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**-RESEARCH ARTICLE-**

# COMPETITION IN THE NON-LIFE INSURANCE INDUSTRY

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**─Abstract─**

From 2000 to 2008, the Zimbabwean economy experienced a severe economic crisis. There has been a significant rebound of the financial system following the crisis, with several initiatives being pursued. In light of these post-economic-crisis developments, this study examines the evolution of competition and market structure in the non-life insurance market in Zimbabwe from 2010 to 2022. The study uses the Panzar and Rosse methods and the long-run regression model to measure competition. The research demonstrated that insurance companies operate in long-term equilibrium. The research also revealed that insurance companies operate under monopolistic competition. This is demonstrated by the differentiated products sold by non-life insurance companies. This indicates that insurance companies can generate more revenue due to the uniqueness of their characteristics, such as their trademarks, image, and advertising. Policymakers should continue monitoring sector developments to increase competition in the sector.

**Kaywords:** Competition; Panzar and Rose; Non-Life Insurance; Zimbabwe; Long run

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## 1. INTRODUCTION

The significance of competition in the financial system has been the subject of extensive research (Antwi & Antwi, 2013; Bikker, 2010; Carbo et al., 2009). The literature argues that competition in the financial system is necessary for the efficient intermediation of savers and investors, which fosters economic development (Buchs & Mathiesen, 2005). Competition in the financial system is essential for efficient financial intermediation, provision of services at reduced social costs, more accessible access to financial services by households, and enhancement of product quality and innovation (Coccorese, 2009; Claessens & Laeven 2004; Claessens & Klingebiel 2001; Claessens et al. 2001). Competition in the financial sector reduces the cost of financial intermediation and increases the effectiveness of financial intermediation, product innovation, and service quality (Claessens & Laeven, 2004). It has also been noted that competition in the financial system can lead to improved innovation, lower prices, and a higher quality of financial products, all of which are essential for effective monetary transmission, and that, in general, it improves financial stability (Bikker 2010; Carbo et al. 2009). Competition should always be controlled because it can become retrogressive beyond a certain level (Bikker, 2010). According to Bikker and Boss (2005), competition can lead to bank insolvency, influencing financial stability. Excessive competition can result in decreased profits, and firms may be unable to build additional buffers to protect against disruptions (Bikker, 2010). There are also potential adverse effects of increasing competition, such as an increase in risk propensity that may result in a decline in profitability and efficiency (Mishkin, 2013).

Mishkin and Stanley (2009) also noted that financial markets and institutions affect our daily lives and involve enormous flows of funds throughout the economy, which in turn affect business profits, the production of goods, and even the economic health of nations. The insurance industry is one financial sector that provides distinctive financial services by assisting societies in risk management. Insurance companies offer financial protection against monetary losses caused by unforeseen circumstances to individuals and businesses. The risk-pooling property of insurance promotes economic activity by mitigating losses and managing non-diversifiable risk to facilitate commercial transactions and credit provisions (Ndalu, 2017).

The significance of competition has sparked considerable interest in the phenomenon's quantification. Consequently, numerous approaches to measuring competition have been proposed. These methods include the traditional Industrial Organisation approach, the new structural approach, and the new empirical industrial organization (NEIO) approach. Structure-Conduct-Performance (SCP) analysis is the basis for most traditional methodologies and structural approaches. The SCP assumes that market concentration increases the likelihood of cooperation. The methodology deduces competition from market structures.

The structural approach to measuring competition is based on indicators such as the concentration ratio assessed by the market share of the system's top banks or the Herfindahl-Hirschman Index (HHI). The approaches presuppose that a concentrated system reduces competition, resulting in increased profits. These concentration measures reflect the nature of competition by reflecting the effects of the number of participants and the size distribution of firms in an industry. The structural approach then extrapolates the nature of competition from relatively simple numerical indicators (Leon, 2014). The primary benefit of structural approaches is their modest data requirements. The structural approach is flawed because it lacks a solid theoretical foundation, there is ambiguity regarding the relationship between structure and behavior, the direction of causality is not defined, and it is difficult to determine which concentration levels it accurately reflects (Ergungor, 2004). The concentration measures are linked to empirical implementation and the difficulties of improperly defining the market. It fails to distinguish between the physical and product markets (Shaffer, 2004).

The new structural measures rely on regulatory indicators to gauge the degree of contestability. The method is based on regulatory requirements, such as entry requirements, barriers to entry into the financial system by local or foreign actors, and other restrictions (Leon, 2014). According to the contestability theory, firms can operate competitively without entry barriers, whereas financial regulations impede firms' free entry and exit into the financial sector (Leon, 2014). Given that financial instruments and innovations can alter the competitive environment over time, the contestability theory considers these factors. The competition determinants have expanded with the incorporation of regulatory and institutional variables.

The new empirical industrial organization (NEIO) concludes competitive pressure by directly observing firms' market behavior (Leon, 2014). These methods utilize formal competition measures to approximate the response of output prices to input costs. Most of these formal competition measures have been applied to other industries and implemented to measure competition in the banking sector. The NEIO methods were created to circumvent the shortcomings of structural approaches. The limitation of structural approaches is their assumption of unidirectional causation between market structure and performance. These methodologies do not account for the market behavior of banks or the effect of performance on market structure. The NEIO infers firms' behavior directly from their behavior. The approaches employ optimization models derived from competition indicators, including the Lerner index, the Panzar and Rosse test H-statistic, the conjectural variation parameters, and the Boone indicator.

