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FIRM FINANCIAL PERFORMANCE IN THE GLOBAL 1000: DOES HUMAN CAPITAL EFFECTIVENESS MATTER?

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COMPULSORY DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work, each significant contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, cited and referenced.

Signature: Date: 26 September 2018

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"Be grateful for whoever comes [into your life], because each has been sent as a guide from beyond."

– Jallaludin Rumi

Abstract

Organisations worldwide spend a substantial proportion of revenue on salaries and benefits (compensation) as an investment in employees who are regarded as human capital. The justification behind this investment is the theoretical assertion that investments in human capital predict financial performance but empirical support for this relationship is limited. The present study contributes to the extant literature by examining the relationship between human capital effectiveness (HCE) and financial performance. A further contribution of the research is to consider alternative criteria of financial performance as findings may be dependent on operationalisation of the criterion. The relationships we tested were between Human Capital Return on Investment (HCROI) and (1) Return on Assets and (2) Return on Equity. Drawing on the Resource Based View theory, we conducted a study using 10 years of data from a sample that comprised the Global 1000 (highest revenue, listed firms domiciled across 45 countries). We used a retrospective correlational study. Spearman Correlation (r_s) analysis revealed significant effects for the relationships we investigated in all years. Moreover, meta-analysis showed these effects to be significant on average across the 10 years, showing moderate strength and relative stability. A corollary of the study is that we established global benchmarks for HCROI and provided the first empirical evidence that supports a positive relationship between HCE and financial performance. These findings may be useful to investors who seek possible indicators of expected financial performance from HCE. In doing so, the study suggests we should expand financial reporting to include HCE indicators. Implications of findings and study limitations are noted.

Key words: human capital, human capital effectiveness, human capital return on investment, HCROI, financial performance, return on assets, ROA, return on equity, ROE, meta-analysis.

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Firm Financial Performance in the Global 1000: Does Human Capital Effectiveness Matter?

Management has informed you, the HR manager, that the spend of between 20% - 70% (Fitz-enz, 2000) of hard earned revenue on the salary and benefits expense, to reward and invest in employees, is excessive therefore management has gained shareholders' support to have this expense reduced. How do you convince these stakeholders to view revenue spent on Human Capital as a necessary investment that can be leveraged to attain important outcomes such as financial performance instead of as a grudge expense?

You could gather support from decades of research on human capital (HC) which suggests that HC is more important than physical capital in the realisation of business goals (Becker, 1962; Schultz, 1961) however, these propositions are theoretical. Some literature further postulates theoretical *outcomes* that can be achieved by investing in employees such as sustained competitive advantage, profitability and improved financial performance (Becker, 1962; Cascio & Boudreau, 2011; Fitz-enz, 2000; Huselid & Barnes, 2002). Moreover, recent studies empirically demonstrate that the relationship between HC and *firm* performance is significant and positive.

In addition to the academic reasoning above, global consulting firms such as McKinsey Consulting, Deloitte and Price Waterhouse Coopers (PWC) dedicate consulting teams and services on HCE related projects (Guenole, Ferrar, & Feinzig, 2017). These firms have established the use of HR metrics to quantify HC within the firm and in noteworthy client firms such as McDonalds (Guenole et al., 2017) and other Fortune 500 firms.

However, despite the commitment of academia and practice in propelling our realisation of HC's contribution to the success of the organisation, some key authors highlight that scholarly empirical support for the financial impact of investing in people is unknown (Becker, Huselid, & Ulrich, 2002; Cascio & Boudreau, 2011; Fitz-enz, 2009b). The question remains: Do firms that invest in HC realise higher financial performance?

The aim of the proposed study is to address this question and explore whether investing in HC can predict financial performance outcomes. That is, do firms that invest in Human Capital Return on Investment (HCROI) tend to report higher Return on Assets (ROA) and Return on Equity (ROE).

We carefully considered the operationalisation of the focal variables. We used HCROI as a measure of the independent variable HC, while ROA and ROE were used as measures of the dependant variable which is financial performance. We considered alternative criteria to measure financial performance as findings may be dependent on operationalisation of the criterion. Moreover, we investigated the research question by operationalising the constructs using measures relevant to stakeholders who routinely rely on ROI metrics to interpret the financial health of organisations (Fitz-enz, 2009b; Fitz-enz, 2010).

The participant population we studied comprised the Global 1000 (highest revenue, listed firms domiciled across 45 countries). We conducted a retrospective correlational study using Spearman Correlation (r_s) analysis to test the effects for the relationships we investigated in all years. Moreover, meta-analysis was used to test the effects on average across all years of study.

Conducting the study in this manner is warranted because in a world where profitable and successful organisations impact a country's economy, stakeholders, employees and customers alike, it is important that we provide empirical support to the debate about HC in relation to financial performance (Becker et al., 2002; Huselid & Barnes, 2002; Schiemann & Ulrich, 2017). Furthermore, we as Human Resource Management practitioners (HRM) must gather support for investments in HC by accurately and credibly communicating the implications of such investments to shareholders and management (Cascio & Boudreau, 2011; Schiemann & Ulrich, 2017).

A second reason why this approach is warranted relates to stakeholder perspectives. The results derived from this study, will advance our understanding of HC by providing the first evidence in support or refutation of, a relationship between HC and financial performance. These findings may be beneficial to both management and investors who seek indicators of expected financial performance from HC. If a positive correlation is found, HRM will have empirical support to defend investments in human capital investment. More specifically, they will be able to defend substantial compensation and benefit costs by presenting factual findings which indicate that increased financial performance can be realised. If there is no correlation, stakeholders and the HC academic fraternity may reconsider arguments for the investment in HC and further probe the construct.

