Article Type: Research Paper

Market share and efficiency: Causality test in Indonesian general insurance industry

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Abstract: This study aims to analyze the relationship between market share and technical efficiency in the Indonesian general insurance industry. The data for the period 2010-2020 is used, which was obtained from the Indonesian Financial Services Authority (OJK). The results show that efficient companies emerged from the category of industry possessing comparatively higher and lower market shares. Furthermore, the panel Granger-causality test indicates a one-way direction of causality, where only the market share has an impact on the technical efficiency score. The panel regression using the Feasible Generalized Least Square (FGLS) model shows that market share has a negative impact on technical efficiency scores. Other variables, such as the age of the industry, merger, and acquisition are listed in the stock exchange and do not have a significant effect on the efficiency score. Based on the aforementioned findings, it can be inferred that the quiet-life hypothesis is applicable within the Indonesian general insurance sector. Consequently, the government must foster competition among the businesses operating within the industry.

Keywords: General Insurance Industry; Market Share; Technical Efficiency; Causality Analysis
JEL Classification: L1; L8; C4

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THIS ARTICLE IS AVALILABLE IN:
http://journal.umy.ac.id/index.php/esp

DOI: 10.18196/jesp.v24i1.17092

CITATION:
Jamil, I. R., & Setiawan, M. (2023). Market share and efficiency: Causality test in indonesian general insurance industry. *Jurnal Ekonomi & Studi Pembangunan, 24*(1), 144-163.

ARTICLE HISTORY
Received:
05 Mar 2023
Revised:
05 Apr 2023
20 Apr 2023
08 May 2023
Accepted:
16 May 2023

Introduction

Risk and uncertainty are pervasive factors that impose substantial challenges on individuals, households, and governments. One viable approach to mitigating these risks is through the utilization of insurance services (Sinha & Dionne, 2001). Since risk and uncertainty continue to escalate at both national and global levels, the role of the insurance industry is becoming increasingly crucial. This is evidenced by the growth of the Non-Bank Financial Institutions (NBFI) sector driven by an increase in the insurance industry (FSB, 2020). Therefore, the role played by the insurance industry becomes crucial in mitigating risks and uncertainties in various domains, providing essential protection and stability for individuals, households, and governments (OJK, 2020).

The general insurance industry has emerged as a thriving sector that consistently shows growth. From 2010 to 2020, the gross premiums within the industry have continuously expanded, reflecting an upward trajectory. Simultaneously, the total assets in the general insurance sector have exhibited a positive trend during the same period (OJK, 2010, 2015, 2021).

However, the industry has relatively slow growth with a negative trend, and from 2010 to 2020, the number decreased by an average of 1.2% annually. This condition indicates that there are barriers to entry into the market, serving as characteristics of concentrated industry (Martin, 1979). Meanwhile, high market concentration can affect efficiency and welfare (Indiastuti & Setiawan, 2020). This can be proven by the relatively low-efficiency value of Indonesian insurance (Eling & Luhnen, 2010a), which has a low penetration in the economy compared to other Asian countries (OECD, 2016). In contrast, the declining trend in the number of players may signify that only efficient industry capable of acquiring market share and generating profits can be sustained (Esteve-Pérez & Mañez-Castillejo, 2008; Foster et al., 2008). These two competing explanations must be examined to determine the true underlying cause for the trend phenomenon.

Theoretically, two hypotheses can explain the relationship between industry's dominance based on their market share and efficiency. The first hypothesis is the quite-life (QL) proposed by Hicks (1935), where an industry in a monopoly condition will be free from competition and have low incentives in optimizing its efficiency (Setiawan et al., 2012; Alshammari et al., 2019). Another hypothesis, namely the efficient structure (ES) proposed by Demsetz (1973), stated that industry with high efficiency could produce at low costs for increased profit and a higher degree of concentration.

Most studies conducted in the insurance industry indirectly test the ES and QL hypotheses. There was a study that compared the ES and Structure-Conduct-Performance (SCP) hypotheses, where the SCP hypothesis stated that market structure can affect performance through industry behavior (Mason, 1939; Bain, 1951). This was shown by Alhassan et al. (2015), where the ES hypothesis was applied to both life and general insurance in Ghana.

Besides the proof between the ES and SCP, some studies tested these two hypotheses with Relative Market Power (RMP) hypothesis. RMP was developed by Shepherd (1983), where market share was directly proportional to market power and accompanied by an increase in prices and profits. Therefore, under certain conditions, the RMP and QL hypotheses can be similar (Alshammari et al., 2019). The study on the property insurance industry conducted by Choi & Weiss (2005) showed a negative relationship between market share and price and profit, hence, the ES hypothesis was applied to the studied industry. On the other hand, Weiss & Choi (2008) found that in the automotive insurance industry, the SCP hypothesis did not apply because market concentration was not positively related to price. The RMP hypothesis did not hold for states with stringent pricing policies but was only applicable solely to those with a high competitive spirit. Alhassan & Biekpe (2016) found a positive influence between competition and efficiency in the general insurance industry in South Africa. These findings indicated that competition was directly proportional to the efficiency scores of the industry. Meanwhile, when the variable was lower, the efficiency also decreased, and QL hypothesis was considered to be valid. A similar result was also reported by Alshammari et al. (2019) on

the takaful industry in the Gulf Cooperation Council[1], where the positive relationship between competition and efficiency showed that the QL hypothesis was applied.

