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A critical examination of the effect of size on the profitability of insurance brokerage firms in Ghana

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Abstract

This paper takes a critical look at the effect of firm size on the profitability of Ghanaian Insurance brokerage firms. Specifically, the paper examined the effect of firm size (measured by total assets) on firm profitability (measured by ROA and ROE) from a lagged perspective (i.e. the lagged effect of size), non-linear perspective, and across quantiles, using fixed effects, random effects, robust and PCSE estimation techniques. Analysing a unique data of 64 insurance brokers from 2007 to 2015, the findings show that firm size exhibited a significant and positive short term effect on firm profitability but the relationship turned negative in the long term showing a non-linear relationship of size on profitability, with an inflection point above the mean firm size. However, the non-linear effect was evident in the 50th and above percentile of brokers but not in the lower quantiles. The lagged values of size also significantly affected firm profitability but it was not as pronounced as the short term effects. The study recommends larger Ghanaian insurance brokerage firms take a staggered and reflective approach in its growth measures.

Keywords: Profitability; Size; Non-linear effect.

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1. Introduction

Financial institutions play a key role in maintaining a vibrant financial system that spurs growth, development and globalisation. These institutions serve as pillars of growth and development in developed and developing economies; they promote the transfer of funds to areas most needed, trading of instruments, maturity intermediation, investment growth, project scaling and execution, asset building and storage, forecast and planning, and growing local and international businesses (Becks & Levine, 2004; Berger *et al*., 2000; Cornett & Saunders, 2003; Haiss & Sumegi, 2008; Hull, 2012; Kotey, 2019; Kotey & Abor, 2019; Kotey, Kusi & Akomatey, 2019). Because of the pivotal role they play, a slight underperformance may cause a ripple effect in the financial system and institutions less hedged are bound to suffer. A downturn in performance can affect various institutions and the consequences may be catastrophic taking years to repair the economic damages caused. This has been evident in the financial crises that have occurred and the subsequent after-effects that have befallen the financial systems globally (Crotty, 2009; Furceri & Mourougane, 2009). Through these financial crashes, lessons have been learnt and reforms designed to bolster the financial system and prevent further crashes from happening, have been implemented. However, there's is always the looming threat of the next financial crisis hence the need for the financial system to continually innovate.

Financial institutions have a number of instruments to protect themselves with; financial mechanisms like trade agreements, hedging, restrictive covenants, insurance, liquidity planning and others have been used over years by firms to protect their financial interests and maintain stability (Cornett & Saunders, 2003; Hull, 2012). Of these, the most used and widely available technique is insurance, which is simply the transfer of a firm's risk to another institution (i.e. the insurance company) more poised to absorb those risks. This effectively reduces the firm's risk and serves as a cushion or a buffer in times of economic uncertainty or financial instability. Insurance companies are like the 'earth wire' that absorb financial shocks when they occur and mitigate their effects by replenishing lost or weakened financial assets.

Insurance companies have over the years served as a buffer for internal and external risks. The insurance sector plays an important role in mitigating the risk effects of the financial sector (Akotey *et al*., 2013). By paying regular contributions, normally called premiums, companies can effectively transfer their business risks to the insurance company which promises to pay a lump sum or at least indemnify them in the case an adverse occurrence which is insured against occurs. In cases where the risk to underwrite is too huge for an insurance company, it may result to syndication or transfer part of its risk to a reinsurer.

Because of the relevance of insurance companies in the financial landscape, studies on insurance has been far and wide with both macro and firm-level implications (Akotey *et al*., 2013). But contextually, empirical and theoretical evidences of insurance effects in Africa is lacking even though the insurance sector has been shown to be very vibrant (Alhassan & Biekpe, 2018; NIC, 2018; Owusu-Sekyere & Kotey, 2019). Rather, recommendations from oversees research have been used to underpin African policies. Again, not much focus has been given to the auxiliary sectors that uphold the insurance industry, say insurance brokers who serve as key sales agents. Because of the role insurance brokerage firms play in the insurance sector, there is a need for more research into them as their existence and operation significantly influence the insurance ecosystem. This study leans towards this idea focusing on insurance brokers.

Following Owusu-Sekyere & Kotey (2019) who found a positive effect of firm size on profitability on Ghanaian insurance brokerage firms, a question emerges; what are the long term and short term effects of size on profitability of insurance brokerage firms? Is the relationship linear? Is the relationship the same or varied across all firm levels? Further hinting on this point, Miano (2011) found that AON Kenya, one of the largest insurance brokerage firms in Kanya (with a 14% market share) benefited unfairly from its size and that protected its profits. Again, Latorre & Farinós (2015) found a significant relationship between operational performance and firm size whilst investigating the ethical behaviour of Spanish insurance brokers. These evidences inherently suggest that firm size of insurance brokers may have varied effects and implications that need to be further examined, hence the need for this research. In examining existing research literature, there is a clear research gap as very little empirical research has been done to properly look into these size effects in the contexts alluded to. To buttress this point, studies on the effect of the size-profitability nexus has been disproportionately done on manufacturing firms. Becker-Blease *et al.* (2010) found that the effect of size on profitability is industry-specific showing that findings cannot easily be generalized, hence the need for more industry-specific research on the insurance brokerage sector. These conclusions motivate this study. This research seeks to contribute to empirical knowledge by providing a broader scope and context on the size-effect discourse focusing on brokerage firms.

The paper seeks to do this by examining the effect of size on profitability in a more detailed scope, using data from an African country as context. This study would add to existing knowledge by examining the long and short-term effects, lagged effects and quantile effects of firm size on the profitability of Ghanaian insurance brokerage firms. This would provide a deeper understanding on size-effects on local brokerage firms and thus provide a sound basis for decision making.

2. The Ghanaian insurance landscape

The privatization of the Ghanaian insurance industry in the past decade has been attributed to three main factors; the separation of life and non-life insurance companies[1]; the listing of SIC, a major player, on the Ghana stock exchange[2]; and the influx of foreign insurance companies influenced by the relaxation of regulations (Akotey *et al*., 2013). These significant changes to the sector have created an efficient and competitive environment that is pro-growth. Insurance penetration is generally low[3] in Africa due to low trust in insurance products and low levels of litigation (NIC, 2018). In Ghana, Insurance penetration (including pensions and health insurance) as at end of 2018, stood at 1% from 1.2% in 2017 (NIC, 2018; 2017). The underdeveloped state of the insurance market in Africa, (excluding South Africa[4]) has been attributed to low disposable income, poor public perception and low capacity of the insurance sector (NIC, 2018). On the other hand, insurance brokers in the Ghanaian market have increased year on year in size, revenue and number; from 78 registered brokers in 2016 to 81 in 2017 and 82 in 2018 signalling a growth in the insurance brokerage industry (see Owusu-Sekyere & Kotey, 2019).

In 2018, the insurance cover remained at 30% with a significant portion of the percentage attributed to microinsurance. Total assets of the insurance industry stood at GHS 6.2 bn[5], a 14.8% jump from GHS 5.4bn in 2017, but lower than the

1. The Insurance Act, 2006 (Act 724) led to the legal separation of the structure of insurance companies into life and non-life entities, and the proliferation of the Ghanaian insurance market.

2 SIC (State Insurance Company, now SIC Insurance Company Ltd.) was listed on the Ghana Stock Exchange on the 25th of January, 2008 with a GHS 2,500,000.00 stated capital.

