.

Based on signaling theory, companies with higher goodwill tend to show an overvaluation of business combination activities, which could indicate risks associated with mergers and acquisitions to banks or other creditors. However, this study's findings indicate that cash holding is unaffected by the goodwill variable. Thus, the signal theory cannot be supported by this result. This may occur because goodwill is not necessarily perceived as a negative signal by investors or creditors. This statement is in line with Lee (2011), who finds that, contrary to the general view based on the opportunistic reporting hypothesis, discretionary reporting caused by SFAS 142 was not used opportunistically.

According to Aprila & Budhidharma (2022), the positive impact of the COVID-19 pandemic on corporate cash holdings is not diminished by goodwill, which is consistent with the findings of this study. The authors explain that only a limited number of Indonesian companies have engaged in business combinations that generate goodwill. As a result, the analysis shows that goodwill moderation does not weaken the positive influence of the COVID-19 pandemic on the level of corporate cash holdings in Indonesia.

However, this study's findings are not aligned with previous research conducted by Qin et al. (2020), which asserts that the positive effect of COVID-19 on the level of corporate cash holdings is weakened by goodwill. The authors explain that high goodwill indicates a high risk of business integration following mergers and acquisitions. This risk may ultimately reduce corporate cash holdings and lead banks or other creditors to limit the provision of credit financing.

The role of goodwill impairment in moderating the global energy crisis effect on cash holdings

Based on Table 5, column (3), the value of GWIM* Treated * Period is positive at 0.0058962. However, with a significance level greater than 0.05, these findings are not significant. This indicates that goodwill impairment does not moderate the global energy crisis's effect on cash holding. This finding is further strengthened by a robustness test using the PSM method, which showed that the treatment effect coefficient is 0.0115 with a significance value greater than 0.1, indicating that the result is also not statistically significant. Therefore, it can be deduced that the global energy crisis's positive effect on corporate cash holdings is not moderated by goodwill impairment. As a result, this study's third hypothesis is rejected.

Goodwill impairment refers to an adjustment to the carrying amount of goodwill by reducing its value due to several reasons, such as an overestimated acquisition or adverse macroeconomic conditions. Based on the signaling theory, Spence (1973), information asymmetry exists between internal and external parties, where only management (internal party) possesses detailed information regarding the condition and prospects of the company. Management may hide information about various factors behind the decrease in goodwill to maintain the company's value. However, a decline in goodwill value is often considered a main indicator of failed synergies in a business combination that causes investors or creditors to limit

their credit. Thus, cash holdings owned by companies that experience goodwill impairment are predicted to decrease due to financing constraints. However, this study finds that goodwill impairment did not affect the company's cash holdings, as the significance value of the goodwill variable is greater than 0.05.

This can occur because information on the value of goodwill impairment is considered less relevant to business analysts (investors, banks, or creditors). This assertion is supported by Schatt et al. (2016), who concluded that the goodwill impairment is often viewed as ineffective due to the fact that users cannot rely on accounting figures or additional information provided by management in impairment test notes. Instead, users tend to adjust their expectations based on publicly available information. Additionally, several studies demonstrate that avoiding goodwill impairment has long-lasting effects on a company's future performance and stock price (Han & Tang, 2020). Thereby, investors and creditors may not necessarily restrict credit as a result of goodwill impairment. As a result, the crisis's impact on company cash holdings is not affected by the impairment of goodwill.

However, this study's findings do not align with previous research conducted by Qin et al., (2020), which asserts that the effect of COVID-19 on the level of corporate cash holdings is weakened by goodwill impairment. The author explain that goodwill impairment serves as a warning signal that the company's profitability may decline in the future. Consequently, creditors may restrict their credit provision, which could ultimately reduce the company's cash holdings.

CONCLUSIONS

This paper examines the causal effect of the global energy crisis on the level of cash holding in Indonesian companies, given the limited research on cash holdings that examines the effect of the global energy crisis and research conducted in a developing country. This study compares two types of firms, those that are seriously affected and those that are not seriously affected-to determine whether corporate cash holdings are influenced by the global energy crisis. The results find that the global energy crisis has a positive effect on corporate cash holdings. However, goodwill and the impairment of goodwill, as indicators of corporate risk related to the synergy of business combinations, were found not to moderate this effect.

This paper contributes to cash holding literature by providing information and bridging the gap between various crisis impacts on cash holding. This research also offers several implications. First, the findings provide useful information for the government regarding the different levels of exposure between seriously and not seriously impacted industries caused by a global energy crisis on cash holding. This information may help policymakers formulate better financing and macroeconomic policies. Second, investors may use the study's findings to make more informed decisions when diversifying their portfolios, particularly in relation to the liquidity risk faced by firms across different industries.

This paper has several limitations. First, the study uses a limited number of control variables. The analysis mainly focuses on how the global energy crisis affects cash holdings However, since cash holdings are influenced by many other variables (factors), the regression

model should include a broader set of explanatory variables. Only a limited number of variables were included due to constraints in the existing literature. Second, the model's robustness cannot be assessed using the kernel propensity score matching. Thus, suggestions for further research are expected to include additional control variables, apply alternative robustness tests, and increase the observation period until the global energy crisis has fully subsided.

List of Abbreviations

USA: United States of America, GW: Goodwill, GWIM: Goodwill Impairment, PSM: Propensity Score Matching.

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Availability of Data and Materials

The datasets are available from icdx.co.id, idx.co.id, and Yahoo Finance.

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