In light of this, the research question is: *Does a consistent (over time) correlation exist between human capital effectiveness (expressed as HCROI) and financial performance (expressed as ROA and ROE) in a sample of highest revenue, global, listed companies.*

This study will present the research in five chapters, the first chapter introduces the research topic, the second chapter forms a literature review which contemplates previous theoretical and limited empirical literature related to the focal construct's human capital and firm performance. Based on the literature review, hypotheses are formulated linking HC to firm performance. The third chapter is the methods section which details our approach in terms of research design, measurement strategies, sampling and statistical analyses used to investigate our hypotheses. In the fourth chapter we present our findings following statistical analyses of our hypotheses. The fifth chapter is the discussion section which discusses our findings in relation to the literature review presented in the second chapter. Lastly, we present the conclusion to the study.

Literature Review

This chapter explores the two constructs underpinning this study, namely, human capital (HC) and financial performance. First, the HC construct will be defined and several theories / models on HC will be presented. Second, we will focus on the measurement of HC, particularly HCROI. Third, we will discuss financial performance and present relevant measures of financial performance. Lastly, a review of the literature focussing on both HC and financial performance will be presented, bringing the two constructs together.

Human Capital Background

While HC is now a well-known term that is "part of our lingua franca" this was not always the case (Goldin, 2016, p. 56). Traditionally, in the industrial era, physical capital was thought to be the main contributor to growth in firm revenue without consideration for intangible factors. That is, it was believed that if the firm had better equipment and machinery, more products could be produced thus allowing higher sales and subsequently, higher revenue. In recent years, this traditional logic has been challenged through research and by practitioners with their findings showing that "the growth of physical capital … explains a relatively small part of the growth in income in most countries" (Becker, 1962, p. 4). Researchers argue that a growth in income is primarily due to an intangible type of capital called HC (Cascio & Boudreau, 2011; Fitz-enz, 2000; Huselid & Barnes, 2002). Additionally, historically, many believed that to regard people as an asset which could be "equated with property and marketable assets" implied slavery (Becker, 1962; Goldin, 2016, p. 2).

Although historically the categorisation of people as an asset was not accepted until 1958, the concept of HC dates as far back as the 1700's to Adam Smith who used the term in his seminal publication, "Wealth of the Nations" (Smith, 2010). Support for the HC construct was propelled when Mincer (1958), a pioneer in economics, presented the first theoretical

publication that conceptualised HC. He reasoned that investment in HC could lead to important outcomes and should be granted equal, if not more importance as other assets such as physical capital.

Following seminal work by (1) Mincer (1958) who conceptualised HC, (2) Theodore Schultz (1961) who theorised the outcomes HC could contribute towards, and (3) Becker (1962) who linked HC to production outputs, HC research increased within multiple disciplines. Moreover, in practise, global consulting firms such as McKinsey, Deloitte, KPMG, and PWC dedicate entire departments to HC research and practise. HC in both research and practise has advanced to become accepted as one of the most important assets to organisations (Guenole et al., 2017). Now that the background on HC has been discussed, the definition of HC will follow.

Definition of human capital

The terms HC and HR are used interchangeably however they have different meanings. Ling and Jaw (2006) wrote that: "*human resource* implies that workers are not merely cost or expenses to be minimized, but a precious resource that companies must treasure. The term *human capital* points to the concept that humans are not merely resources which companies must treasure, but also are 'capital' that can be invested to yield income and other useful outputs over long periods of time" (Ling & Jaw, 2006, p. 380).

HC has evolved over the last 50 years resulting in the conceptualisation of several definitions of HC. HC was originally conceptualised under the economics discipline however it has expanded into multiple disciplines including "entrepreneurship, human resources, industrial-organizational psychology, labour economics, organizational theory, and strategy" (Nyberg & Wright, 2015, p. 287).

While there are nuances within each discipline, consensus among the disciplines when defining the construct is that HC is defined as deliberate time, and money investments, in

employees' education, health and internal migration, that equips employees to take advantage of better opportunities within the organisation and exponentially improves their contribution to the organizations performance (Becker, 1962; Cascio & Boudreau, 2011; Fitz-enz, 2000; Huselid & Barnes, 2002; Mincer, 1958; Schultz, 1961). Now that we have defined HC, the focus will shift to elaborating on theories that underpin our understanding of HC.

Theories of Human Capital

The acceptance of HC in various disciplines has resulted in multiple theories to substantiate the construct. Three theories are prominent in the literature, (1) classical human capital theory, (2) intellectual capital theory and (3) resource-based view theory (RBV). The first two theories are grounded in economics and the third in strategic management, HRM and industrial-organisational psychology disciples.

Classical Human Capital Theory. Classic HC theory originated in economics and classifies employees' as assets that contribute to economic and organisational goals rather than an expense that should be managed (Cascio & Boudreau, 2011; Mincer, 1958, 1981). Like other assets HC has the potential to increase, in value and output, if investments are made in the education of employees (Becker, 1962; Mincer, 1958). Classical HC focusses on investments made in employees through both formal and firm-specific education and the resultant effect on economic and organisational benefits. Recently investments made in public health was added to the research agenda. The rationale behind this theory is that individuals must be both healthy and educated to participate in the labour market (Goldin, 2016).

We found that classical HC theory and related studies have a predominant focus on the consequences of investing in HC on the individual level with little consideration for the organisation. Nyberg and Wright (2015) contend that research should shift its focus to probe the "strategic implications of that individual" (p. 289). Intellectual capital theory addresses

this contention by considering the implications on the organisation when investments are made in employees and will be discussed next.

Intellectual Capital Theory. Intellectual capital (IC) theory postulates the role of intangible capitals as a contributor to important organisational outcomes. It presents a taxonomy of intangible capital comprising three primary components: (1) Human Capital which constitutes the knowledge, skills, talents and experience of employees, (2) Relational Capital which denotes knowledge grounded in relationships with entities that exist outside the firm such as suppliers, creditors, investors and customers and (3) Structural Capital which represents knowledge bases apart from employees' minds (e.g. databases and computer applications).

While IC theory is prominent in the literature and widely applied in accounting related research, limitations to applying this theory as the basis for research on HC exists. Bontis and Fitz-enz (2002) consolidated the findings on various studies to provide support for the constructs that make up IC. They found that it is not clear which component of IC drives firm performance and that "empirical research has been minimal" to support the taxonomy (Viljoen, 2012, p. 29). Furthermore, Marco, Maria Serena, and Stefano (2016) highlight that there are limited measurement tools to measure IC which compromises research directed at gaining empirical insight.