3. Insurance penetration in Africa (excluding South Africa) averages 1%, whilst the global penetration rate averages 5%.

4. South Africa alone accounts for more than 60% of the premium generated in Africa.

5. Total assets consist of GHS3.1bn from the Life insurance sector, GHS2.4bn from the Non-Life Sector and GHS0.7bn from the Reinsurance sector.

growth rate of 28% experienced in 2016 when total assets stood at GHS 3.7bn (NIC, 2018; 2017; 2016). Total premiums paid was GHS 3.9bn (from GHS 2.4bn in 2017) of which GHS 202m was the realised profit for the year, a fall by GHS 43m from 2017. Corporate tax of GHS 36m also fell from GHS 50m in 2017. Though the low levels of insurance penetration show an underdeveloped insurance sector, the financial data presents a viable and profitable industry with growth prospects. Also, in the same year, the industry paid on average GHS 1.9m (1.6m in 2017) daily Life Insurance claims and GHS 1.1m (GHS 0.7m in 2017) daily Non-life Insurance claims. These payouts have likely contributed to maintaining wellbeing or standard of living, ensuring business continuity, or reducing unemployment or dependency of the beneficiaries which positively affects economic growth and development (NIC, 2018; 2017).

The National Insurance Commission (NIC) is the apex body responsible for regulating the insurance sector in Ghana. Through regulation, the commission seeks to influence market conduct by correcting market imperfections or vulnerabilities making the insurance system function properly. To increase insurance penetration, solidify the insurance market and deepen the mitigation of risk, the commission is working with other regulatory agencies to increase in the number of compulsory insurance[6] whilst improving enforcement (NIC, 2018; 2017; 2016). The new insurance bill is expected to mitigate risk whilst increasing transactions, grow the industry and help stabilize the financial market whilst contributing to GDP growth (Dyble, 2020; Insureghana, 2019; NIC, 2018). Also, the commission has amended its current regulations governing the operations of Ghana Oil and Gas Insurance Pool (GOGIP) to promote greater participation of local Insurers in the Oil and Gas sector. The amended regulation is expected to result in about USD 100m yearly growth in the local Oil and Gas written premiums from 2019 (NIC, 2018; 2017). Other initiatives of the commission include tackling the challenges facing motor insurance and having an understanding with the Ghana Shippers Authority to promote marine insurance (Dyble, 2020). The commission is also keen at promoting agricultural insurance with its Agricultural Insurance Policy (in collaboration with Alliance for Green Revolution in Africa (AGRA)), developing the annuities market, promoting

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[6]. As per Sections 183 and 184 of the Insurance Act 2006 (Act 724), there are two compulsory insurance; Fire Insurance for private commercial buildings (completed and under construction); and a minimum compulsory Motor Third-party Insurance for vehicle users. The new Insurance bill includes compulsory Group Life Insurance, Workmen's Compensation, Professional Indemnity, Marine-Cargo & Hall, Commercial Building and Public Liability Insurance.

insurance in Micro, Small and Medium Enterprises, and improving the public trust in insurance through the periodic publishing of the Insurance Awareness Index and Insurance Confidence Index. In June 2019, the commission issued a circular announcing new Minimum Capital Requirements for the Ghanaian insurance entities effective 30th June 2021. The objective is to improve upon the financial capacity and liquidity of the insurance industry (Dyble, 2020; NIC, 2018).

3. Empirical review

Globally, the nexus between size and profitability is well researched across manufacturing industries (Stigler, 1963; Kaen & Baumann, 2003; Becker-Blease *et al.*, 2010; Doğan; 2013; Niresh & Thirunavukkarasu, 2014; Kartikasari & Merianti, 2016). The consensus from the empirical literature has generally been mixed; some academics found a positive relationship between size and profitability (see Babalola, 2013; Charumathi 2012; Doğan, 2013; Velnampy & Nimalathasan, 2010), others found a negative relationship (see Kartikasari & Merianti, 2016; Becker-Blease *et al*., 2010), whilst others found no relationship at all (see Niresh & Thirunavukkarasu, 2014; Becker-Blease *et al.*, 2010; Velnampy & Nimalathasan, 2010). Using a broader scope of data, Becker-Blease *et al.* (2010) found different size-profitability effects in different industries suggesting that the nexus is industry-specific. We follow this train of thought to suggest that most research on size and profitability have been on manufacturing industries leaving out the other industries, hence the need for this research; the size-profitability nexus has not been well researched in the brokerage industry. We examine some empirical research on the size-profitability nexus and how they relate to this research.

Doğan (2013) examined the size-profitability nexus on 200 companies listed on the Istanbul Stock Exchange between 2008 to 2011. Using Return on Assets as a proxy for profitability and total assets and number of employees as a size indicator, the author found a positive effect of size on profitability. Similarly, Babalola (2013) used a similar approach on manufacturing companies listed on the Nigerian Stock Exchange and also found a positive relationship between size and profitability. Using a non-manufacturing data, Charumathi (2012) found that there is a significant positive correlation between size and profitability of Indian Life Insurers. Further, Asimakopoulos *et al.*, (2009) identified that a firm's profitability is positively affected by its growth in sales, investment and size, whiles leverage and current assets are negatively related to performance.

Cekrezi (2015) in his paper also showed that size had a positive relationship on the financial performance of Albanian Insurance Companies. These studies, however, do not test the linearity of the nexus, showing a gap in the literature.

Using the same metrics for size and profitability, Niresh & Thirunavukkarasu (2014) did not find a significant relationship between size and profitability using a 5-year data (2008-2012) of 15 listed companies on the Colombo Stock Exchange (Sri Lanka). Becker-Blease *et al.* (2010) examined the size-profitability nexus with 109 SIC four-digit manufacturing industries, using different measures of profitability. They found that the relationship differed from industry to industry; for 47 of the industries, size increased profitability at a decreasing rate, for another batch of 52 industries there was no significant relationship whilst the remainder of the industries has a positive increasing effect of size on profitability. Kaen & Baumann (2003) found similar relationships whiles working with a broad dataset of 64 American manufacturing industries between 1990 and 2001. These findings show that there are variations in the size-profitability nexus justifying the need for the effects to be examined in different contexts.

In Owusu-Sekyere and Kotey (2019), they found that monetary assets and firm size positively affects returns (ROA and ROE), whiles debt and fixed assets had negative returns. They employed a panel data of 64 insurance brokerage firms in Ghana over a period 2011 to 2015. However, the study did not show the shape of the relationship over time. This study seeks to fill this gap.

4. Theoretical review and hypothesis development

A number of theories underpin our variables of interest. For firm size, we support our research by the theory of economies and diseconomies of scale whilst how we measure profitability is supported by the stakeholder and shareholder theory.

Economies and diseconomies of scale are opposing theories that explain the size-profits nexus (Athanasoglou *et al*., 2008; Kotey, Kusi & Akomatey, 2019; Kusi, Gyeke-Dako & Agbloyor, 2017; Terraza, 2015). Economies of scale is a cost advantage a firm gains due to firm growth through scale in production which reduces its average cost of production (Stigler, 1958). It is based on the premise that as firms output increases, its cost per unit decreases up until the point where further increases lead to an increase in average cost. This theory advocates for firm growth as a means of increasing production whilst driving down cost per unit which leads to an increase in profits. Prominent supporters of this theory have opined that larger institutions have better operational efficiencies and synergies that allow them to whittle down their cost of production compared to smaller ones.

Diseconomies of scale argues the opposite; it extends from the economies of scale and proofs that beyond a certain point, an increase in firm size doesn't result in high profits, rather it creates challenges for the growing firm. The proponents of this theory cite bureaucratic challenges, duplication of roles and responsibilities, slowness in adopting creativity and innovations, fall in quality as hindering effects to firm profits when firms grow. A case in point is the fall of the mobile manufacturing company Nokia, which grew to the point where it became very bureaucratic and slow to innovate in the midst of competition that subsequently led to its fall in value and later acquisition by Microsoft (Lamberg *et al*., 2019).

With these theories underpinning our research, we intuitively argue out the possibility of a non-linear relationship between firm size and profitability. We hypothesize that given the influence of economies and diseconomies of scale, there exists a non-linear relationship between firm size and profitability. We further test for the nature of this non-linear relationship in this study.

With regards to firm profitability, we support our research approach by another set of opposing theories; stakeholder and shareholder profit maximization theory.