This paper's primary objective is to examine the evolution of competition and market structure in the non-life insurance market in Zimbabwe from 2010 to 2017. From 2000 to 2008, the Zimbabwean economy experienced a severe economic crisis. During the crisis, the economy declined by 40 percent cumulatively (GoZ, 2009). In September 2008, the economy experienced one of the worst hyperinflation episodes in history, with

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inflation reaching 231 million percent (Zimstats, 2009). The crisis harmed the financial sector's performance. Due to inflation-adjusted losses on government securities and significant levels of statutory reserves, their balance sheets shrunk in real terms (Chipika & Malaba, 2011). The hyperinflation eroded the banking public's savings. Due to inefficiencies in the national payment systems, a decline in loans denominated in the local currency, and declining foreign exchange flows, financial intermediation was hampered. Since the economic crises of 2000-2008, the insurance market has undergone structural reforms, including mergers, modernization, financial integration, the influx of foreign capital, and the problematic effects of the global financial crisis. This study employs Panzar and Rosse to measure Zimbabwean non-life insurance industry competition.

## 2. THE NON–LIFE INSURANCE SECTOR IN ZIMBABWE

(Larte et al., 2013) The financial system comprises financial institutions, financial instruments, and financial markets that facilitate channeling funds from depositors to investors. Zimbabwe's financial system is highly developed compared to the scale of the economy. The financial sector of Zimbabwe consists of insurance firms, microfinance institutions, pension funds, and banks.

Insurance companies play a significant role in Zimbabwe's service-based economy, and their services are now integrated into the broader financial sector (IPEC, 2014). The insurance industry is an integral component of Zimbabwe's financial system, and its economic benefits are substantial. The insurance industry contributes significantly to a nation's economic development and protects individuals and businesses against financial losses caused by unforeseen events. Insurance enables individuals to transmit the burden of uncertainty to the insurer in exchange for a financial consideration known as the premium. Insurance companies, including life, fire, accident, and liability, offer numerous types of insurance.

(IPEC, 2014) The non-life insurance companies in Zimbabwe have faced both challenges and opportunities. After a decade of economic decline, introducing a multicurrency system in 2009 revitalized the insurance industry, which had almost completely collapsed. Since 2008, the insurance industry has faced several industry-specific challenges. A shortage of consumer confidence reduces the number of insurance policies purchased. 2008's hyperinflation resulted in a loss of insurance savings, which has led to the current situation.

Compared to the monthly premiums consumers must pay, the quantity of insurance payouts is considered inadequate. Zimbabwe's lack of foreign currency negatively impacted the sector, making paying premiums for most reinsurance programs difficult. The sector has been impacted by corporate governance issues, which has resulted in insurance companies losing revenue (IPEC, 2017).

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The Covid -19 pandemic has not been kind to the sector, which is witnessing higher-than-usual lapse rates due to anticipated liquidity issues as customers' incomes decrease. The majority of people lost their jobs as a consequence of the government's implementation of mandatory lockdown in March 2020. The pandemic harmed investment income due to lower returns on property and equity investments.

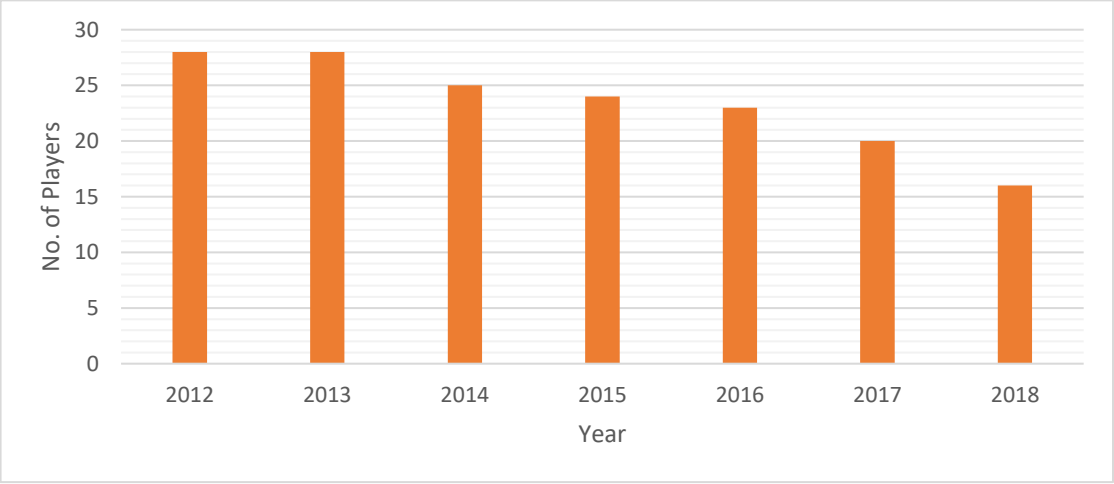


**Figure 1.** Number of Non-Life Insurance Players
**Source:** IPEC (2019)

Since 2012, the number of participants in Zimbabwe's non-life insurance sector has been declining (Figure 1). From 2012 to 2018, participants decreased from 28 to 16. The decline in the number of participants can be attributed to deregistrations during the time frame. In 2016, for instance, four non-life insurers were deregistered for different reasons. Global Insurance Company, Heritage Insurance Company of Zimbabwe, Excellence Insurance Company Private Limited, and KMFS were deregistered. Deregistration reduces the number of sector participants, which has repercussions for the sector's levels of competition.

The efficacy of the insurance industry can be determined by the volume of business underwritten by industry participants. This information is available from Gross Premium Written (GPW) or Net Premium Written (NPW). Figure 2 demonstrates that the aggregate performance of non-life insurance based on GPW increased between 2010 and 2017. Between 2010 and 2013, the growth rate of GPW was higher than it was between 2014 and 2017. The earlier time period coincided with higher economic development in the nation. During the years 2014-2017, the economy grew at a slower rate. This indicates a positive correlation between aggregate premium written and national economic activity. In 2010, engineering, hire purchase, hail, and agricultural insurance all experienced business growth of over 60%, primarily due to increased consumer confidence against the backdrop of a stable and recovering economy bolstered by the multicurrency regime.