We found it necessary to seek a more robust theory that (1) allows HC to remain the focal variable of study, (2) proposes measurement tools of HC and (3) acknowledges that firm level outcomes are possible following investments in HC. After surveying the broad literature on HC, it was found that RBV is the most relevant theory within the HRM and HC nomological network that considers the firm level outcomes of investing in HC (Chen & Lin, 2004; Crook, Todd, Combs, Woehr, & Ketchen Jr, 2011). The following section will discuss RBV theory.

Resource based view theory. Resource based view (RBV) theory is a contemporary framework that offers insight into why and how HC influences firm performance. RBV presumes that an organisations possession of internal strategic resources such as assets, capabilities and competencies can be leveraged to attain important outcomes e.g. higher productivity leading to superior competitive advantage to outperform competitors and in turn earn higher revenues (Chen & Lin, 2004; Gerhard & Nick, 2007). According to RBV research HC is a strategic resource because it is a rare, valuable and inimitable asset. Furthermore, HC can be leveraged as a source of sustained competitive advantage to attain the mentioned outcomes. Various recent studies strongly support this view.

A meta-analysis study of RBV literature by Crook and colleagues suggests that HC might be a "key factor in explaining why some firms outperform others" (Crook et al., 2011, p. 2). Delery & Roumpi endorse this view, stating that "the RBV-based stream of literature advocates that HC … constitute[s] the main source of sustainable competitive advantage" which drives the success of an organisation (p. 5).

In summary, the theories discussed assert that HC is valuable to the firm because there is value in intangible assets, particularly HC. Moreover, RBV asserts that important outcomes such as sustained competitive advantage and increased profitability can be leveraged through investments in HC. Resultantly, this study will be theoretically grounded in RBV. Now that we have located our theoretical understanding of HC within RBV, we will discuss consequent outcomes from investing in HC according to RBV.

Outcomes of HC According to RBV.

HC investments can result in outcomes at three levels namely, the (1) national, (2) individual and (3) enterprise levels. HC can be studied and defined at each level. At the national level HC is "both a condition and a consequence of economic growth" (Mincer,

1981, p. 1). In other words, an investment in HC can increase the economic growth of a nation while a country that displays high economic growth rates will likely invest in HC.

At the individual level, Goldin (2016) suggests investments in an individual's education strategically increases their HC and subsequently their productivity which in turn increases their earnings. Consequently, research at the individual level focuses on investment in individuals' HC through education. At the enterprise level, investment in HC can be made at both the individual and organisational level resulting in outcomes e.g. increased profitability for the enterprise.

HC at the enterprise level increasingly occupies the minds of stakeholders and academics. In the case of stakeholders, the success and continuity of the business is reliant on such outcomes while academics realise that researching such topics relevant to stakeholders and practitioners is necessary. This will enable the transfer of academic knowledge into practise (Rynes, Bartunek, & Daft, 2001) and in turn improve practise using scientifically backed strategies.

Literature on HC, at the enterprise level, underpinned by RBV claims that resulting outcomes from investments in HC are: (1) Innovation (Bontis & Fitz-enz, 2002), (2) sustained competitive advantage and (3) increased profitability (Becker, 1962; Boudreau & Ramstad, 2002; Cascio & Boudreau, 2011; Crook et al., 2011; Fitz-enz, 2000; Hansson, Johanson, & Leitner, 2004; Huselid & Barnes, 2002; Kryscynski & Ulrich, 2015; Schultz, 1961). The relevant claim to stakeholders (i.e. investors and management) would be that investments in employees have the potential to yield a return on investment (ROI) such as higher financial performance. However, empirical research that tests this link is limited (Crook et al., 2011; Fitz-enz, 2000).

Resultantly, this study focuses on the financial firm performance outcome due to the importance it holds for stakeholders and the potential for investments in HC to elucidate this

outcome. Before discussing financial firm performance, the measurement of HC at the enterprise level will be discussed, followed by a discussion of the antecedents of HC. This will enable a comprehensive understanding of HC followed by a discussion of the financial performance outcome thereafter.

Measuring Human Capital

Approaches to human capital measurement. HC at the enterprise level can be operationalised using multiple measures. The traditional approach to measuring HC focuses on measuring *how* HRM activities (associated with attraction, selection, retention, development, etc.) are delivered. The contemporary method in contrast measures the *outcomes* of investments in HC in economic terms (Cascio & Boudreau, 2011).

The contemporary method of measurement would be the most appropriate to measure HC at the enterprise level because the quantitative format and focus on outcomes is useful to stakeholders. Shareholders are concerned with whether their investment in the company is used sensibly and whether the value of their investment increases. Management on the other hand are concerned with outcomes such as financial performance and increased revenue given the investment made in HC. Ultimately, stakeholders require (1) an understanding of scarce resources and (2) investments in HC reported in economic terms, in order to ensure (3) effective and efficient management of scarce resources and how they are invested (Cascio & Boudreau, 2011). Consequently, the next section briefly contracts *effectiveness, efficiency and impact* measurement points with focus on the effectiveness aspect which underpins this study.

Human capital effectiveness, efficiency and impact. Boudreau and Ramstad (2002) developed three anchor points to capture different types of value HC adds to the firm. They are categorised in order of sophistication of how HC is measured, namely (1) effectiveness measures (2) efficiency measures, and (3) impact measures (Viljoen, 2012).

Effectiveness refers to "doing the right things" (Möller, Gamerschlag, & Guenther, 2011, p. 315). In the context of HC, effectiveness refers to whether a strategy is applied to what is being done so that it can be done well to outsmart competitors. *Efficiency* refers to "doing things right" (Möller et al., 2011, p. 315) or in a logical way, i.e. consuming the minimum amount of resources while gaining a maximum output. An example would be (holding all other factors constant) an organisation invests in HC but achieves higher financial performance compared to other organisations that invest the same amount in HC. *Impact* refers to whether investments through interventions e.g. training, have achieved intended outcomes (Boudreau & Ramstad, 2002). Based on these three anchor points HC can be categorised into these three levels (Boudreau & Ramstad, 2002).