This study has two objectives, first, to measure the market share value and the efficiency score of general insurance industry in Indonesia. Even though the Concentration Ratio (CR_N) or Herfindahl-Hirschman Index (HHI) are typically used to assess the overall market structure, this study employs market share of individual industry as a proxy for competition. The choice is made by the CR_n and HHI methods due to the limitations to measure the overall market structure (Pepall et al., 2014). This study focuses on conducting a detailed analysis at the industry level, hence, the utilization of market share is more appropriate for the study design. Furthermore, the variable is calculated by determining the share concerning the total assets. This approach aligns with mainstream practices in the financial industry, and the efficiency score is measured using Data Envelopment Analysis (DEA). This method enables the assessment of relative efficiency scores for observed groups by employing the concept of a production frontier. DEA also possesses the advantage of describing the structure of the production frontier and providing insightful information based on the economic background (Quanling, 2001). This study also aims to fill the gap in testing the evidence of QL and ES hypotheses in the Indonesian general insurance industry. Previously, Abidin et al. (2022) only performed efficiency calculations in 2017 and 2018, while Abidin & Cabanda (2011) calculated the efficiency of the non-life insurance industry and also interacted with several variables without the inclusion of concentration or competition variables. The previous results did not provide a definitive understanding of the relationship between efficiency and an increase in market share, or the potential implications of the variables. Therefore, there is a need to have a direct test between market share and efficiency to determine the applied hypotheses between QL and ES. It can generate more appropriate policy implications for developing the industry by testing the applicability of ES or QL hypotheses (Setiawan et al., 2012).

Research Method

Data

This study utilizes panel data from industry operating in the general insurance sector from 2010 to 2020. The data used for calculating market share and conducting DEA are obtained from the Insurance Statistics report published by the Indonesian Financial Services Authority (OJK). To avoid a possibility of bias from inflation, all nominal variables are deflated using the GDP deflator with the base year 2010 sourced from the Central Statistics Agency (BPS). This study also uses age and dummy merger & acquisition variables obtained from the industry's official website and OJK insurance directory. The dummy variable listed on the Indonesian stock exchange (IDX) is sourced from the IDX

[1] The Gulf Cooperation Council is an economic and political alliance of Middle Eastern countries.

website[2]. The more detailed information on data used in this study can be seen in Table 1.

Table 1 Definition and Source of the Variables

Variable Name	Definition	Sources
Operational Cost	The amount of Rupiah spends by industry to run its business activity.	Indonesian Financial Service Authority (OJK)
Equity	The sum of rupiah disbursed to the shareholders provided that the entirety of the industry's assets has been liquidated and all liabilities have been duly settled.	Indonesian Financial Service Authority (OJK)
Technical Reserves	The amount of rupiah is reserved to pay underwriting liabilities.	Indonesian Financial Service Authority (OJK)
Net Claims	The amount of Rupiah for unpaid claims at the end of the year is added to the claims paid in the current year, less outstanding claims at the beginning of the year, after deducting claims paid by reinsurance.	Indonesian Financial Service Authority (OJK)
Investment Income	The amount of income generated by investment instruments, such as stock, bonds, and other securities.	Indonesian Financial Service Authority (OJK)
Assets	The value of assets, property, contracts, and things owned by the industry, especially those used for business operations, including receivables and prepaid expenses.	Indonesian Financial Service Authority (OJK)
Industry Age	The age of the industry from the year of establishment to the year of observation.	Indonesian Financial Service Authority (OJK) and Industry Official Website
Merger & Acquisition	A dummy variable that indicates whether the industry was merged or not, "0", not merged or acquired, "1" when it experienced one time in the observation period, "2" when it experienced twice in the observation period.	Industry Official Website
Listed	A dummy variable that indicates whether the industry is listed on the Indonesian stock exchange (IDX) or not, "0" when it is not listed on IDX, "1" when listed on IDX.	Indonesian Stock Exchange (IDX)

Methodologies

This study employed the methodological approach utilized by Setiawan et al. (2012), which aimed to examine the evidence supporting the QL or ES hypothesis within the industry. This approach comprises four stages of analysis, where the market share of insurance industry is calculated. Subsequently, technical efficiency is measured using Data Envelopment Analysis (DEA), and in the next approach, this study employs the Granger-

[2] Data listed on the stock exchange can be accessed on the old Indonesia Stock Exchange. www.idx.co.id/perusahaan-tercatat/profil-perusahaan-tercatat/

Causality test to investigate the causal relationship between the variables. Panel regression is conducted to estimate the direction of the relationship between the two variables, based on the outcomes of the Granger Causality test.

Market Share Calculation

In general, market share is the actual part of sales, both in terms of quantity and value of the company's money to the entire market (Cooper & Nakanishi, 2010). In the insurance industry, it can be calculated through the number of assets conducted by (Cummins et al. (1999) or through gross premiums accomplished by Ansah-Adu et al. (2011) and (Alhassan et al. (2015). In this study, the market share calculation is conducted by comparing the assets with the total of the insurance industry in Indonesia.

Efficiency Measurement

The efficiency measurements are carried out to determine the industry's performance compared to others. The method often used to measure efficiency in the insurance industry is DEA (Luhnen, 2009). Meanwhile, DEA is a non-parametric approach that uses linear programming to measure efficiency values based on the optimization of the combination of inputs to outputs (Eling & Luhnen, 2010b). Each input-output combination of each Decisions Making Units (DMU)[3] is compared with the most efficient unit of analysis and a value is obtained between 0 to 1. Meanwhile, when the unit obtains 1 then the value is stated to be efficient, and further away from the number means an inefficient value.