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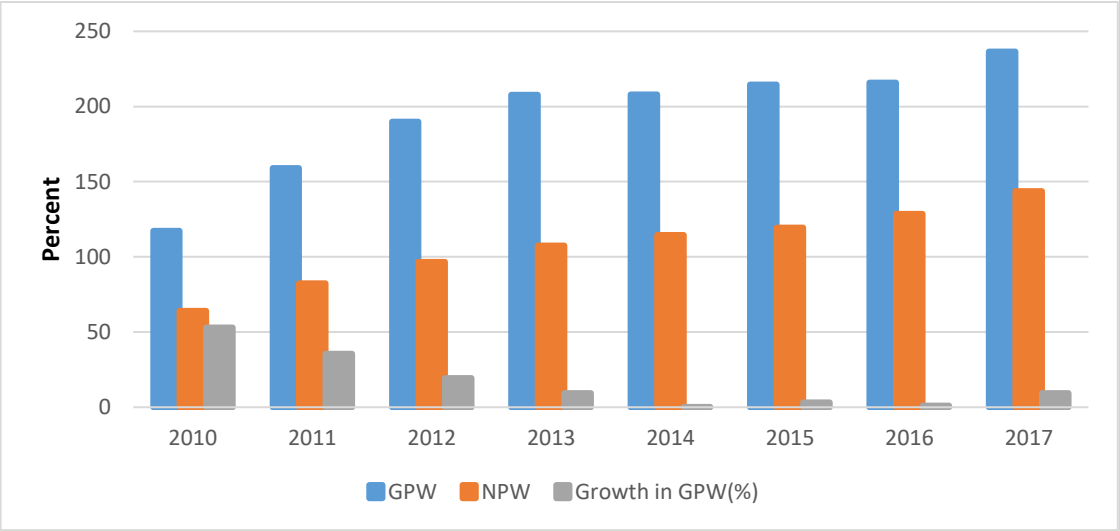


**Figure 2.** Non-Life Insurance Firms Performance Indicators
**Source:** Insurance and Pension Commission

In 2011 and 2012, the auto insurance industry dominated the non-life insurance sector. This was primarily attributable to the general improvement in the macroeconomic environment, which increased the number of vehicles on Zimbabwe's roads during the review period. Hire purchases and bonds were the most significant contributors to non-life insurance in 2015, as people began to focus on the long term as the economy stabilized.

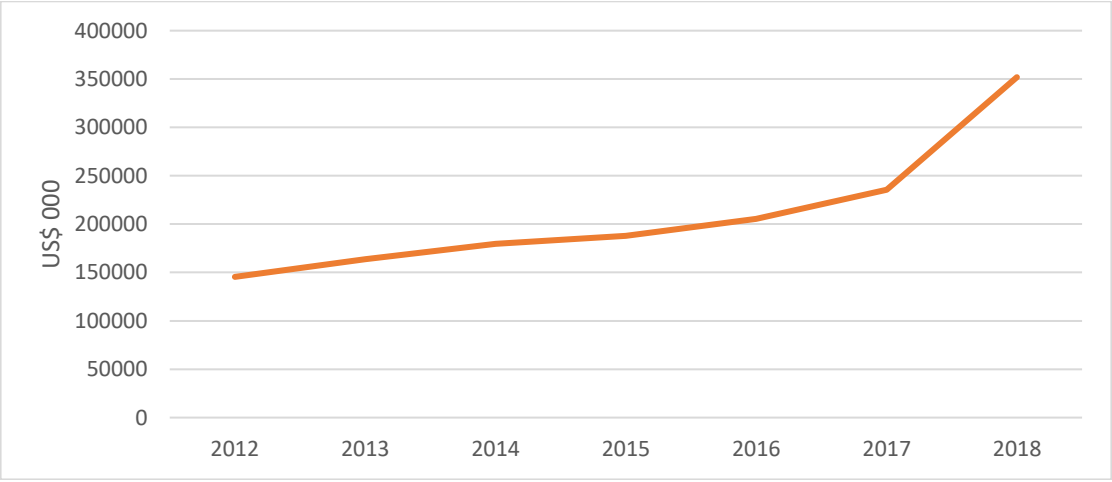


**Figure 3.** Non-Life Insurance Firms Total Assets
**Source:** Insurance and Pension Commission

Figure 3 depicts the development of the non-life insurance industry's total assets from 2012 to 2018. During the hyperinflationary period, the sector's assets were demolished. After the economy stabilized in 2009, insurance companies had to increase their assets.

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In 2012, the insurance industry's total assets amounted to 145.47 million dollars, which increased to $351.87 million in 2018. In 2017-18, total assets increased by 116.45 million dollars, representing the highest increase in total assets since the end of the hyperinflation period.

## 3. LITERATURE REVIEW

The literature on competition in the insurance industry is scant (Cobbinah et al., 2020; Alshammari et al., 2019; Bikker et al., 2008). Those who have studied competition in the insurance industry have used the Boone indicator method to quantify competition (Kramari & Mileti 2019; Kasman et al. 2019; Camino-Mogro et al. 2019). Alternatively, several studies have utilized the Panzar and Rose method to evaluate competition in the insurance industry (Alhassan & Biekpe 2016; Murata et al. 2014).