The present study will focus on the effectiveness aspect of HC which is in line with RBV theory. We argue that at the enterprise level, the focus should be on measuring HC effectiveness. This will allow an understanding of whether investments relate to achievement of important enterprise level outcomes such as financial performance which, according to RBV, contributes to sustained competitive advantage. With this in mind, the next section will focus on the measures of HC effectiveness.

Measures of human capital effectiveness. Consensus in practise calls for HRM to expand their focus from qualitative HC management towards quantifying and explaining the effectiveness of investments made in HC (Fitz-enz, 2000). Business executives that interpret contributions primarily in quantitative terms find HRM to lack an evidence based approach when explaining the impact of investments in HC (Becker et al., 2002). Executives rely on measures conveyed in accounting terms which is interesting because despite HC being claimed to be an important asset in the organisation, conventional accounting offers minimal direction on measuring the "impact of intangibles on firm performance" (Huselid & Barnes, 2002, p. 2). In response to the lack of appropriate measures, Fitz-enz (2000) developed

proficient measures using scientific rigour, drawing from financial accounting and economics. Other authors such as Law and Kesti (2014), Viljoen (2012) and Mathis, Jackson, Valentine, and Meglich (2017) support the measurement principles of HC according to Fitz-enz (2000). The effectiveness of the contribution of HC in terms of profitability, can be quantified using the following three measures (Bussin, 2013; Fitz-enz, 2000):

Human capital value added (HCVA). HCVA measures profitability per average full-time equivalent employee (FTE) (Fitz-enz, 2000). FTE is a unit of measure that shows the number of full time (eight) hours worked per employee. That is, two employees each working a total of four hours is combined to give us the sum of eight hours. This combination equates to one FTE.

The following equation was developed to calculate HCVA:

$$\text{HCVA} = \frac{Revenue - (Expenses - Pay + Benefits)}{Number\ of\ FTE's}$$

HCVA has been used by intellectual capital theorists such as Firer and Williams (2003) and is widely used in practise (Bussin, 2013; Manuti & De Palma, 2014) however, we contend that it is an inadequate measure of HC. Operationalising revenue output of employees is not as straightforward as removing expenses and dividing the revenue per employee by FTE as a measure of revenue contribution per employee. Bukowitz, Williams, and Mactas (2004) refute measures of revenue per FTE because firstly, it is unlikely employees at different levels of the organisation produce the same level of profit. An employee's contribution to the bottom line is relative to their role in the organisation. Secondly, FTE measures ignore the contribution of contingent workers who play a significant role in the contemporary organisation due to outsourcing and the millennial workforce who

prefer temporary positions (Schreuder & Coetzee, 2016). The next measure we discuss is Human economic value added (HEVA).

Human economic value added (HEVA). HEVA measures the efforts of management. HEVA "shows how much true profit is left" after deducting expenditure including costs of capital and tax expenses. This allows an understanding of how much profit is left after management has paid (1) cost of debt e.g. interest paid on loans and (2) cost of equity e.g. dividend payments to investors. The following equation was developed to calculate HEVA:

$$\text{HEVA} = \frac{Net\ operating\ profit\ after\ tax - Cost\ of\ capital}{Number\ of\ FTE's}$$

While HEVA measures economic value added per FTE after capital and equity costs, there are limitations to using this measure. First, the true focus in this ratio is on managements influence on revenue through debt and equity strategy which is then divided by FTE to calculate revenue per employee. However, as in the case of HCVA, each employee is unlikely to contribute the same economic value as others. Second, in the case of both HEVA and HCVA the use of FTE in measures disregards contributions from contingent employees. In summary, we argue that while HEVA is insightful from a management influence perspective, the true value from the full workforce is negated. The next measure we discuss is Human capital return on investment (HCROI) which is robust against these limitations.

Human capital return on investment (HCROI). HCROI represents profits made on monies spent on employee pay and benefit expenses (Fitz-enz, 2000). In other words, "how much would the company gain for every R1 paid to an employee (Economic Contribution of Human Resources)" (Viljoen, 2012, p. 70).

HCROI indicates how effectively the investment in HC is contributing to the firm's financial performance. The larger the percentage return, the more effective the investment in

HC. The literature indicates that HCROI captures the HC construct most effectively and more precisely indicates the value added to the organisation through investment in HC (DiBemardino, 2011; Law & Kesti, 2014; Mathis et al., 2017).

Fitz-Enz (2009) describes HCROI as "leverage on pay and benefits" and he developed the following formula to calculate HCROI:

$$\text{HCROI} = \frac{Revenue - (Expenses - Pay + Benefits)}{Pay + Benefits\ (all\ labour\ classifications)}$$

An example of the equation follows:

$$\text{HCROI} = \frac{\$200\,000\,000\ [Revenue] - (\$170\,000\,000\ [Expenses] - \$120\,000\,000\ [Pay + Benefits])}{\$120\,000\,000\ (Pay + Benefits)}$$

$$\text{HCROI} = \frac{\$150\,000\,000}{\$120\,000\,000}$$

$$\text{HCROI} = \$1.25$$

While HCROI has gained prominence in the literature (Bukowitz et al., 2004); Fitz-enz (2000); (Fitz-enz, 2009b; Viljoen, 2012), there are criticisms against the measure. Boudreau and Ramstad (2007) and Berman, Knight, and Case (2009) caution that retrospectively evaluating the contribution of HC using HCROI ignores the time value of money. Boudreau and Ramstad further highlight that while it is useful to measure the ROI of HR, firms should caution against interpreting positive HCROI values to mean that the investment in HC is the sole positive impact on revenue. External factors such as successful marketing campaigns may have increased revenue resulting in a positive ratio and not

necessarily investments in salaries. Furthermore, HCROI does not consider contributions made per employee category which was an argument against the previous two measures.