DEA approach has several advantages to be applied in this study, and according to (Cooper et al. (2011), it is a very flexible method used to evaluate efficiency in various contexts across many countries. The application model is relatively more convenient due to it only requires a few assumptions. DEA also offers the possibility to use multiple inputs and outputs, which becomes a constraint for other methods because of the complexity to explain the relationship between these variables (Cooper et al., 2011). However, it has a drawback, where this method required all variables to have a positive value and should not have a missing value (Joseph, 2002). To satisfy these requirements, this study applied some adjustments. According to Alhassan & Biekpe (2016), the data were adjusted by adding a certain constant value due to the positive result obtained. Meanwhile, there were limited alternatives to overcome the missing value, and DMU with incomplete data was eliminated.

The DEA model had two assumptions, Charnes et al. (1978) proposed the assumption of Constant Return to Scale (CRS), while Banker et al. (1984) introduced the assumption of Variable Return to Scale (VRS). The CRS assumption is valid only when each DMU operates at an optimal level but factors such as imperfect competition in markets can hinder optimal operation (Casu & Molyneux, 2003). Therefore, this study employs the VRS assumption, since it acknowledges the possibility that DMUs can operate at a sub-optimal

[3] In this study, the DMU in question is an insurance company in Indonesia.

scale Diacon et al. (2002). It seeks to determine the technical efficiency of insurance industry in the form of the ability to maximize output from certain inputs (*output-oriented*) (Setiawan et al., 2012). This is motivated by the assumption that there is a completion between the listed businesses (Barros et al., 2005). As a result, the industry competes to maximize its output, and the DEA-VRS model is denoted by the following equation:

$max_{\theta,\lambda}\, \phi, \lambda$ s.t.
$-\phi q_i + Q\lambda \geq 0,$
$x_i - X\lambda \geq 0,$
$l1'\lambda = 1,$
$\lambda \geq 0,$

Where, ϕ represents technical efficiency (Farrell, 1957) with $1 \leq \phi \leq \infty$ and $\phi - 1$ is a proportional increase in the output of industries i with a constant quantity of inputs. Meanwhile, the efficiency score is denoted by $1/\phi$ whose value varies from 0 to 1 (Coelli et al., 2005).

Input Choice

Studies related to efficiency using DEA have three choices of input factors, namely labor, business service, and capital. However, there are limited data on labor and business services for the insurance industry. Cummins et al. (1999) and Luhnen (2009) also proxied the two inputs by the operating costs divided by the average wage in the sector. This was not conducted due to the limited availability of data on average wages in the insurance sector. In this study, operational costs were used as a proxy for labor and business services according to Diacon et al. (2002), Ansah-Adu et al. (2011), and Alhassan et al. (2015). Meanwhile, capital input is separated into two categories, namely debt and equity capital. Luhnen (2009) proxied equity capital by equity, and technical reserves were used to represent the debt capital, according to by Alhassan et al. (2015) and Alshammari et al. (2019).

Output Choice

There are three principal approaches in selecting output in the financial services industry, namely asset (intermediation), user cost, and value-added. However, the value-added approach is commonly used in the literature because of its suitability for use in measuring efficiency (Cummins & Weiss, 2000). Based on this approach, there is an assumption that insurance industry will provide three main services, including (a) risk pooling and bearing, (b) financial services related to insured losses, and (c) intermediation. The first two types of services are proxied by net claims according to Luhnen (2009), even though there are other alternatives, by using premium as the proxy. The premium cannot represent the output because it is the value of quantity times price (Yuengert, 1993). The output of intermediation services is proxied by investment income as stated by Diacon et al. (2002), Klumpes (2007), and Alhassan & Biekpe (2016).

The selected variables (both for input and output) for DEA estimation are informed in Table 2.

Table 2 List of Input and Output Variables for DEA

Input	Output
Operational Cost	Net Claims
Equity	Investment Income
Technical Reserves	

Technical Efficiency-Industry Market Share

To investigate the correlation between market share and technical efficiency and to determine whether the QL or the ES hypotheses apply to the insurance industry, the study employs a panel Granger-causality test. The regression model used is based on the study of Setiawan et al. (2012), with the following equation.

$$TE_{it} = \alpha_j + \sum_{K=1}^{K} \beta_K TE_{it-K} + \sum_{K=1}^{K} \gamma_K MS_{it-K} + v_{it}$$

$$MS_{it} = \lambda_j + \sum_{K=1}^{K} \alpha_K TE_{it-K} + \sum_{K=1}^{K} \delta_K MS_{it-K} + \varepsilon_{it}$$

Where the TE and MS variables are the technical efficiency and market share of the insurance industry. The variables will be transformed into log form to ensure that TE remains in the range of 0 and 1 even though MS has increased. Since panel data are used, panel VAR specification and moment condition should be noted to obtain optimal lag order in the VAR estimation. MMSC, proposed by (Andrews & Lu, 2001), can be applied to show various commonly-used maximum likelihood-based model-selection criteria, such as the Akaike information criteria (AIC), the Bayesian information criteria (BIC), and the Hannan-Quinn information criteria (HQIC) (Abrigo & Love, 2016). By conducting this test, this study aims to identify which theory, either QL or ES hypothesis, is more applicable. Subsequently, a panel regression analysis is performed based on the outcomes of the panel Granger-causality test.