Cobbinah et al. (2020) have demonstrated that competition promotes stability. According to Kramari and Mileti (2019), competition intensified in the years following EU accession. Kasman et al. (2019) discovered that non–life insurers are more stable in an environment that is less competitive and highly concentrated, lending credence to the competition–fragility hypothesis. Camino-Mogro et al. (2019) determined that ideal competition existed in the insurance industry in Ecuador. Alshammari et al. (2019) found a positive correlation between competition and efficacy, supporting the quiet life hypothesis. Cummins et al. (2017) found that competition increases the integrity of EU life insurance markets, implying that efficiency is the mechanism by which competition contributes to insurer solvency. Bikker and Leuvensteijn (2008) discovered that the Dutch life insurance industry was less competitive than other industries. Kar and Swain (2014) discovered that competition negatively affected the quality of the loan portfolio. Bachis et al. (2007) examined competition in the British general insurance market. The research revealed that the private and commercial automobile insurance markets are not as competitive as is commonly believed. According to the study, measures that focus on the behavior of individual firms over time suggest that both short-run and long-run persistency of profits can be observed in most automobile markets. In contrast, measures that concentrate on markets at a specific time suggest that competitive pressure varies over time and across markets, and has decreased in all markets since the mid-1990s.

Numerous researchers have also utilized the Panzar and Rosse methods to assess competition in the financial sector. Most of these studies have been conducted in the finance industry (Pruteanu-Podpiera et al., 2008; Liu et al., 2013; Yildirim et al., 2007). These findings supported the conclusion that the banking system operated under monopolistic competition. Several researchers in the insurance industry have utilized the Panzar. Alhassan and Biekpe (2016) examined the relationship between efficacy and competition in the South African non-life insurance market. Panzar and Rose's Model quantified the competition. The annual estimates of P-R H-statistics also suggest that firms in the market generate income under monopolistic competition conditions. Using

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the Panzar and Rosse methodology, Murata et al. (2014) evaluated the condition of competition in the Australian General Insurance industry. The study's findings indicate that general insurance firms operate in a less-than-ideal competitive environment. The less indicates that input costs are not entirely shifted to sales revenues.

## 4. CONCEPTUAL FRAMEWORK

The conceptual framework in Figure 2 represents the study concept based on the literature review and research hypothesis.

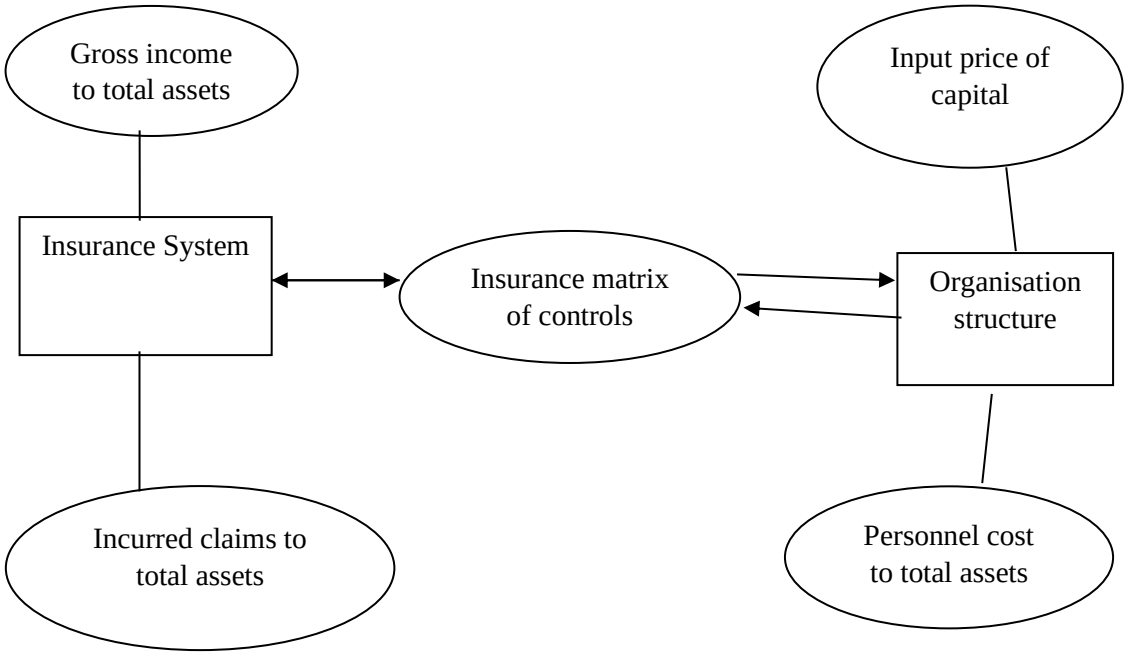


**Figure 2:** Conceptual framework on insurance system structure

## 5. MATERIALS AND METHODS

This study employs the Panzar and Rosse H-Statistic to estimate the market structure in which non-life companies operate. The Panzar and Rosse H-statistic is derived according to Bikker and Haaf (2002), with modifications to accommodate the insurance industry. The research utilizes periodic data from 2010 to 2022. The sample consisted of fifteen non-life insurance firms. The data was extracted from the financial statements posted on the websites of the insurance companies.

The fundamental premise of the model is that profit maximization remains true at both the industry and firm levels. The profit maximization condition at the firm level is as follows:

$$R_i(y_i^*, Z_i^R) = C_i(y_i^*, W_i, Z_i^C) \quad (1)$$

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Where $R_i(y_i^*, Z_i^R)$ and $C_i(y_i^*, W_i, Z_i^C)$ are the revenue and cost functions of the insurance firm i. $y_i$ is the output of the firm, $W_i$ is a K-dimensional vector of factor input prices of insurance firm i, $W_i = (w_1, w_2 \ldots . w_k)$, $Z_i^R$ is a vector of j exogenous variables determining the revenue function $Z_i^R = \left(z_{1i,}^R, Z_{2i}^R \ldots . . Z_{Li}^R\right)$, $Z_i^C$ is a vector of L exogenous variables that shift the cost function $Z_i^C = (z_{1i,}^C, Z_{2i}^C \ldots . . Z_{Li}^C)$.