Despite these criticism's, HCROI is an established metric in practise (Bussin, 2013; Manuti & De Palma, 2014). Additionally, HCROI includes the contribution of all employees who were offered pay and benefits therefore addressing the limitation of excluded FTE employees in the previous two measures. Furthermore, HCROI is claimed to be "one of the best indicators for human capital productivity" (Law & Kesti, 2014, p. 42). Consequently, HCROI was used to measure HCE in this study.

Thus far, we have provided insight into theoretical outcomes achievable through investments in HC. We then highlighted that HCROI is the most appropriate measure of HCE. While we now understand the possible outcomes attainable through investments in HC and how to measure that investment quantitatively, we acknowledge that HCE and its relation to outcomes do not exist in isolation. This relationship is influenced by factors other than investments. The following discussion unpacks the antecedents (factors) that influence HCE.

Antecedents of Human Capital Effectiveness

Multiple studies focus on theoretical outcomes of investing in HC however Bontis and Fitz-enz (2002) pointed out that there is limited research that measure the "antecedents and consequents" (223) of HC management. They addressed this gap by conceptualising a "causal map of human capital antecedents and consequents" (p. 223). This model was tested on a sample of 76 executives from 25 companies within the financial services industry. The findings suggest that the model has a statistically high explanatory power for factors affecting HCE.

According to the model (Figure 1), HCE is positively affected by human capital investment (HCI) and negatively affected by human capital depletion (HCD). HCI refers to the compensation of employees and training and development investments. HCD occurs

through turnover, meaning people who voluntarily or involuntarily leave the organisation along with their talents, skills and abilities and the potential contribution they could have made. These polar factors contribute to HC valuation (HCV) which is the "mediating construct that predicts human capital effectiveness" (Bontis & Fitz-enz, 2002, p. 230). HCV is the sum of the positive contribution of HCI investment and the negative deductions from HCD which influences HCE.

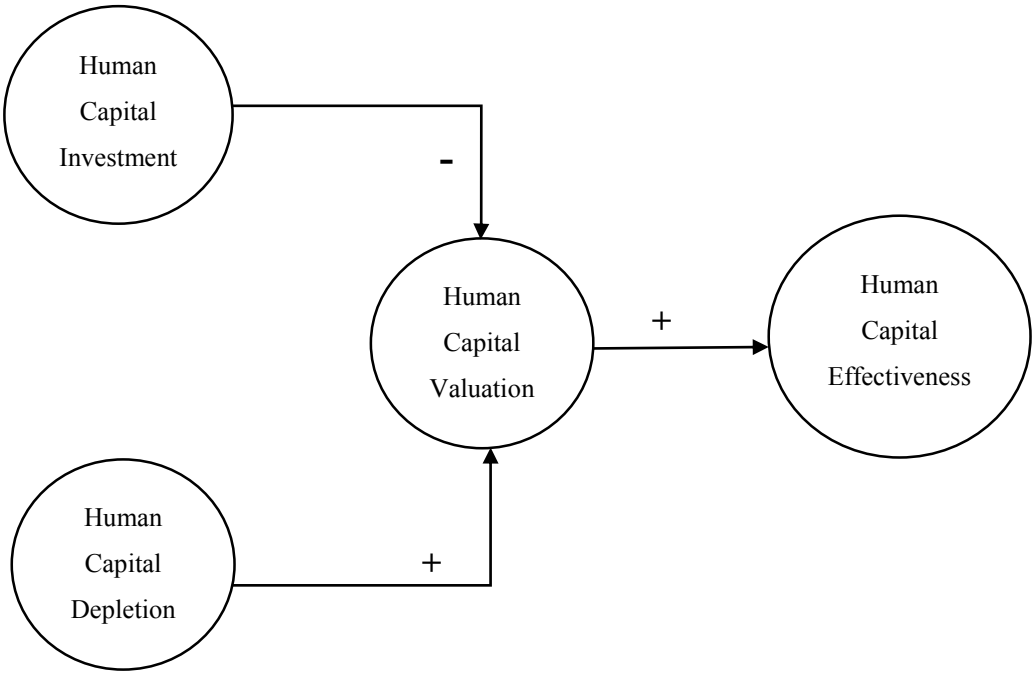


Figure 1. Conceptual Model. Intellectual capital ROI: A causal map of human capital antecedents and consequents by Bontis, N., & Fitz-enz, J., 2002. Journal of Intellectual Capital, 3(3), 228. Copyright 2002 by MCB UP Ltd.

Another study by Crook et al. (2011) hypothesised mediators in the relationship between firm performance and HC. They found that *operational performance* mediates the association between HC and firm performance. In other words, organisations with higher operational performance resultantly reported a stronger relationship between HC and firm performance with the opposite holding true. They further found that that, to improve

performance, firms not only should attract, invest in, and develop human capital but should also retain experienced managers and employees. A key element which contributes to the retention of such employees is the offering of competitive pay and benefits.

This concludes the discussion on the antecedents and consequents of HCE. The discussion will now revert to the discussion on firm performance. The focus will be directed toward this outcome because we found it to be (1) the most relevant outcome to practitioners and (2) lacking in empirical support in the literature.

Firm Performance

Enterprise level HCE focuses on whether HC may influence firm performance. While conceptual arguments for the link is cemented in literature, Fitz-enz (2009b) contends that until 2009 the contribution of the "human element to the profit equation" was not empirically addressed (p. xvii). That is, a business case for investing in HC was yet to be presented.

The business case for human capital is an argument that links investment in human capital to firm productivity and performance. To develop an understanding of how investment in human capital may relate to firm performance, the construct firm performance along with appropriate measures will be systematically presented in this section.

The direction of, and motivation behind, firm performance is informed by the purpose of the organisation and the profit seeking nature of the economic landscape within which organisations exist. RBV theory is the most prominent theory in SHRM which offers theoretical reasoning behind the continued existence of the firm. To recap, RBV highlights that firms seek to employ scarce resources efficiently to attain sustained competitive advantage. Sustained competitive advantage allows the firm to achieve outcomes such as outperforming competitors, higher productivity levels, more satisfied customers, and increased profitability.