$$y_{jt} = a_i + \beta x'_{it} + \beta z_{it} + u_{it}$$

The variables x and y are determined by the results of the panel Granger-causality test. The variables y and x are market share and efficiency when the ES hypothesis holds. On the other hand, y and x denote efficiency and industrial concentration when the QL hypothesis holds. There is also z as a representation of several control variables used in the model. The selection of these control variables is very dependent on the results of the panel Granger-causality test. For example, based on the study of Alhassan et al. (2015), when the ES hypothesis applies, the control used includes total assets, the ratio of losses to premiums obtained, the ratio of debt to assets, the growth rate of GDP, and the inflation rate. Based on Alhassan & Biekpe (2016), when the QL hypothesis applies, the control variables used are diversification, total assets, age, claims to premium ratio, reinsurance to premium ratio, and debt to equity ratio. However, the selection of control

variables used will be readjusted based on the literature and the availability of data used. The panel data analysis has three possible models, namely Pooled Ordinary Least Squared (Pooled OLS) Model, Fixed-Effect Model (FEM), and Random-Effect Model (REM). The Pooled OLS model is applied by conducting regression without concern for cross-section and time-series elements on the data (Gujarati & Porter, 2009). The estimation from Pooled OLS model also faces bias and inconsistency caused by the unobservable constant variables. Therefore, FEM and REM can be used to solve these problems.

FEM overcomes the unobserved variable problem by incorporating time-demeaned data into the equation to remove the unobserved constant variable from the model. Furthermore, REM overcame a similar problem by assuming that the unobserved constant variables were not correlated at all with any explanatory variables in the model (Wooldridge, 2013). To determine the best model between the variables, the Hausman test can be performed. This statistical test can show the relationship between unobserved constants to explanatory variables in the econometric model. FEM is better to apply than REM when the exogenous assumption from unobserved constant variables is rejected. Meanwhile, REM is preferred to FEM when the exogenous assumption from unobserved constant variables is met (Amini et al., 2012).

The further step after determining the best model for panel data regression is the specification or heteroscedasticity test. Heteroscedasticity is defined as a condition where the distribution of the residuals is not constant. The result of the t-test and F-test can be overstated and lead to incorrect conclusions regarding the level of significance when a regression model has a heteroscedasticity problem (Gujarati & Porter, 2009). To detect the problem, this study performs the Modified Wald test for GroupWise heteroscedasticity, where the method is a residual variation test that allows the detection of problems, between cross-section units (Baum, 2001). This study will apply the Generalized Least Square (GLS) model after detecting the heteroscedasticity problem. According to Bai et al. (2021), the GLS model is more efficient than the OLS because it can directly account for heteroscedasticity in the estimation.

Result and Discussion

Table 3 is a descriptive statistic from the adjusted data and the adjustment was made because there were 0 and negative values in several variables used as inputs and outputs in the DEA method. However, adjustments were not made to the asset variable due to the completeness of the data values, as well as to produce the actual market share in the general insurance industry. Based on Table 3, there is a fairly high variation in each of the variables used in this study.

Table 3 Descriptive Statistics from 2010 – 2020 in billion Rupiah

Variables	Obs	Mean	Std Dev	Min	Max
Operational Cost	831	610.469	102.784	42.778	731.612
Equity	831	720.321	924.996	3.844	7216.718
Technical Reserves	831	455.354	727.749	10	5657.513
Net Claims	831	383.525	300.422	3.125	4545.311
Investment Income	831	65.298	93.437	6.758	694.213
Asset	846	1110.1555	1840.638	1.7151	12804.13

Sources: OJK, Processed by authors

After making several adjustments and conducting DEA, the market share value and technical efficiency score of the general insurance industry in the 2010-2020 periods were obtained. As shown in Table 4, the concentration ratio is used to capture market competition conditions in general (CR_n). In addition, the efficiency values that have been estimated using the DEA method are also disclosed[4]. The level of market concentration demonstrates a downward trend until 2015, followed by an upward movement. Simultaneously, the estimated efficiency scores display a negative trajectory. In the context of this present study, these findings indicate that reduced market concentration can result in decreased efficiency. However, when market concentration increases, it does not necessarily lead to an increase in the efficiency score. Relying solely on this information, there is no distinct correlation between efficiency and market concentration.

Table 4 Average Efficiency Score and Market Concentration for the Indonesian General Insurance Industry in 2010-2020

Year	Efficiency	CR_4	CR_8
2010	0.925	39.376	61.724
2011	0.926	35.867	58.067
2012	0.865	33.416	54.578
2013	0.857	33.303	55.921
2014	0.832	33.228	51.940
2015	0.809	33.315	51.903
2016	0.835	34.675	52.598
2017	0.833	33.976	52.137
2018	0.782	33.771	52.511
2019	0.740	33.742	53.897
2020	0.790	34.700	53.804

Note: CR_4 is the concentration ratio of four industries, CR_8 is the concentration ratio of eight industries

Table 5 shows that from 2010-2020 there are several general insurance industries with a high average level of market share and efficiency value equal to 1, such as PT Astra Buana, PT Asuransi Umum Panin, and PT Asuransi Sinar Mas. In the same period there are several industries with a low average market share with an efficiency value equal to 1, namely PT Asuransi Wanamekar Handayani, PT Asuransi CHUBB Indonesia, and PT Asuransi Puri Asih. However, the three industries (PT Asuransi Wanamekar Handayani, PT Asuransi CHUBB

[4] The efficiency score for each DMU is presented in Table 8 (see the Appendix).