At the individual level, profit is maximized where the marginal revenue must equal marginal cost:

$$R_i'(y_i^*, Z_i^R) = C_i'\left(y_i^*, W_i, Z_i^C\right) \tag{2}$$

The H-statistic evaluates the elasticity of total revenues in respect of changes in factor input prices:

$$H = \sum_{k=1}^{K} \frac{\partial R_i^*}{\partial w_{ki}} . \frac{w_{ki}}{R_i^*} \tag{3}$$

The P-R approach assumes log linearity in the specifications of the marginal revenue and marginal cost functions.

$$Ln(R_i') = a_0 + a_1 Ln(y_i) + \sum_{j=1}^{J} d_j \, Ln\left(Z_{ji}^R\right) \tag{4}$$

$$Ln(C_i') = \; c_0 + c_1 Ln(y_i) + \sum_{j=1}^{J} b_k \, Ln\,(w_{ki}) + \sum_{j=1}^{J} v_j \, Ln\left(Z_{li}^C\right) \tag{5}$$

For a profit-maximizing insurance firm, the equilibrium output results from equation 2;

$$a_0 + a_1 Ln(y_i) + \sum_{j=1}^{J} d_j \, Ln\left(Z_{ji}^R\right) = \; c_0 + c_1 Ln(y_i) + \sum_{j=1}^{J} b_k \, Ln\,(w_{ki}) + \sum_{j=1}^{J} v_j \, Ln\left(Z_{li}^C\right) \tag{6}$$

Rearranging the terms:

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$$Ln(y_i^*) = \frac{i}{(a_1 - c_1)} \cdot \left[ c_0 - a_0 + \sum_{j=1}^{J} b_k \, Ln\,(w_{ki}) + \sum_{j=1}^{J} v_j \, Ln\left(Z_{li}^{C}\right) - \sum_{j=1}^{J} d_j \, Ln\left(Z_{ji}^{R}\right) \right] \quad (7)$$

The reduced form equation for revenues of the representative insurance firm is given by the equilibrium output of insurance firm i and the common price level:

$$Ln(R_i^*) = Ln(P^* y_i^*) \quad (8)$$

The price level is provided by the inverse demand equation, which also reads in Logarithms:

$$Ln(p) = \mu + \lambda Ln(Y) \quad (9)$$

$$where\ Y = \sum_{i=1}^{I} y_i \quad (10)$$

Y is the aggregate output of the industry. The reduced form revenue equation after algebraic manipulation is achieved as:

$$Ln(R_i^*) = \alpha + \sum_{k=1}^{K} \beta_k \, Ln(w_{ki}) + \sum_{q=1}^{Q} \delta_q \, Ln(z_{qi}) \quad (11)$$

$z_i$ is a vector of Q insurance firm-specific variables without reference to their origin from the cost or revenue function, $Z_i = (z_{1i,\ldots,Z_{Qi}})$ :

The H-statistic is then defined as follows:

$$H = \sum_{k=1}^{K} \beta_k \quad (12)$$

The interpretation of the H-statistic is shown in Table 1 below.

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**Table 1. H-Statistic Interpretation**

| H-Value | Interpretation |
|---|---|
| H=0 | Monopoly Equilibrium<br>Perfect Colluding Oligopoly |
| 0 < H < 1 | Monopolistic Competition |
| H=1 | Perfect competition<br>Natural monopoly in a perfectly contestable market |

**Source**: Panzar and Rosse (1977, 1982, 1987)

Numerous P-R model specifications exist (Bikker et al., 2009). These include the P-R revenue equation with total log assets as a control variable (Shaffer, 2004); the P-R price equation without a control variable (De-Bandt, 2000); and the P-R price equation that takes firm size into account (Bikker & Groeneveld, 2000).

The P-R model used in this analysis is based on Claessen and Laeven's (2004) work. The model includes the prices of production factors and variables specific to the insurance company. Equation 5.1 describes the regression equation that must be estimated:

$$Ln(R_{it}) = \alpha_i + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{2,it}) + \beta_3 \ln(W_{3,it}) + \gamma \ln(Z_{,it}) + \varepsilon_{it} \qquad (13)$$

Where: i denotes insurance firms, and t denotes years. $R_{it}$ is the ratio of gross income to total assets. Gross income includes both interest and non-interest income. Gross income is used because firm insurance income comprises interest and non-interest income, such as property rental income.

$W_{1,}$ is the ratio of personnel expenses to total assets (a proxy for the input price of labor). Personnel expenses are necessary for any firm because personnel ensures work is carried out. The insurance firm employees are the salesmen working to improve the income of the insurance firm.

$W_{2,}$ is the ratio of other operating and administrative expenses to total assets (proxy for input price of capital). Other operating costs refer to all non-personnel costs faced by the insurance firm and proxy the physical cost of capital scaled with total assets. These included marketing expenses, information technology, and rental costs.

$W_{3,}$ is the ratio of incurred claims to total assets. Incurred claims are given to policyholders to compensate for losses incurred out of specified events. These represent the main cost incurred during the operations of the insurance firm. It is probably the essential input factor for the insurance firm, enabling the insurance companies' success or failure.

$Z$ is a matrix of controls, including the underwriting risk (risk) and reinsurance as the ratio of total assets ($reinsu$)) which controls for insurance firm size effects. The control

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variables capture the set of insurance firm-specific factors. All the variables are in natural logarithms. Finally, $\boldsymbol{\varepsilon_{it}}$ denotes insurance firm-level fixed effects.