The Shareholder and stakeholder theory are two of the well-known theories in finance; the shareholder theory is of the view that management responsibility is to maximize wealth for its immediate shareholders. Its main proponent, the economist Milton Friedman, in the early 20th century argued that since it was shareholders who put up the money for the business and bear all the risks, it is only fair that the company creates profits for them. Friedman believed in a free-market and encouraged capitalism. In his seminal book 'Capitalism and Freedom', Friedman justified this theory by explaining that the businesses had no social responsibility, only a profit responsibility to its shareholders but shareholders, in their own volition, could perform social responsibilities on individual bases (Friedman, 1970; Greene, 1993). Thus, management has a legal and fiduciary responsibility to act in the best interest of the shareholders. This capitalist rhetoric was generally accepted by the economists of that time up until the late 20th century when Edward Freeman argued otherwise.

In 1984, Edward Freeman, in his seminal book 'Strategic Management: A Stakeholder Approach' argued that a company's real success lies in satisfying all its stakeholders, not just its shareholders. This paved way for the stakeholder theory. Freeman opined that if a business existed to solely make profits for its shareholders whilst ignoring its other stakeholders, though the business may make profits in the short term, it would not survive in the long term (Freeman, 1984; Freeman and Gilbert, 1988). He explained that real long term business success relied on the business meeting the needs of its stakeholders; these include internal stakeholders like employees, and external stakeholders like customers, suppliers, social, government and environmental groups, political groups, the media, financial institutions, etc., without whose support the business would cease to exist. Thus, rather than seeing the business as a capitalist entity, Freeman saw businesses as part of an ecosystem of related parts that needed to work together with other parts to achieve growth through productivity. Stakeholder theory goes beyond the immediate shareholders to include other entities that affect and/or are affected by the activities of the business. Thus, if management makes profits for its shareholders, but maltreats its employees, or creates goods consumers don't want or does not engage with the local community, the business would eventually fail as stakeholders become less satisfied with the company.

Rather than take a stance, we adopt both theories in how we measure firm profitability. We adopt return of assets (ROA) and return on liabilities (ROE) as our key metric for performance as ROA looks at returns from a stakeholder perspective and ROE from a shareholder perspective. This approach has been well used by other researchers (see Charumathi, 2012; Doğan, 2013; Niresh & Thirunavukkarasu, 2014; and others) and is appropriate for the industry-type this study is based on. Preliminarily, we expect the effects on ROA to be more pronounced than ROE.

5. Research methodology

Using a quantitative research framework, an unbalanced annual secondary data on 64 Ghanaian brokerage firms over the period 2007-2015 were sampled for the study. Specific firm-level variables, generated from yearly data extracted from the firms' financial statements, are used in the study to examine how firm-level characteristics affect profitability. Two macroeconomic variables are added as control variables.

The study follows up on a previous study (Owusu-Sekyere & Kotey, 2019) to critically examine the effect of size on profitability. Specifically, this study examines the lag effect of size on profitability as well as the linearity of this relationship. We follow closely their model (which is an adaptation of Kozak, 2011) and revise it to suit the focus of the study. The estimation function then is;

$$Profitability_{it} = f\{Debt, Fixed\ assets, Monetary\ assets, Size, Risk, Inflation, GDP\}$$

Where *Profitability*$_{it}$ represents the profitability of insurance brokerage firm *i* over year *t*, which is a function of the firms' debt, fixed assets, monetary (or current) assets, size, risk, inflation and GDP growth rate.

As indicated in the previous chapter, the authors employ ROA and ROE as measures of profitability. Essentially, we estimate each of the measures of profitability against the chosen independent variables. Based on the estimation function and in line with the focus of the study, the regression models are hereby stipulated:

ROA Model

Size on profitability

$$ROA_{it} = \partial + \beta_1 TDTA_{it} + \beta_2 TANG_{it} + \beta_3 FLEX_{it} + \beta_5 SIZE_{it} + \beta_6 RISK_{it} + \beta_7 INFLATION_{it} + \beta_8 GDP_{it} + \varepsilon_{it} \quad (1)$$

Lagged effect of Size on profitability

$$ROA_{it} = \partial + \beta_1 TDTA_{it} + \beta_2 TANG_{it} + \beta_3 FLEX_{it} + \beta_4 SIZE_{it-1} + \beta_5 SIZE_{it} + \beta_6 RISK_{it} + \beta_7 INFLATION_{it} + \beta_8 GDP_{it} + \varepsilon_{it} \quad (2)$$

Non-linear effect of Size on profitability

$$ROA_{it} = \partial + \beta_1 TDTA_{it} + \beta_2 TANG_{it} + \beta_3 FLEX_{it} + \beta_4 SIZE^2{}_{it} + \beta_5 SIZE_{it} + \beta_6 RISK_{it} + \beta_7 INFLATION_{it} + \beta_8 GDP_{it} + \varepsilon_{it} \quad (3)$$

ROE Model

Size on profitability

$$ROE_{it} = \partial + \beta_1 TDTA_{it} + \beta_2 TANG_{it} + \beta_3 FLEX_{it} + \beta_5 SIZE_{it} + \beta_6 RISK_{it} + \beta_7 INFLATION_{it} + \beta_8 GDP_{it} + \varepsilon_{it} \quad (4)$$

Lagged effect of Size on profitability

$$ROE_{it} = \partial + \beta_1 TDTA_{it} + \beta_2 TANG_{it} + \beta_3 FLEX_{it} + \beta_4 SIZE_{it-1} + \beta_5 SIZE_{it} + \beta_6 RISK_{it} + \beta_7 INFLATION_{it} + \beta_8 GDP_{it} + \varepsilon_{it} \quad (5)$$

Non-linear effect of Size on profitability

$$ROE_{it} = \partial + \beta_1 TDTA_{it} + \beta_2 TANG_{it} + \beta_3 FLEX_{it} + \beta_4 SIZE^2{}_{it} + \beta_5 SIZE_{it} + \beta_6 RISK_{it} + \beta_7 INFLATION_{it} + \beta_8 GDP_{it} + \varepsilon_{it} \quad (6)$$

Robust Model

$$ROA_{it} = \partial + \beta_1 TDTA_{it} + \beta_2 TANG_{it} + \beta_3 FLEX_{it} + \beta_4 SIZE^2{}_{it} + \beta_5 SIZE_{it} + \beta_6 RISK_{it} + \beta_7 INFLATION_{it} + \beta_8 GDP_{it} + \varepsilon_{it} \quad (7)$$

$$ROE_{it} = \partial + \beta_1 TDTA_{it} + \beta_2 TANG_{it} + \beta_3 FLEX_{it} + \beta_4 SIZE^2{}_{it} + \beta_5 SIZE_{it} + \beta_6 RISK_{it} + \beta_7 INFLATION_{it} + \beta_8 GDP_{it} + \varepsilon_{it} \quad (8)$$

Quantile Model

$$q(ROA)_{it} = \partial + \beta_{q1} TDTA_{it} + \beta_{q2} TANG_{it} + \beta_{q3} FLEX_{it} + \beta_{q4} SIZE^2{}_{it} + \beta_{q5} SIZE_{it} + \beta_{q6} RISK_{it} + \beta_{q7} INFLATION_{it} + \beta_{q8} GDP_{it} + \varepsilon_{it} \quad (9)$$

$$q(ROE)_{it} = \partial + \beta_{q1} TDTA_{it} + \beta_{q2} TANG_{it} + \beta_{q3} FLEX_{it} + \beta_{q4} SIZE^2{}_{it} + \beta_{q5} SIZE_{it} + \beta_{q6} RISK_{it} + \beta_{q7} INFLATION_{it} + \beta_{q8} GDP_{it} + \varepsilon_{it} \quad (10)$$

Where ROA- Return on Assets, ROE- Return on Equity, TDTA- Total Debt to Total Assets, Tang- Fixed Assets to Total Assets, Flex- Current Assets to Total Assets, Size- Size of the Firm, $Size_{it-1}$- Lagged value of size, $Size^2$- Squared value of size, Risk- Firms Risk, Inflation, and GDP- GDP growth rate.