While these outcomes are important, financial performance based on profitability stands out as a core outcome for every organisation and is crucial to multiple stakeholders (Fitz-enz, 2009b). Profitability measures are routinely used to represent financial performance of the firm. These measures enable analysis of the firm's profits given levels of sales, assets, or invested capital. Without profits, attracting outside investors to continue operation of many firms, particularly listed firms, would be an immense challenge possibly resulting in the eventual closing of the organisation. This would result in loss of jobs and of a product or service provider. Profitability as a measure of firm performance is widely accepted by stakeholders both within and outside the organisation.

Profitability analysis is conducted to report on the profitability of organisations and enable comparison with other firms within the industry. The DuPont Model is a method that can be used to analyse the profitability of a company using traditional performance management tools. The DuPont model "integrates elements of the Income Statement with those of the Balance Sheet" (Mubin, Lal, & Hussain, 2013, p. 1).

ROA and ROE are financial profitability ratios widely used in managerial finance and are routinely evaluated by shareholders and executives (Gitman et al., 2012). ROA and ROE are the most appropriate indicators of performance in this study because, ROA drives profitability, efficiency and effectiveness of organisations while, ROE drives the goal of maximizing the wealth of the firm's owners (shareholders). Resultantly, each measure is useful to different stakeholders. ROA indicates financial performance for management and results can be used in decision making. ROE captures financial performance for investors who make decisions on whether to begin or continue investments in the organisation. Both ROA and ROE are equally important, offering different insights in understanding the financial performance of organisation, yet they are not without limitations.

A limitation to using ROE and ROA as a dependant variable to determine their relationship to other constructs, is that underlying effects may inflate or deflate uncovered relationships. Occasionally, one may see a correlation between one of these variables and another construct, however the relationship could be influenced by other underlying factors native to the accounting discipline such as financial leverage (also referred to as gearing[1]) or general factors such as country or industry effects (Dinçer & Hacioglu, 2014; Rayan, 2008). A remedy for this in the accounting discipline is to use panel data analysis to expose any "noise" from these effects (Papa & Speciale, 2011). Nevertheless, ROA and ROE continue to be widely used as key performance indicators coupled with supplementary analyses to acknowledge potential underlying effects.

Thus far, we conducted a critical analysis of the literature on HC. First, we introduced theories of HC and argued that RBV is applicable within the SHRM setting. Second, we explained important terms such as HC at the enterprise level and HCE which are the levels at which we argued HC in the SHRM setting should be investigated. Third, a review of the measurement approaches to uncover the effectiveness of HC were presented and upon comparison we found that HCROI is the most robust measure. Fourth, we presented a discussion of firm performance which established that according to RBV, financial firm performance is the fundamental outcome expected from the sustained competitive advantage created through investments in HC. Finally, we presented the appropriate measures of financial performance in a profit generating firm. Up to this point the discussion has been theoretical. We will now review empirical studies in the literature that have investigated the link between HC and financial performance to understand empirical findings.

[1] Gearing is the effect of debt on revenue and in turn financial performance ratios

Empirical Findings: Linking Human Capital and Financial Performance

Intellectual capital framework. Early empirical investigations that link HC and financial performance were conducted under the IC theoretical framework, following criticisms by Bontis and Fitz-enz (2002) claiming that minimal empirical proof existed to support the framework. Studies by Chen, Cheng, and Hwang (2005); Firer and Williams (2003); Kamath (2008); Ling and Jaw (2006), Dimitrios, Dimitrios, Charalampos, and Georgios (2011) and Carla (2015) attempted to uncover an association between IC and firm performance. Out of six empirical studies, four studies support this link while contradictory findings were reported in two of the studies. Their investigations centred around three IC's and not solely HC. Given that HC is the focal construct in this study, we will discuss the findings related specifically to HC.

The first exploratory study was by Firer and Williams (2003) on a South African sample. They correlated HC efficiency, operationalised using HCVA derived from an accounting equation. Firm performance was operationalised using ROA. Their findings suggested that an association was non-existent. They highlighted that these findings may be due to apathy towards IC assets in the national context. Interestingly a recent study by Carla (2015) also within the South African context reported similar findings. We agree that national context may have influenced their findings however, we further postulate that the measure of HC may have had an influence.

The second study by Chen et al. (2005) investigated the association between HC efficiency and financial performance operationalised as ROE, ROA, Revenue growth (increase in revenue from year 1 to year 2) and employee productivity (revenue before tax divided by number of employees). They found a positive association between firm performance and HC efficiency in a sample of Taiwanese businesses. This finding inspired the third study by Ling and Jaw (2006).

The third study by Ling and Jaw (2006) implemented a global sample which comprised thirty companies, which are domiciled in Taiwan but compete globally, to uncover the HC and firm performance association. They looked at the relationship between what they termed international human capital (IHC) and financial performance. IHC refers to "human capital that enables a firm to compete globally" (Ling & Jaw, 2006, p. 380).

IHC was measured using a self-developed instrument. The measure was tested using exploratory factor analysis (EFA) to confirm the dimensions and they found that items loaded onto four factors namely, Input-based IHC, Transformational IHC, Output-based IHC and Competency of top management team. Each factor scored an eigenvalue above one and the measure accounted for 62.897 per cent of the variance. Financial performance was measured using (1) average operation revenue and (2) earnings per share. Structural equation modelling (SEM) was used to investigate the hypothesised relationships. They found that two dimensions of IHC are positively, and significantly ($p < .05$), related to firm financial performance, (1) Input-based IHC and (2) Output-based IHC. Figure 2 below illustrates the relationships that were found.