The H-statistic is then defined as:

$$H = \beta_1 + \beta_2 + \beta_3 \quad (14)$$

The P-R approach assumes the observations are in long-run equilibrium. The long-run equilibrium can be tested using the H-statistic in a reduced-form profitability equation. Return on assets or return on equity is used as the dependent variable instead of total income. The resultant H (called $E$) is supposed to be significantly equal to zero in equilibrium and significantly negative in the case of disequilibrium.

To verify the condition of long-run equilibrium, the following regression model is estimated:

$$Ln(ROA_{it}) = \alpha_i + \beta_1 \ln(W_{1,it}) + \beta_2 \ln(W_{2,it}) + \beta_3 \ln(W_{3,it}) + \gamma \ln(Z_{,it}) + \varepsilon_{it} \quad (15)$$

ROA is the pre-tax return on assets. Because $ROA_{it}$ can take on negative values, the dependent variable is computed as $Ln(1 + ROA_{it})$. The equilibrium $E$ statistic is defined as:

$$E = \beta_1 + \beta_2 + \beta_3 \quad (16)$$

The test of long-run equilibrium involves testing whether $E = 0$. $E < 0$, there is long-run disequilibrium while if $E = 0$, there is long-run equilibrium. The test for the long-run equilibrium is undertaken using the Wald coefficient restriction test

## 6. EMPIRICAL RESULTS AND DISCUSSION

This section presents and analyzes the study's findings. It assesses both the equilibrium position of the firms during the study period and the evolution of competition among the firms. This section will present the descriptive statistics of the variables, the correlation matrix, and the unit root test results before examining the primary results.

Table 2 summarizes the descriptive statistics for the dependent and explanatory variables. It illustrates the conduct of the employed variables, including the statistical mean, minimum, maximum, and standard deviation, and the number of observations. There are a total of 140 observations included in the study.

**Table 2. Descriptive Statistics**

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| | $\ln(W_{2,it})$ | $\ln(W_{3,it})$ | $\ln(W_{1,it})$ | *lnrisk* | *Reinsu* | *ROA* | PR | TR |
|---|---|---|---|---|---|---|---|---|
| Mean | -4.7031 | 0.7412 | 23.0480 | 6.9692 | 1.6424 | 1.5641 | 0.7120 | 0.1120 |
| Median | -4.6424 | 0.6874 | 23.4175 | 7.0399 | 1.6150 | 1.5661 | 0.4602 | 0.3421 |
| Maximum | -1.8936 | 7.1487 | 28.9135 | 15.3218 | 3.4128 | 1.9776 | 2.1231 | 1.5777 |
| Minimum | -10.3041 | -5.9978 | 7.0388 | -0.2185 | 0.0304 | 1.1762 | -0.2992 | -1.0317 |
| Std. Dev. | 1.4901 | 2.7720 | 3.1200 | 3.2647 | 0.7557 | 0.1192 | 0.8777 | 0.8007 |
| Observations | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 |

The data under consideration is balance panel data. There are eight variables to consider. The data indicates less variation among the variables, as indicated by their reduced standard deviations.

Multicollinearity is the presence of one or more linear relationships between some or all explanatory variables of a regression model. Estimates are unbiased, but the relative intensity of explanatory variables and their joint effect are unreliable when multicollinearity is present. The correlation matrix (Table 3) was used to verify that the variables are not correlated to ensure that the envisioned model does not suffer from the same flaw. The correlation coefficient is a quantitative evaluation that assesses the direction and magnitude of this tendency to vary in tandem.

**Table 3. Correlation Matrix**

| | $\ln(W_{2,it})$ | $\ln(W_{3,it})$ | $\ln(W_{1,it})$ | *lnrisk* | *Reinsu* | *ROA* | PR | TR |
|---|---|---|---|---|---|---|---|---|
| $\ln(W_{2,it})$ | 1.000 | 0.564 | -0.729 | 0.730 | -0.450 | 0.363 | -0.040 | -0.102 |
| $\ln(W_{3,it})$ | 0.564 | 1.000 | -0.525 | 0.678 | -0.306 | 0.417 | 0.078 | -0.114 |
| $\ln(W_{1,it})$ | -0.729 | -0.525 | 1.000 | -0.568 | 0.277 | -0.456 | -0.053 | 0.005 |
| *lnrisk* | 0.730 | 0.678 | -0.568 | 1.000 | -0.275 | 0.350 | 0.078 | 0.027 |
| *Reinsu* | -0.450 | -0.306 | 0.277 | -0.275 | 1.000 | -0.062 | -0.031 | -0.041 |
| *ROA* | 0.363 | 0.417 | -0.456 | 0.350 | -0.062 | 1.000 | -0.063 | -0.016 |
| PR | -0.040 | 0.078 | -0.053 | 0.078 | -0.031 | -0.063 | 1.000 | 0.646 |
| TR | -0.102 | -0.114 | 0.005 | 0.027 | -0.041 | -0.016 | 0.646 | 1.000 |

Multicollinearity is problematic when the correlation between independent variables is more significant than 0.80 (Gujarati, 2008). According to Table 3, there is no extreme correlation between the variables. This result indicates that all variables may be utilized in regression analysis without multicollinearity.

The Levin, Lin, Chu test and the Im, Pesaran, and Shin test determine the order of variable integration. The unit root test results are presented in Table 4. Applying the two methods was intended to ensure that the variables are not incorporated in the same order when determining the regression method. All variables are integrated into the first order. Consequently, a panel regression analysis was conducted with either fixed or random effects.