Indonesia, and PT Asuransi Puri Asih) have ceased to operate since 2011. In addition to the level of efficiency, the value of market share also determines the ability to survive in the general insurance market in Indonesia.

Table 5 The Indonesian General Insurance Industry Average Efficiency Score Based on Market Share Condition in Periods 2010-2020

High Market Share Industry			Low Market Share Industry		
Industry's Name	**Efficiency**	**Market Share**	**Industry's Name**	**Efficiency**	**Market Share**
PT Asuransi Astra Buana	1.000	8.918	PT Asuransi Karyamas Sentralindo	0.968	0.066
PT Asuransi Kredit Indonesia (Persero)	0.961	8.078	PT Asuransi Puri Asih	1.000	0.064
PT Asuransi Jasa Indonesia (Persero)	0.661	8.040	PT Lloyd Indonesia	0.958	0.026
PT Panin Insurance Tbk. (PT Asuransi Umum Panin)	1.000	7.869	PT Asuransi CHUBB Indonesia	1.000	0.013
PT Asuransi Central Asia	0.750	7.518	PT Asuransi Wanamekar Handayani	1.000	0.004

Based on Table 5, the average efficiency value in industries with a high market share, such as PT Asuransi Jasa Indonesia (Persero) and PT Asuransi Central Asia did not achieve an efficiency value equal to 1. The average value of efficiency is relatively lower compared to industries with the lowest average market share. This finding has not been able to show a clear relationship between an industry's market share and its technical efficiency. Therefore, further analysis is needed to determine a clear relationship between the two variables.

This study employs the panel Granger-causality test using a vector autoregression (VAR) model and a forward orthogonal deviation (FOD) approach to reduce the number of lost observations due to the unbalanced data (Abrigo & Love, 2016). Meanwhile, the determination of the order is carried out using the model determination criteria (MMSC) by Andrews & Lu (2001) and the first 4 lags as an instrument. The lags are used to minimize the value of each selection criterion in MMCS, as explained by (Abrigo & Love, 2016). The first-order panel VAR model is selected because it has smaller MBIC, MAIC, and MQIC values compared to other orders. By using the fisher-type stationary test (Choi, 2001), both the market share variable and the efficiency variable are significant at the 1% level, hence, panel Granger-causality test can be carried out at the level of these variables.

Table 6 Panel VAR Granger-Causality Test Block Exogeneity Wald Tests

	Dependent Variables	
Independent Variables	**MS**	**TE**
TE	1.365	
MS		11.301***

Notes: *** Significant at 1%

Table 6 shows the presence of a unidirectional causal relationship, where the MS variable exerts a substantial impact on the TE variable. Specifically, the market share of the industry influences its efficiency. This observation indicates that the applicable hypothesis for the general insurance industry in Indonesia is the QL hypothesis. Consequently, a thorough examination of the impact of market share on efficiency shall be conducted due to the aforementioned QL hypothesis.

According to Setiawan et al. (2012), this study uses a panel regression model as an additional test of the QL hypothesis in the observed industry. This method is used to determine the impact of market share on the technical efficiency score of general insurance industry. In the panel regression model, the market share variable is transformed into log form according to Barros et al. (2010), hence, the data used can be distributed more normally. In addition, several control variables that can also affect the efficiency level of insurance industry are included, such as industry age, dummy mergers and acquisitions, and dummy listed on the stock exchange. These variables are selected because older industries have better adaptability and reputation than new industries (Alhassan & Biekpe, 2016). Mergers and acquisitions can also provide benefits for industries such as increased investment income and increased income at every level of risk. Insurance industries that carry out mergers and acquisitions can experience increased efficiency (Cummins et al., 1999), and the dummy variable listed on the stock exchange is used to capture the effect of transparency on government requirements (Barros et al., 2010).

Based on the results of the Hausman test, the prob>chi2 value is 0.0069, where the null hypothesis is rejected or the fixed-effect model is more suitable to use than the random-effect model. The heteroscedasticity test is carried out using the Modified Wald test for groupwise heteroscedasticity. The result shows that the value of prob>chi2 is equal to 0, or smaller than the p-value of 0.05. As a result, there is a heteroscedasticity problem in the model and this study uses the GLS method to overcome these problems. The results of the estimates made with GLS are shown in Table 7.

Table 7 Feasible Generalized Least Squares (GLS) Results

Variables	TE
Ln(market share)	-0.004***
	(0.001)
Age	9.08*10-6
	(7.22e-05)
merger & acquisition	-0.005
	(0.003)
Listed	0.001
	(0.004)
Constant	0.684***
	(0.003)
Observation	831
Number of Industries	92
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Based on the Feasible Generalized Least Squares (FGLS) in Table 7, market share and technical efficiency have a negative relationship and are significant at a 1% level. This means that the market share owned by the industry is inversely related to the efficiency score. Based on the results of the panel Granger-causality test and panel regression, the QL hypothesis is proven in the Indonesian general insurance industry. This finding is in line with previous studies with similar results in Europe (Fenn et al., 2008), South Africa Africa (Alhassan & Biekpe, 2016), and GCC countries (Alshammari et al., 2019), where larger market share reduces the industry's efficiency in the insurance market.