ROA and ROE are the measures of profitability, ∂ is the constant term, β1,… ,β8 are the coefficients or parameters of the respective variables, the subscript "t" denotes time and "i" firms. "ε" is the error term. q represents the quantiles where $0 < q < 1$.

Guided by the theory, the authors adopt ROA and ROE as the main measures of profitability. For comparison and to correct for possible biases, we use a number of estimating strategies; fixed effects, random effects, robust regression and PCSE (Panel Corrected Standard Errors) estimation. These estimations help provide statistically sound, verifiable and reliable results. Quantile regression is also adopted to examine if there are any visible differences in the size-profitability nexus across the quantiles.

The regression results are put into groups and arrayed in tables with clear headings. Fixed and random effects estimations are presented for both ROA and ROE models. Each modelling group (ROA or ROE) are presented in seperate tables. Robust and quantile estimations are each presented in separate tables.

The ROA models, where profitability in the regression equations is measured using ROA, are presented in Table 4. The regression results are based on equations 1, 2, and 3 examining the results from a Random effect (models 1-3) and Fixed effects (models 4-6) perspective. The ROE models, where profitability in the regression equations are measured using ROE, are also presented in Table 5. The regressions results are based on equations 4, 5, and 6 examining the results from a Random effect (models 7-9) and Fixed effects (models 10-12) perspective.

Robust estimation methods are presented in Table 6. Specifically, we test for the effects using a robust regression estimation technique in models 13 and 14, measuring profitability as ROA in 13 and ROE in model 14 respectively. We do this to correct for possible biased estimates from biased standard errors. In models 15 and 16, we employ another approach – Panel Corrected Standard Errors (PCSE). The PCSE, which is also another robustness check, is presented in models 15 (ROA model) and 16 (ROE model) respectively.

Table 7 contains the quantile regressions (ROA- model 17 to 20 and ROE- model 20 to 24). The quantile regressions result present the quantile regressions output on a 25% incremental bases (i.e. 25th, 50th, and 75th percentile).

Table 1: Regression Variables

Variable		Meaning and interpretation	Source
ROA	Dependent variables	Return on Assets. Measures how efficient management is in using the firm's assets to generate returns. Formula; $ROA = \frac{Net\ income\ or\ Earnings}{Total\ Assets}$	Authors computation. Data from firms' annual financial statements
ROE	Dependent variables	Return on equity. Measures the returns management get from the total equity invested by shareholders. Formula; $ROE = \frac{Net\ income\ or\ Earnings}{Equity}$	Authors computation. Data from firms' annual financial statements
TDTA	Independent variables	Total debt to total assets. Measures the total debt of the brokerage firm as a ratio to its total assets	Authors computation. Data from firms' annual financial statements
Tang	Independent variables	Fixed assets to total assets. This measures the amount of tangible assets kept by insurance brokers.	Authors computation. Data from firms' annual financial statements
Flex	Independent variables	Monetary assets to total assets. The variable also measures how much of the total assets are not fixed assets (or current assets).	Authors computation. Data from firms' annual financial statements
Risk	Independent variables	Standard deviation of EBIT to average value of EBIT. This variable as a proxy for measuring the risk of the brokerage firm.	Authors computation. Data from firms' annual financial statements
+Size	Independent variables	Natural logarithm of total assets. This variable is employed as a proxy to measure the size of the brokerage firm.	Authors computation. Data from firms' annual financial statements
+L.Size	Independent variables	Lagged value of size. It is a 1-year period lag of the size values. Measures the size lag effects on profitability.	Authors computation. Data from firms' annual financial statements
+$Size^2$	Independent variables	Size squared. It is the squared values of size. Measures the non-linear effect of size.	Authors computation. Data from firms' annual financial statements
Inflation	Control variables	Inflation. Measured as a percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services at specified intervals.	World Bank database
GDP	Control variables	GDP growth rate. Measured as the annual percentage change in GDP. Measures how fast the economy is growing.	World Bank database

Notes: +: variable of interest.

Source: Authors own.

The data for the study has been uploaded into the Mendeley database[7]. All the analysis and table outputs presented in this study are generated using STATA statistical software.

6. Analysis and presentation of findings

ROA and ROE have a mean of 8.6% and 1.3% which supposes that the firm's returns are more explained by their assets rather than their equity (Table 2). ROE has more dispersed variations. The mean value of debt to assets (TDTA) of 29% shows the percentage of the assets accounted for by debt. Thus, implying that the remainder (of about 70%) is accounted for by equity. The Tang mean of 37% also means fixed assets account for 37% of the total assets. The mean values of fixed and monetary assets are 37% and 63% showing that more of their assets are kept in monetary form. The level of variation in the data is also about the same.

Size, measured by the natural log of total assets, averagely stands at 12.79. When compared to the data range, the average tilts towards the minimum value than the maximum value. This may suggest that averagely the insurance brokerage firms in the data are smaller in size with a fewer number being bigger. Inflation averaged 13.26% within the period under study whilst GDP growth rate averaged 7.2%.

TABLE 2: DESCRIPTIVE STATISTICS

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	219	.0862308	0.3091779	-2.155652	.8103704
ROE	219	.013112	1.181951	-13.21498	.9516071
TDTA	219	.2937755	.2847737	-.1627625	1.833533
Tang	220	.3691356	.3015277	-.4162825	.9793391
Flex	220	.6308644	.3015277	.0206609	1.416283
Size	220	12.79227	1.281249	10.15929	16.77118
Risk	563	-.5677352	10.31312	-191.6291	57.52785
Inflation	603	13.26082	3.648332	8.726837	19.25071
GDP	603	7.201111	3.170221	3.92	14.05

As expected, ROE and ROA are strongly correlated with each other because they are both measures of return (Table 3). Also, they are both weakly correlated with the dependent variables, signalling the absence of multicollinearity in the

[7] Data DOI: http://dx.doi.org/10.17632/gx572w29sr.2

data. The VIF test results show that the VIF values (individual and total) are within the acceptable region (see Appendix 2).

ROA and ROE are both also negatively correlated with Tang, TDTA, and Inflation but, positively correlated with Flex, Size, Risk, and GDP, exhibiting a weak relationship in all cases. Thus, a rise in debts, fixed assets, and higher inflation rate reduces firm returns. But, a rise in firm size, monetary assets, risk and economic improvement in the macroeconomy has a reverse effect on returns.

It is also interesting to note the negative relationship between debt (TDTA) and fixed assets (Tang) showing that much of the firms' fixed assets do not necessarily come from debt. Fixed assets also negatively related to current assets as they equal total assets. Another interesting note is the negative correlation between debts and inflation, signalling that in times of low inflation, firms borrow more and vice versa. It is seen from the data also that fixed assets and size negatively correlate the GDP showing that in periods of low economic growth, firms invest more on fixed assets to grow the business rather than spend on other factors.

Current assets (Flex) is also observed to be negatively correlated with firm size, risk and inflation. The interpretation is that if the firms hold more liquid assets, they deprive themselves of other investment and growth opportunities. Also, the firms hold more cash or invest in risky projects in low inflation environments and vice versa.

Table 3: Correlation Table

	ROA	**ROE**	**TDTA**	**Tang**	**Flex**	**Size**	**Risk**	**Inflation**	**GDP**
ROA	1.0000								
ROE	0.8212	1.0000							
TDTA	-0.2407	-0.2650	1.0000						
Tang	-0.2320	-0.1088	-0.0435	1.0000					
Flex	0.2320	0.1088	0.0435	-1.0000	1.0000				
Size	0.2166	0.2133	0.2475	0.1139	-0.1139	1.0000			
Risk	0.0705	0.0655	0.0237	0.0329	-0.0329	0.0394	1.0000		
Inflation	-0.1040	-0.0825	-0.0897	0.1216	-0.1216	0.1512	-0.0344	1.0000	
GDP	0.0737	0.0541	0.0904	-0.1178	0.1178	-0.1860	0.0013	-0.8896	1.0000

The regression outputs are presented in the tables that follow;

The R-squared for the regression models ranged from 28% to 34%. For the random effects regression, the wild chi^2 values and the probabilities are shown (and the R squared omitted). The Wald chi^2 probabilities are significant at 0.00

in all cases showing the statistical strength and significance of the findings. The number of firms was between 64 and 60 in the regression output showing a wide data set hence statistically significant results.