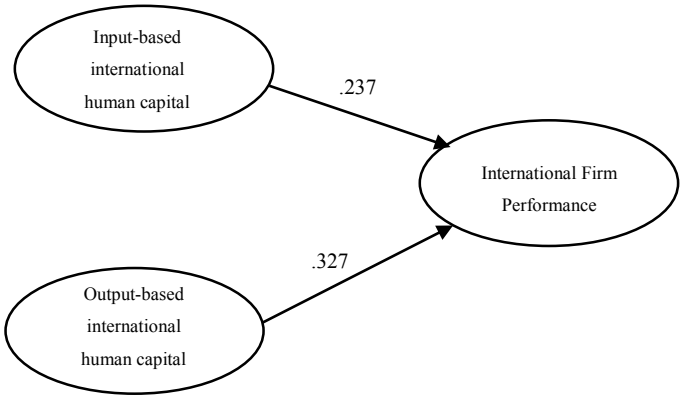


Figure 2. Adapted illustration of structural equation modelling test results showing significant positive relationship between international human capital and firm financial performance by Ling and Jaw (2006).

Interestingly, only the relationships between firm performance and two factors, Input-based IHC and Output-based IHC were reported. Results for the remaining two factors were not shared in the article and therefore cannot be commented on. This could be because the variables mentioned in the results were prioritised. Nevertheless, an overall positive, moderate relationship between IHC and firm performance was found.

The fourth study by Kamath (2008) was conducted using a sample of Indian pharmaceutical professionals. They were the second researcher team after Ling and Jaw (2006) to hypothesise a positive correlation between HC and firm performance due to the HC required in the research and development field of pharmaceutics. They used Firer and Williams (2003) methods to measure HC and financial performance. They reported a positive correlation between HC and ROA which interestingly differed from findings by Firer and Williams (2003) despite similarities in the method. We believe this could be due to the timing of the study which occurred five years after Firer and Williams (2003) study because by this time, organisations from emerging nations realised the value in HC (Gerhard & Nick, 2007) or as the researcher's logic suggests, pharmaceutics requires substantial HC efforts. Since these initial studies reporting correlations between facets of IC and financial performance were published, multiple related studies have been published, particularly using samples from emerging economies (Dimitrios et al., 2011; Ozkan, Cakan, & Kayacan, 2017; Vladimir, Stevo, & Nick, 2016). They have all found HC to be positively related to financial performance. We now shift the focus from studies underpinned by IC to the first empirical study of HC and financial performance under RBV theory.

Resource based view. In 2012 a meta-analysis study by Crook et al. (2011) consolidated findings in the literature related to the HC-performance relationship. They incorporated studies regardless of theoretical framework when defining HC and used firm performance as a broad dependant variable instead of financial performance. Their study was located within RBV theory from which they hypothesised a positive relationship between HC and firm performance.

To test the hypothesis, they conducted the meta-analysis comprising a sample of 66 studies to evaluate the relationship between HC and firm performance using SEM. They reported a significant positive correlation between HC and firm performance (mean $r = .21$) (Crook et al., 2011). This can be interpreted to infer that an increase in HC by one standard deviation will likely increase performance by .21.

This finding supports RBV theory which purports that higher firm performance is achievable by investing in HC. While this finding is important, our concern is that Crook et al. (2011) combined studies that operationalised firm performance and human capital differently. Furthermore, sample selection, sample size and operationalisation of variables differed across studies. This finding therefore cannot be generalised to particular industries, sectors or organisational settings. Furthermore, firms will not necessarily attempt to interpret findings contaminated with such anomalies. Thus far, we found few empirical studies that investigate the relationship between firm performance and HC with only one study that incorporated RBV. Furthermore, none of these studies investigate HCE in relation to financial performance.

Following our theoretical arguments mentioned earlier, as a final strategy to exhaust the search for literature relevant to our study, we conducted a more specific search for resources focussed on the relationship between HC effectiveness measured using HCROI and financial performance. However, the search returned very little research on the topic of

HCROI and firm performance. The only result was a thesis by scholar Viljoen (2012) who operationalised HCE using the HCROI recommendation by Fitz-Enz on a sample of companies listed on the South African stock exchange to establish benchmarking practises.

Findings and hypotheses. The reviewed studies offered partial insight into the relationship between HC and financial performance. With limited empirical rigour, they found that investment in HC impacts firm performance, with a few noted contradictions. This provides confidence that the potential for a relationship between HC and financial performance is likely to exist.

However, in our review, we noted crevices between findings of reviewed literature that should be addressed before we can have a comprehensive and accurate understanding of the relationship between HCE and firm performance in the real world. Debate on the impact that HCE has on financial performance is non-existent. There is therefore a gap for research to compare financial performance ratios against the HCROI ratio to determine if there may be a correlation between the variables and by inference, the constructs. Furthermore, studies that broadly address HC and firm performance are dated, employed restricted sample sizes, employed varying measurement strategies and used restricted sample sizes resulting in findings that are restricted to the country in which the sample is domiciled (Firer & Williams, 2003). To address these limitations, Ling and Jaw (2006) advise future researchers to use samples comprising global companies while Firer and Williams (2003) recommend using cross-sectional analysis across multiple years. We take on these recommendations and further propose that sampled companies should display a priority for high financial performance e.g. listed companies which dutifully publish financial performance to external constituencies. Based on our literature review, the research question we derived is therefore:

Does a consistent (over time) correlation exist between human capital effectiveness (expressed as HCROI) and financial performance (expressed as ROA and ROE) in a sample of 1000 highest revenue, global, listed companies.

Based on the research problem we address through our research question; the following hypotheses were uncovered:

Hypothesis 1 (H1): A positive relationship exists between HCE expressed as HCROI and Financial Performance expressed as ROA and ROE.

Hypothesis 2 (H2): The positive relationship between HCE expressed as HCROI and Financial Performance expressed as ROA and ROE is consistent over time.

Figure 3 illustrates the conceptual model adopted in the present study. Human capital effectiveness was operationalised using HCROI. Financial performance was operationalised using ROA and ROE. Error in the model is acknowledged (ζ_1).