There is a higher potential for industries with large market shares to become inefficient due to multiple business lines. According to a report by KPMG (2016), prominent industries in the sector engage in various business lines. By diversifying their products, these industries can expand consumer base and increase market share. However, the strategy often comes with the drawback of higher operational costs, placing a burden on the industry. According to Hsieh et al. (2015), diversification can reduce performance due to the rise of agency costs and inefficient cross-subsidization business. An industry with a lower market share and a less diversified business line are more likely to have reduced inefficiency potential. It can become more efficient to operate in a certain business line while facing a lower operational cost.

Conclusion

This study attempts to test the the applicability of the quiet-life (QL) hypothesis; which explains that the higher market share will reduce the efficiency of companies, and the efficient structure (ES) hypothesis; which points out that the more efficient companies will gain a higher market share, through the panel Granger-causality test in the Indonesian general insurance industry in 2010 – 2020. In addition, this study also conducted panel data regression as an additional test of the applicable hypothesis.

The estimation results show that industries with an efficiency score = 1 have relatively high and low market shares. The results of the Granger-Causality test show that there is a one-way causality relationship where only market share affects efficiency. Based on these results, the QL hypothesis is applied to the general insurance industry in Indonesia, and this is supported by the panel regression results where there is a negative effect on market share.

The findings provide evidence supporting the validity of the QL hypothesis within the industry. Consequently, the government should intervene and foster a competitive environment while facilitating free entry. By fostering increased competition, efficiency can be enhanced within the sector, ultimately leading to greater social benefits for society. Industries should also strive to improve their efficiency by mitigating potential agency costs from operating in multiple lines of business.

The limitation of the present study is the relatively narrow observation periods. As a result, the economic shocks (such as the Covid-19 pandemic), which might affect technical

efficiency and market share cannot be controlled in the analysis. Therefore, future studies can use a more extensive observation period, hence any shocks or events that could affect the insurance market (especially in Indonesia) can be controlled to produce a better-estimated coefficient to show the relationship between market share and technical efficiency.

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Appendix

Table 8 Data Envelopment Analysis (DEA) Results

Company's Name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
PT Asuransi Adira Dinamika	0.775	0.815	1.000	1.000	1.000	0.929	1.000	0.894	0.750	0.672	0.614
PT Asuransi Artarindo	0.915	0.975	0.913	1.000	0.985	0.861	0.987	0.948	0.919	0.773	0.691
PT Arthagraha General Insurance	0.848	0.811	0.842	0.863	0.866	0.579	0.866	0.921	0.870	0.662	0.647
PT Asuransi Etiqa Internasional Indonesia (d/h PT Asuransi Asoka Mas)	0.953	0.849	0.902	0.791	0.709	0.677	0.667	0.643	1.000	1.000	1.000
PT Asuransi Astra Buana	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
PT Asuransi Bangun Askrida	0.846	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
PT Fairfax Insurance Indonesia (d/h Batavia Mitratama Insurance)	0.921	0.959	0.932	0.954	1.000	0.583	1.000	-	-	-	-
PT Berdikari Insurance	0.895	0.879	0.870	0.863	-	0.821	1.000	1.000	0.875	0.740	0.644
PT Asuransi Bhakti Bhayangkara	0.867	0.920	0.937	1.000	1.000	0.922	0.988	0.994	1.000	0.850	0.897
PT Asuransi Bina Dana Arta Tbk.	1.000	0.934	0.914	0.842	0.832	1.000	0.795	0.738	0.842	1.000	1.000
PT Asuransi Binagriya Upakara	0.921	0.842	0.682	0.753	-	0.820	0.680	0.733	0.677	0.748	0.912
PT Asuransi Bintang Tbk.	0.900	0.973	0.738	0.763	0.786	0.889	0.794	0.669	0.573	0.577	1.000
PT Bosowa Asuransi (d/h PT Asuransi Bosowa Periskop)	0.885	0.971	0.892	0.813	0.827	0.836	0.859	0.884	0.854	0.572	0.578
PT BRI Asuransi Indonesia (d/h PT Asuransi Bringin Sejahtera Artamakmur)	0.814	0.842	0.731	0.690	0.506	0.323	0.470	0.516	0.442	0.672	0.712
PT Asuransi Buana Independent	0.795	0.764	0.908	0.799	0.770	0.683	0.759	0.860	0.822	0.638	0.712
PT Asuransi Umum Bumiputera Muda 1967	1.000	1.000	0.791	1.000	1.000	0.634	0.745	0.762	0.666	0.624	0.745
PT Asuransi Central Asia	1.000	1.000	0.866	0.612	0.727	0.592	1.000	0.874	0.594	0.390	0.667
PT Citra International Underwriters	0.933	0.920	0.930	1.000	0.908	-	0.963	0.956	0.900	0.561	0.832
PT Asuransi Dayin Mitra Tbk.	0.834	0.808	0.842	0.510	0.539	0.624	0.560	0.602	0.485	0.544	0.768
PT Asuransi Mandiri Axa General Insurance (d/h PT Asuransi Dharma Bangsa)	0.892	1.000	0.606	0.643	0.908	1.000	0.962	0.993	0.751	0.911	1.000
PT Asuransi Eka Lloyd Jaya	0.906	0.962	0.971	0.928	0.952	0.937	0.986	1.000	0.910	0.858	0.878
PT Asuransi ASEI Indonesia (d/h PT Asuransi Ekspor Indonesia (Persero)	0.842	0.678	0.667	0.594	0.343	0.538	0.618	0.622	0.522	0.685	0.592
PT Asuransi Harta Aman Pratama Tbk.	0.859	0.815	0.716	0.768	0.772	0.518	0.896	0.959	0.753	0.930	0.761
PT Asuransi Himalaya Pelindung	0.937	0.902	0.938	1.000	1.000	1.000	1.000	1.000	-	-	-
PT Asuransi FPG Indonesia (d/h Asuransi Indrapura)	0.859	0.774	0.651	0.969	0.675	0.703	0.588	0.729	0.587	0.660	0.651
PT Asuransi Intra Asia	0.895	0.950	0.962	0.999	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table 8 Data Envelopment Analysis (DEA) Results (cont')