**Table 4. Unit Root Test**

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| Variable | Test | Levin, Lin, Chu | | Im, Pesaran, Shin | | Level of Integration |
|---|---|---|---|---|---|---|
| $\ln(W_{2,it})$ | level | 1.5020 | 0.0665 | 1.1401 | 0.8747 | I(1) |
| | 1st Difference | 7.9526 | 0.000 | 2.4903 | 0.0064 | |
| $\ln(W_{3,it})$ | level | 2.55673 | 0.9947 | 1.3552 | 0.9123 | I(1) |
| | 1st Difference | 6.34206 | 0.0000 | 6.9399 | 0.0000 | |
| $\ln(W_{1,it})$ | level | 0.2257 | 0,4109 | 1.6770 | 0.9532 | I(1) |
| | 1st Difference | 4.4601 | 0.0000 | 2.88218 | 0.0000 | |
| $lnrisk$ | level | 2.14686 | 0.0868 | 0.0143 | 0.5057 | I(1) |
| | 1st Difference | 6.8782 | 0.0000 | 3.05629 | 0.0000 | |
| $Reinsu$ | level | 3.1743 | 0.9920 | 0.8953 | 0.8147 | I(1) |
| | 1st Difference | 10.5151 | 0.0000 | 9.5197 | 0.0000 | |
| $ROA$ | level | 0.1138 | 0.4547 | 1.0601 | 0.9945 | I(1) |
| | 1st Difference | 12.9298 | 0.0000 | 6.5551 | 0.0000 | |
| PR | level | 0.8178 | 0.1418 | 0.1050 | 0.5423 | I(1) |
| | 1st Difference | 8.9118 | 0.0000 | 2.6695 | 0.0475 | |
| TR | level | 0.5179 | 0.1271 | 0.5158 | 0.0671 | I(1) |
| | 1st Difference | 10.8397 | 0.0000 | 3.6042 | 0.0000 | |

The long-run equilibrium was examined using the H-statistic in the profitability equation in reduced form and used as the dependent variable was returning on assets. Table 5 provides the results. E should be significantly equal to zero in equilibrium, and in disequilibrium, it should be substantially negative. Using the Wald test, it was determined that the E statistic did not differ significantly from zero. The statistical value was 0.0017. This indicates that the conditions for long-term equilibrium have been met, so the interpretation of the H-statistics below is valid.

**Table 5. Equilibrium Test Results**

| Dependent Variable: ROA | | | |
|---|---|---|---|
| **Variable** | **Coefficient** | **t-statistic** | **P-Value** |
| $c$ | 1.601723 | 10.50344 | 0.0000 |
| $\ln(W_{1,it})$ | -0.006707 | -0.994997 | 0.3218 |
| $\ln(W_{2,it})$ | -0.005016 | -0.358017 | 0.7210 |
| $\ln(W_{3,it})$ | 0.012470 | 1.973133 | 0.0508 |
| $lnrisk$ | 0.003177 | 0.455986 | 0.6492 |
| $Reinsu$ | 0.037712 | 1.911945 | 0.0583 |
| $F-stat\ (Prob)$ | 4.4841(0.0000) | | |
| $E-statistic$ | 0.0017 | | |
| $H_0: E=0$ | $Chi-square$: 0.0133(0.9080) | | |
| $H_0: E=1$ | $Chi-square$: 4367.27(0.0000) | | |

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According to Table 5, none of the prices of production factors are significant in explaining return on assets (a proxy for profitability). Insurance risk and reinsurance are not explanatory variables for return on assets. This confirms that risk-adjusted rates of return in equilibrium should be identical across all firms, and returns on insurance firms' assets should be unrelated to input costs.

**Table 6. Competitive Structure Test Results**

| | **Dependent Variable: TR** | | | **Dependent Variable: PR** | | |
|---|---|---|---|---|---|---|
| **Variable** | **Coefficient** | **t-statistic** | **P-Value** | **Coefficient** | **t-statistic** | **P-Value** |
| $c$ | -0.0949 | -0.1326 | 0.8947 | 0.5060 | 0.6283 | 0.5309 |
| $\ln(W_{1,it})$ | -0.0528 | -1.6685 | 0.0976 | -0.0453 | -1.2717 | 0.2057 |
| $\ln(W_{2,it})$ | -0.2398 | -2.8653 | 0.0048 | -0.2153 | -2.2869 | 0.0238 |
| $\ln(W_{3,it})$ | -0.0799 | -2.3827 | 0.0186 | 0.0104 | 0.2764 | 0.7827 |
| $lnrisk$ | 0.0926 | 2.7386 | 0.0070 | 0.0560 | 1.4729 | 0.1431 |
| $Reinsu$ | -0.1757 | -1.7684 | 0.0793 | -0.0975 | -0.8729 | 0.3842 |
| $F-stat\ (Prob)$ | 2.7513 (0.0221) | | | 2.9782 (0.0367) | | |
| $H-statistic$ | 0.2501 | | | 0.3725 | | |
| $H_0: H=0$ | $Chi-square: 10.94(0.0009)$ | | | $Chi-square: 43.92(0.0000)$ | | |
| $H_0: H=1$ | $Chi-square: 148.56(0.0000)$ | | | $Chi-square: 97.37(0.0000)$ | | |

The study employed two revenue variables, premium revenue (PR) and total revenue (TR), to assess the competitiveness of insurance companies: premium revenue (PR) and total revenue (TR). Both revenue variables were used as dependent variables to estimate two regression equations (Table 6).

Using TR and PR as dependent variables, the estimated H-statistics are 0.2501 and 0.3725, respectively. The Wald restriction test confirms that the H-statistic is neither zero nor one. The results of the Wald restriction test indicate that insurance companies do not operate under conditions of optimal competition or monopoly. This indicates that insurance companies are subject to monopolistic competition. Insurance companies sell differentiated products in terms of product quality and marketing. The degree of monopolistic competition is diminished due to the products' perfect substitutability. This indicates that insurance companies can generate more revenue due to the uniqueness of their characteristics, such as their trademarks, image, and advertising. They possess a degree of market power, but it is not absolute due to the existence of close substitutes from other companies. The results are consistent with the findings of other studies (Muraat et al., 2002; Kasman et al., 2008) that concluded that non-life insurance firms operated under monopolistic competition.