Table 4 presents the random effects (model 1-3) and fixed effects (model 4-6) of the regression models earlier presented. With regards to the random effects estimations (model 1-3), Size and its variants are significant in all cases. In model 1, firm size and risk both have a positive coefficient signalling they positively affect firm profitability, albeit the coefficient of risk is not significant. The size coefficient shows a positive and significant short term effect of firm size on firm profitability. TDTA, Tang, and GDP and inflation all have negative and significant coefficients with the exception of GDP and inflation, whilst flex is omitted. A percentage point increase in Total debts (TDTA) and fixed assets (Tang) negatively diminishes firm profitability by about 42 and 28 percentage points respectively, at a 1% level of significance. The standard errors of these coefficients are also very small showing less variation from the mean. With regards to size, a 1% increase in the value of the firm size results in profitability increasing by 0.00105 units. This is also significant at 1% and with a lower variation from the mean. These findings are consistent with other studies (Cekrezi, 2015; Charumathi, 2012; Owusu-Sekyere & Kotey, 2019).

Model 2 examines the lagged effect of firm size on profitability. It is observed from the results that the effect of debts, fixed assets, risk, inflation and GDP are consistent with the results of model 1 except fixed assets (Tang) which was significant at 10%. The lagged value of Size is observed to be significant at 1% and positive. Its coefficient shows that a 1% increase in the lagged value of size will lead to firm profitability increasing by 0.0621 units. It is also worth noting that the coefficient of L.Size was smaller than Size in model 1 signalling it's unit-effect is lower comparatively. There is also less variation of the coefficient from the mean. This shows evidence that based on the data, last year's firms size significantly contributes to this year's profits.

Model 3 examines the non-linear effect of size on profitability. As suspected, the results show that firm size is non-linear. Again, the coefficients of the other independent variables are consistent with the findings observed in equations 1 and 2. With regards to the firm size, the positive coefficient is significant at a 1% level of significance, showing a positive short term effect of size on firm profit. The $Size^2$ coefficient which is the squared value of Size (meant to capture the quadratic effect of size) is also significant at a 1% significance level but the coefficient is negative showing that the graph of firm size exhibits an inverse-U shape or parabola. It also shows that the long term effect of firm size on firm profits is negative. The negative coefficient of -0.0405 indicates that beyond a certain point, increase in size negatively affects profitability. This means when the size of the firm goes beyond a certain point (i.e the inflection point/vertex), a 1 percentage increment in size would lead to profitability falling by 0.000405 units. This finding shows that size is non-linear but to statistically conclude that size has a quadratic relationship, we have to further test if the graph of the variable forms a parabola. We start by calculating the inflection point or vertex which shows the point at which the curve bends.

The inflection point is calculated using the formula;

inflection point or location of vertex $= -\beta_{Size}/(2*\beta_{Size}{}^2)$

Where $-\beta_{SIZE}$ is the negative coefficient of the Size variable and β_{SIZE2} is the coefficient of $Size^2$. The calculated inflection point/vertex is 14.321. To statistically confirm whether size is quadratic or parabola in shape, we compare the inflection point to the data range (see Appendix 1). The inflection point falls within the data range showing that size is quadratic. Also, the inflection point falls slightly to the right from the measures of central tendency (median =12.64; Mean =12.79). The Skewness value of 0.52 also partially confirms this (i.e. it is slightly rightly skewed). The data is also leptokurtotic with a value of about 3 (See Appendix 1).

The inflection point of 14.321 tells us that when firm size is below 14.321 (i.e. with total assets below GHS1,660,000), there exists a positive relationship between firm size and profitability, but when size reaches the inflection point, the highest positive returns from size is attained. When size exceeds this value, the positive marginal returns on profitability turns negative – thus increase in firm size results in a fall in profits. This confirms that the effect of size on profitability is non-linear in general and quadratic in specifics.

It can also be observed from the Size and $Size^2$ coefficients that the former is greater than the latter. Which implies that the effects of positive firm size growth effect on profitability (before the inflection point) is more pronounced than the negative firm size growth in profits which occurs after the inflection point.

Table 4: ROA Regression Output

Variables	(1) ROA	(2) ROA	(3) ROA	(4) ROA	(5) ROA	(6) ROA
TDTA	-0.416***	-0.544***	-0.404***	-0.426***	-0.706***	-0.411***
	(0.0704)	(0.0889)	(0.0676)	(0.0859)	(0.119)	(0.0826)
Tang	-0.284***	-0.206**	-0.256***	-	-0.314**	-
	(0.0738)	(0.0850)	(0.0714)		(0.146)	
Flex	-	-	-	0.200*	-	0.165
				(0.108)		(0.104)
Size	0.105***		1.160***	0.166***		1.280***
	(0.0191)		(0.241)	(0.0337)		(0.312)
Size2			-0.0405***			-0.0438***
			(0.00922)			(0.0122)
L.Size		0.0621***			0.00868	
		(0.0222)			(0.0607)	
Risk	0.00142	0.00117	0.00142	0.00129	0.000979	0.00132
	(0.00117)	(0.00127)	(0.00111)	(0.00121)	(0.00158)	(0.00116)
Inflation	-0.0153	-0.0113	-0.0130	-0.0177*	-0.00613	-0.0133
	(0.0105)	(0.0195)	(0.0100)	(0.0106)	(0.0211)	(0.0103)
GDP	-0.00440	0.0133	0.00115	-0.00465	0.0111	0.000851
	(0.0109)	(0.0274)	(0.0105)	(0.0111)	(0.0296)	(0.0107)
Constant	-0.805**	-0.353	-7.694***	-1.767***	0.363	-8.844***
	(0.323)	(0.529)	(1.598)	(0.480)	(0.920)	(2.024)
Observations	212	141	212	212	141	212
Number of Firms	64	60	64	64	60	64
Inflection/ Vertex			14.321			14.612
R-squared				0.289	0.352	0.349
Wald Chi^2	69.80	47.24	95.48			
Wald Chi^2 prob.	0.000	0.000	0.000			

Notes: ROA- Return on Assets, ROE- Return on Equity, TDTA- Total Debt to Total Assets, Tang- Fixed Assets to Total Assets, Flex- Current Assets to Total Assets, Size- Size of the Firm, L.Size- Lagged value of size, $Size^2$- Squared value of size, Risk- Firm Risk, Inflation, and GDP- GDP growth rate. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Model 4 to 6 mirrors the regression structure of model 1 to 3, using a fixed-effects approach. The results are similar to what we found earlier. In equation 4, TDTA, inflation and GDP all exhibit a negative relationship on profitability, albeit the GDP results were not significant. Fixed assets (Tang) is omitted in this case and monetary assets (Flex) included which has a positive coefficient and is significant at 10% level of significance. Similarly, firm size has a significantly positive effect on profitability showing that a 1% increase in firm size will result in profitability increasing by 0.00166 units. This finding is consistent with the earlier discussions. In model 5, the results are similar to model 4, only that fixed assets is omitted, and monetary assets included which is also significant at 10% and positively affects profitability (ROA). In these results, the lagged value of size exhibits a positive effect on profitability but it is not significant in this case.