Company's Name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
PT MNC Asuransi Indonesia (d/h Asuransi Jamindo General Insurance)	0.903	0.969	1.000	0.899	0.841	0.566	0.715	0.784	0.823	0.644	0.812
PT Asuransi Jasa Indonesia (Persero)	0.759	0.727	0.776	0.692	0.690	0.651	0.558	0.782	0.697	0.500	0.759
PT Asuransi Jasa Raharja Putera	0.854	0.969	0.839	0.708	0.963	0.628	0.624	0.588	0.484	0.792	0.696
PT Asuransi Jasa Tania Tbk.	0.861	0.897	1.000	1.000	1.000	1.000	0.753	0.837	0.754	0.622	0.631
PT CHUBB General Insurance Indonesia (d/h PT ACE Jaya Proteksi (d/h PT Asuransi Jaya Proteksi))	0.819	0.555	1.000	1.000	1.000	1.000	1.000	0.989	0.608	0.562	1.000
PT Jaya Proteksi Takaful	0.924	-	-	-	-	-	-	-	-	-	-
PT Asuransi Karyamas Sentralindo	0.968	-	-	-	-	-	-	-	-	-	-
PT Asuransi Kredit Indonesia (Persero)	1.000	1.000	1.000	1.000	1.000	1.000	0.990	1.000	0.910	0.889	1.000
PT Lippo General Insurance Tbk.	1.000	0.920	0.795	0.946	0.938	0.519	0.995	0.901	0.641	0.711	0.655
PT Lloyd Indonesia	0.958	-	-	-	-	-	-	-	-	-	-
PT Asuransi Maipark Indonesia	0.777	0.771	0.694	0.737	-	-	-	-	-	-	-
PT Asuransi Umum Mega	1.000	0.956	1.000	1.000	0.957	0.631	0.885	0.837	0.709	0.637	0.756
PT Asuransi Mega Pratama	0.876	0.928	0.864	0.819	0.819	0.731	0.810	0.794	0.728	0.615	0.704
PT Asuransi Kresna Mitra Tbk. (d/h PT Asuransi Mitra Maparya)	0.838	0.779	0.848	0.892	.	0.777	0.962	1.000	1.000	0.466	.
PT Asuransi Multi Artha Guna Tbk.	0.773	0.693	0.730	0.974	1.000	0.981	0.776	0.501	0.318	0.310	0.339
PT Pan Pacific Insurance	0.863	0.854	0.934	0.967	-	1.000	1.000	1.000	1.000	1.000	1.000
PT Panin Insurance Tbk.	1.000	1.000	1.000	1.000	-	-	-	-	-	-	-
PT Asuransi Parolamas	0.846	0.768	0.661	0.795	0.782	0.604	1.000	0.902	0.874	1.000	-
PT Asuransi Puri Asih	1.000	1.000	-	-	-	-	-	-	-	-	-
PT Asuransi Purna Artanugraha	0.843	0.827	0.937	0.631	0.590	0.539	0.590	0.808	0.818	0.619	0.713
PT Asuransi Raksa Pratikara	0.862	0.965	0.923	0.853	0.859	0.756	0.872	0.855	0.758	0.942	0.896
PT Asuransi Rama Satria Wibawa	0.921	0.825	0.899	0.694	-	0.864	1.000	1.000	1.000	0.903	1.000
PT Asuransi Ramayana Tbk.	1.000	1.000	1.000	1.000	1.000	1.000	0.902	1.000	1.000	1.000	1.000
PT Asuransi Raya	0.887	0.926	0.907	0.914	1.000	1.000	-	-	-	-	-
PT Asuransi Recapital	0.901	0.909	0.761	0.768	0.840	0.859	1.000	-	-	1.000	-
PT Asuransi Reliance Indonesia	0.950	1.000	1.000	1.000	1.000	0.419	1.000	1.000	0.959	0.878	1.000

Table 8 Data Envelopment Analysis (DEA) Results (cont')