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According to the results of the TR regression, all three input prices have a negative relationship with total revenue. Only two of the three input prices (W2 and W3) significantly impact total revenue. This indicates that aside from the price of labor, other prices significantly impact total revenue. Insurance companies total revenue also rises as operating and administrative expenses rise. The other control underwriting risks have a positive and significant effect on total revenue, meaning that as underwriting expenses rise, so do firms' total revenues. Reinsurance, however, does not affect total revenue.

Operating and administrative expenses determine the premium revenue shown in Table 6. None of the other variables influence the premium revenue. Since the coefficient of W_(2,) is negative and substantial, premium revenues decrease as operating and administrative expenses increase.

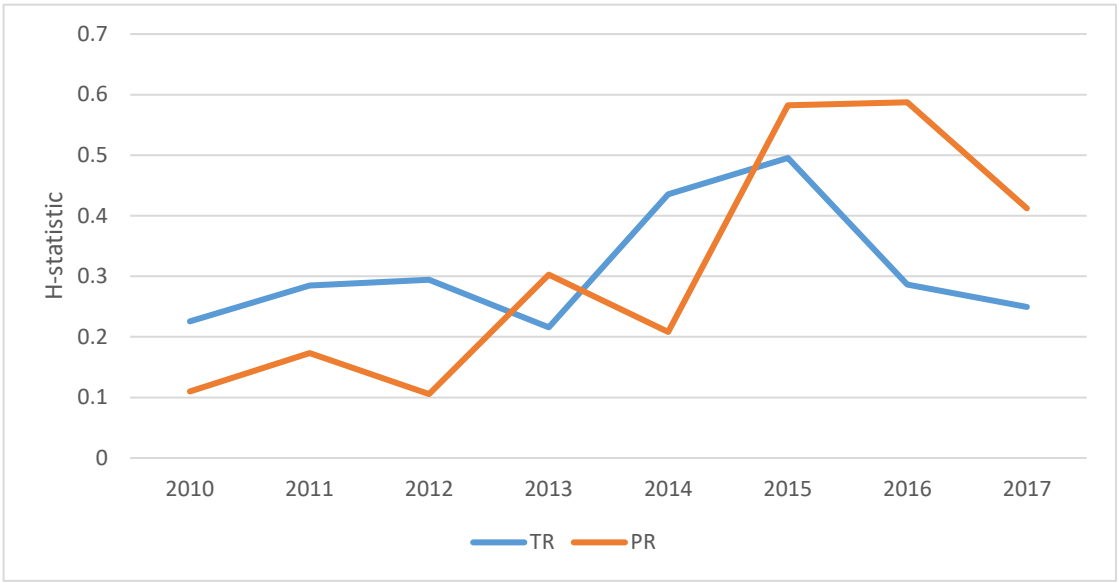


**Figure 4.** Evolution of Competition

From 2010 to 2017, Figure 4 depicts the Panzar and Rosse H-statistic evolution for insurance companies. Between 2010 and 2017, the PR and TR trends indicate that average Panzar-Rosse H- statistics increased. The H-statistic derived from PR rose from 0.1 to 0.4, whereas the H-statistic derived from TR rose from 0.23 to 0.25. This indicates that competition in the insurance industry increased during the study period. This could be explained by the evolution of Zimbabwe's macroeconomic environment during this period. After implementing multiple currencies as legal tender in the country, the economy began to recover from the economic crisis that precipitated the economic decline and hyperinflation between 2000 and 2008. This led to a rise in disposable incomes in the country, which increased demand in the insurance industry. On the supply side, insurance companies that had been decimated began to regain their footing as they increased their capitalization through organic growth and shareholder capital injections.

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In addition, consolidation and mergers increased the capacity of insurance companies to underwrite more business. As a result of the introduction of a stable currency, corporations and individuals could anticipate the future, which increased the demand for insurance.

## 7. CONCLUSION

The role of competition in the financial system has been the subject of extensive research. Studies establish that competition is necessary for the efficient intermediation of depositors and investors, which fosters economic growth. The Zimbabwean economic crisis of 2000-2008 harmed the insurance industry's performance. The sector had to recover beginning in 2009, which revitalized the insurance industry. Insurance companies took advantage of the economic developments and implemented several initiatives to enhance their performance. In light of these developments, the study examined the evolution of competition and market structure of the non-life insurance market in Zimbabwe from 2010 to 2017 using Panzar and Rosse as a measure of competition in the Zimbabwean non-life insurance industry. The study determined that insurance companies were operating in long-term equilibrium, paving the way for the evolution of competition to be determined. In addition, the study demonstrated that insurance companies operate under monopolistic competition. The results of the Wald restriction test indicate that insurance companies do not operate under conditions of optimal competition or monopoly. Insurance companies sell differentiated products in terms of product quality and marketing. This indicates that insurance companies can generate more revenue due to the uniqueness of their characteristics, such as their trademarks, image, and advertising. They possess a degree of market power, but it is not absolute due to the existence of close substitutes from other companies. During the period of the investigation, there was a rise in competition. Policymakers should continue monitoring sector developments to increase competition in the sector. This implies that all anti-competitive policies should be eliminated to enable the market forces to operate freely. As a suggestion for future research, the study suggests an in-depth examination of the determinants of costs and profits for non-life insurance companies and the adoption of other estimation techniques, such as the General Methods Moments and Auto Regressive Distributed Lag model.

**Ethics approval and consent to participate**

Not Applicable

**Consent for publication**

The author consents to the publication of the manuscript

**Availability of data and materials**

Subject to request, the data will be availed

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## Authors' contributions

The author was responsible for the whole manuscript

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