In model 6, the regression results show a non-linear effect of size on profitability. Size has a positive coefficient and its significant at 1% level of significance. The coefficient is also bigger than that of model 3. Thus, when size increases by 1%, profitability increases by 0.0128 units. The coefficient of the quadratic variable ($Size^2$) is negative signalling a non-linear relationship of size on ROA. Thus, when the size of the firm grows exponentially, profits increase but beyond a certain point, size begins to negatively affect profits. When the size of the firm is below the inflection point, size exhibits a positive relationship on firm profitability, but beyond the inflection point, size begins to exhibit a negative relationship. These results are similar to what was observed in model 3.

In support of the shareholder theory, we use Return on Equity (ROE) as a measure of profitability in the next batch of regressions and present the findings below;

Using random effects estimation, model 7 shows that, similar to model 1, firm size has a positive and significant effect on firm ROE. Even though the mean value of ROA was higher than ROE (see Table 2), Size had a larger effect on ROE than ROA. The coefficient of Size in model 7 was double that of regression 1 suggesting that firm size explains more of the returns on equity. The same doubling effect is observed in the fixed effects regression (model 10). This is intuitive as bigger firms will pay more equity to their shareholders, all things being equal. However, the standard errors are much high for regression 7 and 10 indicating larger variations of the mean (coefficients).

We also observe a positive effect of lagged Size on the ROE in both the fixed effects and random effects estimations (model 7 and 10). However, the effect was only significant in the random effects estimation (model 8). In this case, the coefficients more than triple, when compared to reg. 2 (ROA), affirming the earlier assertion. Thus, the previous year's size of the firm has a more than triple effect on equity returns.

Table 5: ROE Regression Output

	Random Effects			Fixed Effects		
Variables	**(7) ROE**	**(8) ROE**	**(9) ROE**	**(10) ROE**	**(11) ROE**	**(12) ROE**
TDTA	-1.045***	-1.414***	-1.051***	-1.333***	-1.994***	-1.289***
	(0.182)	(0.276)	(0.178)	(0.260)	(0.435)	(0.250)
Tang	-0.408**	-0.168	-0.378**	-	-0.829	-
	(0.171)	(0.239)	(0.170)		(0.536)	
Flex	-	-	-	0.575*		0.471
				(0.326)		(0.314)
Size	0.212***		2.465***	0.389***		3.722***
	(0.0421)		(0.610)	(0.102)		(0.944)
$Size^2$			-0.0858***			-0.131***
			(0.0232)			(0.0369)
L.Size		0.195***			0.0380	
		(0.0592)			(0.223)	
Risk	0.00317	0.00286	0.00320	0.00227	0.00155	0.00238
	(0.00338)	(0.00405)	(0.00326)	(0.00366)	(0.00579)	(0.00352)
Inflation	-0.0351	-0.0341	-0.0333	-0.0553*	-0.0303	-0.0422
	(0.0320)	(0.0668)	(0.0306)	(0.0322)	(0.0776)	(0.0312)
GDP	-0.000583	0.0350	0.00816	-0.0121	0.0129	0.00434
	(0.0331)	(0.0943)	(0.0318)	(0.0334)	(0.109)	(0.0325)
Constant	-1.713**	-1.576	-16.44***	-4.048***	0.889	-25.23***
	(0.840)	(1.695)	(4.065)	(1.451)	(3.377)	(6.125)
Observations	212	141	212	212	141	212
Number of firms	64	60	64	64	60	64
Inflection / Vertex			14.365			14.206
R-squared				0.252	0.242	0.313
Wald Chi^2	52.64	31.28	69.86			
Wald Chi^2 prob.	0.000	0.000	0.000			

Notes: ROA- Return on Assets, ROE- Return on Equity, TDTA- Total Debt to Total Assets, Tang- Fixed Assets to Total Assets, Flex- Current Assets to Total Assets, Size- Size of the Firm, L.Size- Lagged value of size, $Size^2$- Squared value of size, Risk- Firm Risk, Inflation, and GDP- GDP growth rate. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

16. To the extent that our regressors are lagged, the slope homogeneity tests are conducted to allow for the lags.

With regards to model 9 and 12, a non-linear effect of size on ROE is observed in both the random and fixed-effects models. It is observed also that before the inflection point, Size has a larger effect on ROE (compared to ROA) than beyond the inflection point where firm size has a negative effect on returns. The inflection point was around 14 (14.36 for the random effects model -model 9- and 14.20 for the fixed effects model- model 12). The results are also significant at a 1% level of significance.

As expected, debt (TDTA) had a negative and significant effect on ROE (models 7 to 12) and so did fixed assets (Tang) albeit only significant in models 7 and 9. Monetary Assets (Flex) had a significant positive effect to ROE and the coefficient was bigger than that of fixed assets indicating that for the insurance brokerage firms understudied, monetary assets was a bigger contributor to firm returns. Risk had an insignificant positive effect on ROE on all versions of the model. Inflation had a negative effect on return but was only significant in model 10 whilst GDP had an insignificant mixed effect on ROE. These findings are similar to the ROA regression output and are also expected following Owusu-Sekyere & Kotey (2019).

Findings from our robust regression (model 13 and 14) and panel-corrected standard errors regression (model 15 and 16) are presented below;

Model 13-16 examines the nonlinear effect of Size on ROA and ROE using robust standard errors (Model 13 and 14) and panel corrected standard errors (model 15 and 16). The findings are similar to what we found in the regression tables presented in table 4 and 5.

First, we observe the non-linear effect of Size on both ROA and ROE; the non-linear effect is in the shape of an inverse-U and falls on the right of the mean value of Size indicating that the curve is negatively skewed; the inflection points (model 13 to 16) are larger signalling the curve for firm size is skewed to the left. It also signals a longer positive growth path than a negative growth path. The coefficients for Size are much bigger for the robust models but their standard errors are also larger in this case showing that there is larger variation in the mean values. The level of significance is also smaller in model 13 and 14.

TDTA had a significant negative effect on returns with the exception of reg. 14. Tang also exhibited a significant negative effect on ROA and ROE. FLEX was omitted in all the regressions. Risk had a significant positive effect on returns in all the robust models. The very small coefficients indicate that the positive effect on returns is very small. Inflation had a negative effect on returns, but it was only significant in model 16. GDP had a negative effect on returns in models 13 and 14, but the relationship changed to positive in models 15 and 16. None of them, however, were significant.

TABLE 6: ROBUSTNESS RESULTS

	Robust regression		**Panel-corrected standard errors**	
Variables	**(13) ROA**	**(14) ROE**	**(15) ROA**	**(16) ROE**
TDTA	-0.209***	0.0266	-0.392***	-1.028***
	(0.0372)	(0.0521)	(0.0684)	(0.337)
Tang	-0.192***	-0.271***	-0.266***	-0.354*
	(0.0341)	(0.0459)	(0.0858)	(0.183)
Flex	-	-	-	-
Size	0.246**	0.325*	1.017***	2.305***
	(0.125)	(0.171)	(0.261)	(0.557)
$Size^2$	-0.00818*	-0.0107	-0.0354***	-0.0798***
	(0.00474)	(0.00649)	(0.00959)	(0.0202)
Risk	0.00150**	0.00444*	0.00155***	0.00345***
	(0.000704)	(0.00247)	(0.000449)	(0.00127)
Inflation	-0.00693	-0.00939	-0.0126	-0.0305*
	(0.00677)	(0.00911)	(0.00854)	(0.0177)
GDP	-0.00636	-0.00591	0.00519	0.0120
	(0.00702)	(0.00944)	(0.0100)	(0.0189)
Constant	-1.412*	-1.954*	-6.712***	-15.45***
	(0.832)	(1.143)	(1.776)	(3.666)
Observations	212	210	212	212
R-squared	0.265	0.227	0.306	0.251
Number of firms			64	64
Inflection / Vertex	15.037	15.18	14.364	14.607

Notes: ROA- Return on Assets, ROE- Return on Equity, TDTA- Total Debt to Total Assets, Tang- Fixed Assets to Total Assets, Flex- Current Assets to Total Assets, Size- Size of the Firm, L.Size- Lagged value of size, $Size^2$- Squared value of size, Risk- Firm Risk, Inflation, and GDP- GDP growth rate. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

We perform a quantile regression to examine this non-linear effect across the quantiles examining different effects along the distribution of the dependent variable (firm returns). To justify running a quantile regression, we test for heteroscedasticity using the Breusch-Pagan test for heteroskedasticity (see appendix 3). The fact that our dependent variables (ROA and ROE) were continues, non-zero and non-repetitive values also aided in the appropriateness of this regression.