Company's Name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
PT Sarana Lindung Upaya	0.853	0.862	0.928	0.741	-	1.000	0.828	0.889	0.862	0.688	1.000
PT Asuransi Sinar Mas	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
PT Maskapai Asuransi Sonwelis	0.901	0.973	1.000	1.000	1.000	-	-	-	-	-	-
PT Staco Mandiri (d/h PT Staco Jasa Pratama)	0.883	0.971	1.000	1.000	0.849	0.970	0.931	0.990	0.953	0.805	1.000
PT Avrist General Insurance (d/h PT Asuransi Starlite International)	0.937	1.000	0.958	0.958	0.922	0.862	0.899	0.888	0.894	0.650	0.824
PT Asuransi Takaful Umum	0.904	-	-	-	-	-	-	-	-	-	-
PT Asuransi Umum BCA (d/h PT Central Sejahtera Insurance (d/h PT Transpacific General Insurance)	0.894	0.912	0.870	0.889	1.000	0.948	0.970	0.920	0.786	0.903	0.909
PT Asuransi Tri Pakarta	0.803	0.746	0.815	0.688	-	0.515	0.605	0.558	0.511	0.580	0.655
PT Asuransi Perisai Listrik Nasional (d/h PT Asuransi Tugu Kresna Pratama)	0.886	0.850	0.853	0.627	0.627	0.689	0.650	0.551	0.495	0.514	0.561
PT Tugu Pratama Indonesia	1.000	1.000	0.506	0.392	0.382	0.316	0.786	0.382	0.334	0.394	0.397
PT Victoria Insurance Tbk.	0.916	0.990	1.000	0.982	-	1.000	0.901	0.933	0.913	1.000	0.710
PT Asuransi Videi	0.909	0.952	0.928	0.986	1.000	1.000	0.997	1.000	1.000	1.000	1.000
PT Asuransi Wahana Tata	0.939	1.000	1.000	1.000	0.969	0.525	0.661	0.575	0.675	0.767	0.701
PT Asuransi Wanamekar Handayani	1.000	-	-	-	-	-	-	-	-	-	-
PT Malacca Trust Wuwungan Insurance (d/h PT Asuransi Wuwungan)	0.963	0.994	0.895	0.939	1.000	1.000	1.000	0.914	0.893	1.000	0.719
PT ACE INA Insurance	0.806	1.000	0.925	-	-	-	-	-	-	-	-
PT Asuransi Sahabat Artha Proteksi (d/h PT Bess Central Insurance (d/h PT Asuransi AIOI Indonesia))	1.000	0.957	1.000	0.847	0.795	0.617	0.843	0.846	0.817	0.665	0.759
PT Asuransi Allianz Utama Indonesia	1.000	1.000	0.730	0.557	0.747	0.617	0.835	0.650	0.674	0.716	0.881
PT Asuransi AXA Indonesia	0.969	1.000	0.904	0.839	0.869	0.823	0.878	0.902	0.932	-	-
PT AIG Insurance Indonesia (d/h PT Chartis Insurance Indonesia)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.580	0.578	0.688	0.682
PT China Taiping Insurance Indonesia	0.864	0.981	0.913	0.648	0.663	0.601	0.587	0.585	0.572	0.451	0.592
PT Asuransi CHUBB Indonesia	1.000	1.000	-	-	-	-	-	-	-	-	-
PT Meritz Korindo Insurance (d/h PT Asuransi Hanjin Korindo)	0.911	0.982	1.000	1.000	0.858	0.789	0.811	0.807	0.772	0.539	0.550
PT KSK Insurance Indonesia (d/h PT Kurnia Insurance Indonesia)	1.000	0.906	0.805	0.624	0.740	0.580	0.724	0.772	0.810	0.771	0.886

Table 8 Data Envelopment Analysis (DEA) Results (cont')

Company's Name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
PT Kookmin Best Insurance Indonesia (d/h PT LIG Insurance Indonesia)	0.964	0.901	0.825	0.912	0.565	0.579	0.786	0.771	0.730	0.570	0.655
PT MAA General Assurance	0.958	1.000	1.000	1.000	1.000	-	-	-	-	-	-
PT Asuransi MSIG Indonesia	0.644	0.871	0.640	0.626	0.608	0.772	0.501	0.569	0.787	0.496	0.672
PT Asuransi Nipponkoa Indonesia (d/h PT As. Permata Nipponkoa Indonesia)	0.774	0.931	0.541	-	-	-	-	-	-	-	-
PT Great Eastern General Insurance Indonesia (d/h PT QBE General Insurance Indonesia (d/h PT Asuransi QBE Pool Indonesia))	0.814	0.846	0.763	0.766	0.773	0.780	0.700	0.845	0.705	0.633	0.622
PT Asuransi Samsung Tugu	0.847	1.000	0.846	1.000	.	0.782	0.549	0.625	0.592	0.467	0.522
PT Sompo Insurance Indonesia (d/h PT Asuransi Sompo Japan Nipponkoa Indonesia (d/h PT Sompo Japan Insurance Indonesia)	0.876	0.943	0.587	-	0.547	0.654	0.547	1.000	1.000	1.000	1.000
PT Asuransi Tokio Marine Indonesia	0.797	0.832	0.583	0.663	0.634	0.607	0.625	0.712	0.589	0.731	0.803
PT Zurich Insurance Indonesia	0.840	0.800	0.863	1.000	1.000	1.000	0.714	1.000	1.000	0.859	1.000
PT Asuransi Sumit Oto	-	0.941	0.861	0.968	1.000	1.000	1.000	1.000	1.000	1.000	1.000
PT Asuransi Mitra Pelindung Mustika	-	-	0.985	0.880	0.778	0.657	0.648	0.651	0.550	0.655	0.726
PT Asuransi Cakrawala Proteksi Indonesia	-	-	-	-	1.000	0.674	1.000	1.000	1.000	1.000	0.789
PT Asuransi Simas Insurtech (d/h PT Asuransi Simas Net)	-	-	-	-	-	1.000	1.000	1.000	1.000	0.669	1.000
PT Asuransi Total Bersama	-	-	-	-	-	-	-	-	-	0.672	0.863
PT Asuransi Candi Utama	-	-	-	-	-	-	-	-	-	-	0.832
PT Asuransi Maximus Graha Persada Tbk.	-	-	-	-	-	-	-	-	-	-	0.329