We run two sets of quantile regression; in Set 1 (model 18-20) ROA is the dependent variable. In Set 2 (model 22-24), ROE is the dependent variable. We juxtapose the quantile regressions with OLS regression (model 11 for set 1 and model 21 for set 2) as is standard practice for comparison. Two interpretations are drawn from the values; 1. The significance of the coefficients from zero (represented by *) and 2. The significant difference of the quantile coefficients from the OLS regressions (represented by +). The findings are discussed below. Appendix 4 presents the graphical presentation of this relationship.

In Set 1, the non-linear effect of Size on ROA is insignificant in the 25th percentile. In the 50th percentile, the results show a significant non-linear effect showing that firms with returns in the median percentile have their size being non-linear. In the 75th percentile, the results on firm size are not significant. Also, looking at the coefficients of size, it is observed that the effect of size on profitability increases across percentiles with the higher percentiles exhibiting a higher effect on size. $Size^2$ is also seen to be significantly different from the OLS coefficients in all the quantile regressions, which suggest the negative effects may be less pronounced across quantiles.

In Set 2, a similar relationship is observed with the median and higher percentiles exhibiting a non-linear effect of firm size on equity returns. In this case, the median and 75th percentile have significant results. Also, the effect of firm size on returns increases across percentiles. With Size in the 25th percentile not significant, just as in set 1, it shows that the non-linear effect observed does not affect firms with low returns (in the 25th quantile).

TDTA had a negative effect on ROA and ROE in both sets of equations. The coefficients also increase across quantiles signalling that brokerage firms with higher returns were more affected by debt than those with lower returns. The quantile debt coefficients were significantly different from the OLS coefficients (except model 20), signalling effects of debts in the quantiles were less pronounced than the general effect of the firms as a whole. Tang also exhibits a significant increasing effect on returns across quantiles. Risk had an insignificant positive effect on returns in both sets except reg. 22 at the 25th percentile. As observed in the other regressions, the coefficients were very small indicating a small effect on returns. Inflation and GDP also had a negative insignificant effect on returns as observed in the other regressions.

Table 7: Quantile Regression

Variables	OLS (17) ROA	25th Percentile (18) ROA	50th Percentile (19) ROA	75th Percentile (20) ROA	OLS (21) ROE	25th Percentile (22) ROE	50th Percentile (23) ROE	75th Percentile (24) ROE
TDTA	-0.392***	-0.208***+	-0.221***+	-0.290***	-1.028***	-0.230*+	-0.0156+	-0.0202+
	(0.0667)	(0.0729)	(0.0415)	(0.0597)	(0.175)	(0.127)	(0.0625)	(0.0708)
Tang	-0.266***	-0.250***	-0.184***+	-0.176***	-0.354**	-0.342***	-0.280***	-0.329***
	(0.0612)	(0.0669)	(0.0381)	(0.0548)	(0.161)	(0.116)	(0.0574)	(0.0650)
o.Flex	-	-	-	-	-	-	-	-
Size	1.017***	0.276	0.288**	0.304	2.305***	0.632+	0.489**+	0.544**+
	(0.224)	(0.244)	(0.139)	(0.200)	(0.587)	(0.425)	(0.210)	(0.238)
$Size^2$	-0.0354***	-0.00883+	-0.00921*+	-0.0104+	-0.0798***	-0.0208+	-0.0164**+	-0.0189**+
	(0.00850)	(0.00928)	(0.00529)	(0.00760)	(0.0223)	(0.0162)	(0.00797)	(0.00902)
Risk	0.00155	0.00104	0.00114	0.00172	0.00345	0.00452*	0.00137	0.00201
	(0.00126)	(0.00138)	(0.000786)	(0.00113)	(0.00331)	(0.00240)	(0.00118)	(0.00134)
Inflation	-0.0126	-0.0115	-0.00302	-0.00927	-0.0305	0.00661	-0.00677+	-0.0159
	(0.0122)	(0.0133)	(0.00756)	(0.0109)	(0.0319)	(0.0231)	(0.0114)	(0.0129)
GDP	0.00519	-0.0106	-0.000554	-0.00569	0.0120	0.0153	0.000268	-0.00850
	(0.0126)	(0.0138)	(0.00783)	(0.0113)	(0.0330)	(0.0239)	(0.0118)	(0.0134)
Constant	-6.712***	-1.657	-1.874**	-1.650	-15.45***	-4.617+	-3.176**+	-3.146**+
	(1.494)	(1.632)	(0.929)	(1.337)	(3.918)	(2.841)	(1.400)	(1.586)
Observations	212	212	212	212	212	212	212	212
R-squared	0.306				0.251			

Notes: ROA- Return on Assets, ROE- Return on Equity, TDTA- Total Debt to Total Assets, Tang- Fixed Assets to Total Assets, Flex- Current Assets to Total Assets, Size- Size of the Firm, L.Size- Lagged value of size, $Size^2$- Squared value of size, Risk- Firm Risk, Inflation, and GDP- GDP growth rate. Standard errors in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$

6.1. Diagnostics and robustness checks

A number of standard procedures were adopted to ensure the reliability and efficiency in the results and models estimated. First, to avoid outlier biases, we screen out outliers from our data, as confirmed by the summary statistic. Second, we employ the Pearson's correlation matrix to check for multicollinearity. We performed a VIF test to further check for multicollinearity. Our mean VIF falls within acceptable levels showing our variables are not multicollinear. Third, we employ a number of estimation strategies to ensure consistency and reliability in results across the different estimation strategies. We find consistency in the results presented across the models to a large extent; hence indicating that the results are reliable. We also perform the Breusch-Pagan/Cook-Weisberg test for heteroscedasticity to justify performing quantile regressions on the data. In our quantile regression, we include the median regression in the discussion of our findings because median regression is more robust than an OLS regression. Fourth, we use the robust standard error and panel corrected standard error approach to control for heteroskedasticity and autocorrelation to ensure the results are efficient. Fifth, we employ a unique dataset consisting of 96% of the population as our sample set. Therefore, the results adequately reflect trends in the insurance brokerage market within the Ghanaian context. These procedures and standards ensure our results are reliable, accurate, efficient and fit or good for generalization in the context of insurance brokerage firms in Ghana.

7. Conclusion and recommendations

The study sought to critically examine the effect of size on profitability of Ghanaian insurance brokerage firms using a unique data set of 64 insurance brokerage firms spanning a 9-year period (2007-2015). The research examined the lagged effect, the short term-long term effect and non-linear effect of firm size on profitability from a shareholder (ROE) and stakeholder (ROA) perspective, as well as examining the non-linear effect across quantiles.

The research findings revealed that similar to other studies (eg. Charumathi, 2012), the short term effect of firm size on firm profitability was positive. But the long term effect turned negative showing a non-linear effect of size on profitability. The positive firm-size effect seemed to be larger than the negative size-effect with the size curve exhibiting a quadratic inverse-U shape with an inflection point above the median. The lagged effect of size also positively and significantly affected firm returns implying previous year's firm size has a pronounced effect on current year firm returns. When this effect is examined in quantiles, the nonlinear effect improves across quantiles; the non-linear effect is prevalent in the median quantile and above (i.e. 50th and higher). For lower quantiles, there is no significant non-linear effect of size on returns.

The study provides fresh insights into the size-profitablity nexus in Ghanaian brokerage firms and provides meaningful applications or considerations for growth policies and decision making. The study recommends that growth policies need to be properly looked at as some levels of growth may harm profits. Again, larger brokerage firms with total assets more than GHS1,660,000 should consider growing in size in a staggered approach rather than ploughing back profits to grow the firm as growth in size beyond a certain point would be detrimental to firm returns. Growing the firm by taking a staggered and reflective approach would safeguard the insurance brokerage firm from growing beyond its inflection point.

Biographical Notes

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Appendices

Appendix 1. Size

Below is a detailed summary of the Size variable.

Detailed Descriptive statistics of SIZE

	Percentiles	Smallest		
1%	10.33667	10.15929		
5%	10.88471	10.23724		
10%	11.18965	10.33667	Obs	220
25%	11.98023	10.36126	Sum of Wgt.	220
50%	12.63861		Mean	12.79227
		Largest	Std. Dev.	1.281249
75%	13.42992	15.63301		
90%	14.73564	15.63682	Variance	1.641598
95%	15.39269	15.67906	Skewness	.5200126
99%	15.63682	16.77118	Kurtosis	2.9699

Appendix 2. Variance Inflation Factor (VIF)

The Variance Inflation Factor measures how much the variance is inflated, which in effect tests for multicollinearity as variables with inflated variances are multicollinear. We conducted a VIF test on our independent variables (variables of interest). The findings are presented in the table below;

Variable	VIF	1/VIF
GDP	4.89	0.204474
Inflation	4.83	0.206909
Size	1.13	0.883013
TDTA	1.09	0.915731
Tang	1.03	0.971090
Risk	1.01	0.991998
Mean VIF	2.33	

The VIFs for each of the predictors were between 1.01 and 4.89 with the mean value being 2.33, which is very low. The standard practice is that VIFs of above 4 needs to be further investigated, whilst those exceeding 10 are signs of serious multicollinearity requiring correction. GDP and Inflation are slightly above 4, but they are macro variables (also not our variables of interest) and do not significantly affect the mean VIF which is well below 4, therefore we do not test further. Since all our variables have VIFs less than 5, we do not further test for correlation in our variables.

Appendix 3. Heteroscedasticity

As a pre-estimation test, we test for heteroscedasticity by conducting the Breusch-Pagan/Cook Weisberg test for heteroscedasticity. This test checks if the standard errors are biased or not. A biased standard error indicates that the independent variables may be heteroscedastic. The null hypothesis states that the variance of the errors are constant, and the alternate hypothesis is that the variance are not constant. After running the test, the findings are here presented.

The P values for both estimations are more than 0.05 which means they're not significant, so we fail to reject the null hypothesis and conclude that the errors do have a constant variance. Therefore, using robust standard errors is appropriate. Also, the presence of heteroscedasticity in the variables justifies the use of quantile regression.

Breusch-Pagan/Cook-Weisberg Test for Heteroscedasticity

ROA Estimations

	Coefficients			
	(b)	**(B)**	**(b-B)**	**sqrt(diag(V_ bV_B))**
	fe	**re**	**Difference**	**S.E.**
TDTA	-0.41116	-0.40378	-0.0073741	0.0475551
Tang	-0.16527	-0.25568	0.0904075	0.0755508
Size	1.279697	1.160007	0.1196894	0.1979344
$Size^2$	-0.04384	-0.04046	-0.0033789	0.0079994
Risk	0.001324	0.001422	-0.0000984	0.0003361
Inflation	-0.01327	-0.01295	-0.0003149	0.0023198
GDP	0.000851	0.00115	-0.0002995	0.0023198

Notes: b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
$chi^2(7)$ = (b-B)'[(V_b-V_B)^(-1)](b-B) = 8.97
Prob>chi^2 = 0.2547

ROE Estimations

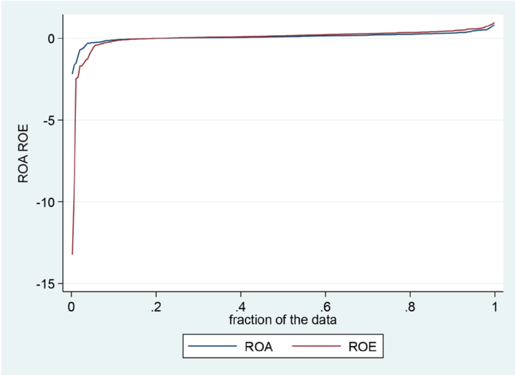
	Coefficients			
	(b)	**(B)**	**(b-B)**	**sqrt(diag(V_ bV_B))**
	fe2	**re2**	**Difference**	**S.E.**
TDTA	-1.28892	-1.05142	-0.2375	0.1854117
Tang	-0.47128	-0.37796	-0.09332	0.2753502
Size	3.721977	2.465009	1.256968	0.7552907
$Size^2$	-0.13121	-0.08579	-0.04541	0.0301043
Risk	0.002378	0.003195	-0.00082	0.0015783
Inflation	-0.04215	-0.03328	-0.00888	0.0094346
GDP	0.004345	0.008162	-0.00382	0.0101377

Notes: b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
$chi^2(7)$ = (b-B)'[(V_b-V_B)^(-1)](b-B) = 12.35
Prob>chi^2 = 0.0897

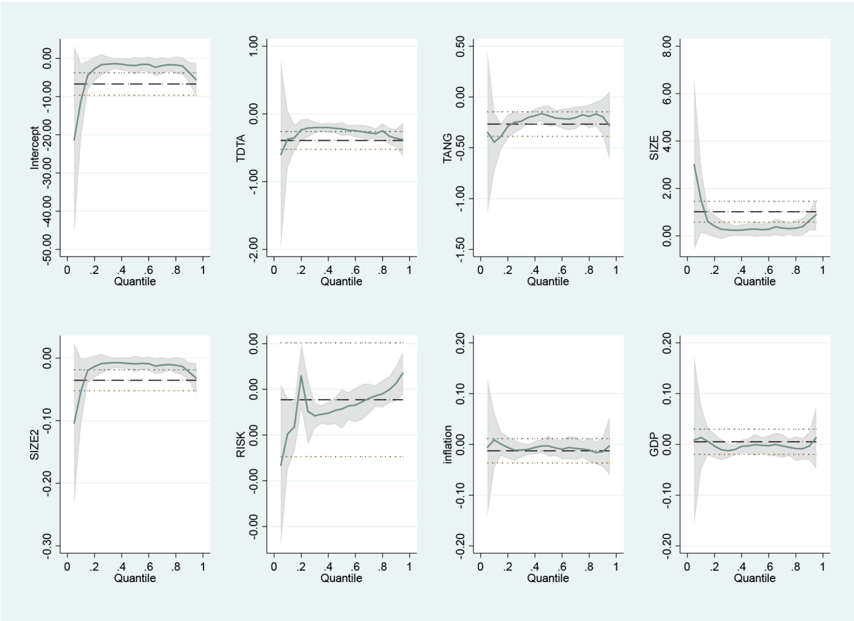
Appendix 4. Quantile graphs

From the Qplot below, ROE comparatively has more negative values close to the 0th percentile in the data than ROA. The ROA and ROE are very similar in shape. ROE is slightly lower than ROA in the lower quantile, but this reverses in the higher quantiles.

ROA and ROE Qplot Graph



From the quantile graphs, Size and Size^2 are observed to be significantly different from the OLS regression in the middle quantiles (from 0.2 to 0.9). The quantile coefficients for Size are significantly lower than the OLS coefficients in the respective region whilst the relationship reverses in Size^2 where the quantile coefficients for Size^2 are significantly higher than the OLS coefficients. TDTA is also seen to be significantly higher than the OLS regression in the lower middle quantiles (from 0.2 to 0.6).



Notes: Where broken horizontal lines- OLS coefficients, dotted horizontal lines- OLS confidence interval, green line- quantile coefficients, Grey area- quantile confidence intervals.