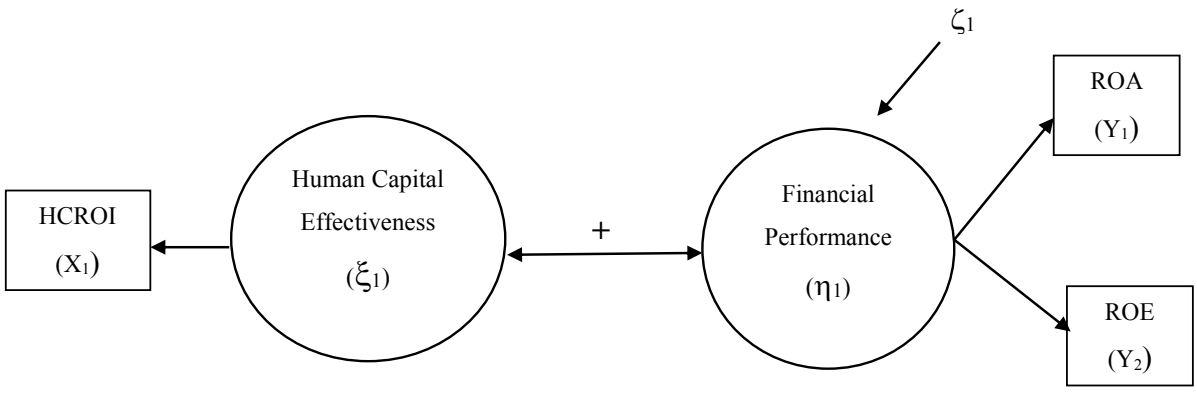


Figure 3. Visual representation of the conceptual model underpinning this study

To summarise this chapter, we (1) discussed the background of HC followed by (2) the theories that underpin HC and (3) the positive outcomes that can be realised from an

investment in HC. We then discussed (4) methods that can be used to measure HCE, (5) the antecedents of HCE, (6) measures of firm performance and we lastly (7) presented a critical evaluation of empirical studies that investigated the association between HC and firm performance.

Although literature on HC and firm performance exists, notable gaps remain. These gaps are in terms of (1) contentious application of HC theory and measures (2) limitations in sample selection and size (3) the use of constructs and variables that are not relevant to stakeholders external to HRM (4) theoretical research describing the potential link between HC and financial performance lacking in empirical support.

The deficiency in the literature due to limitations highlighted above necessitates our empirical investigation into the relationship between HCE and financial performance. This study attempts to address these limitations and in doing so respond to a recommendation made directly by Viljoen (2012) to establish whether HCROI and financial performance of listed companies are associated.

In conclusion, this study uses RBV as the theoretical foundation for investigating HCE and firm performance. The independent variable in this study is HCE and the dependant variable is financial firm performance. We will attempt to address gaps identified in the literature by firstly, operationalising the variables in financial terms allowing business constituencies to understand and interpret the findings. Secondly, we investigate a larger sample spread across industries and countries allowing findings to be generalisable and relevant. Thirdly, data across 10 years will be collected allowing an analysis across time. These artefacts will be applied to test the hypothesis that HC and financial performance are positively related (H1) over time (H2). The next section describes the method we used to investigate the hypotheses.

Method

This study aims to examine the relationship between HCE and financial performance of the top 1000 highest revenue firms, across the globe, listed on a stock exchange. With this aim in mind, this chapter details how the research was conducted to arrive at valid and credible conclusions (Babbie & Mouton, 2001; Wilson & MacLean, 2009). The research design, measurement instruments, sampling procedure, data collection process and finally, the statistical methods used to analyse the data, will be discussed in this chapter.

Research Design

We used an exploratory research design to investigate the relationship between HCE and firm performance. A quantitative correlational approach was used to collect and analyse the data (Wilson & MacLean, 2009). Historical, secondary data on the focal variables was collected over a period of ten years (from the year 2007 until and including the year 2016). The data was analysed retrospectively to uncover relationships between the focal variables. The study can therefore be described as having a cross sectional, correlational design. In other words, the study follows an *ex post facto* (non-experimental) correlational design (Marco et al., 2016). The ex post facto correlational nature of the research design prescribes that the results and inferences drawn from the analyses can inform whether a correlation (relationship) between the variables exists, but not causality.

The quantitative research design we use occurs within a positivistic paradigm. In this paradigm the researcher exists as an outsider to the phenomenon. The world is assumed to be objective and measurable and the researcher employs deductive reasoning to understand the phenomenon (Babbie & Mouton, 2001). This research design was appropriate for this study because it allowed data to be collected and analysed within time and financial constraints.

Measurement

The literature review revealed that measurements of firm performance relevant to this study include financial indicators such as ROA, ROE, total revenues, etc., and are not limited to the use of popular instruments e.g. questionnaires. It was decided that financial indicators, specifically ROA and ROE would be used in this study to measure financial performance. In the case of HCE, it was decided that HCROI would be used as the measurement instrument.

All ratios were gathered from or calculated using data sourced from the Bloomberg (2017) terminal hereafter referred to as Bloomberg. Bloomberg (2017) extracts and stores audited financial statements of worldwide listed companies. Various standard quantitative financial formulae used in practise and research are then calculated and stored. The formula used to calculate each ratio used in the study is presented below:

Human capital. We measured the dependant variable HCE, using the established metric human capital return on investment (HCROI). HCROI has been applied in published work by Manuti and De Palma (2014), Boudreau and Ramstad (2007); Bussin (2013) and Viljoen (2012), to advance comprehension and application of the metric.

HCROI is used to decipher the contribution of employees to the bottom line. HCROI is the value that a company receives from investing in human expertise. The investment in the case of HCROI is made through the salaries and wages expense. Fitz-Enz (2009) described HCROI as "leverage on pay and benefits" expressed as a ratio of revenue. The formula used to calculate the HCROI ratio is as follows:

$$\text{HCROI} = \frac{Revenue - (Expenses - Pay + Benefits)}{Pay + Benefits\ (all\ labour\ classifications)}$$

The following specific data points were extracted from Bloomberg (2017) and substituted into the formula above:

(a) Revenue = total annual revenue

(b) Expenses = the sum of (1) cost of goods sold and (2) operating expenses

(c) Pay and Benefits = personnel expenses

In the numerator, pay and benefits are subtracted from expenses which is then subtracted by revenue. This results in an adjusted profit figure that includes the cost of pay and benefits. This is then divided by pay and benefits producing "the amount of profit derived for every dollar invested in human capital compensation" (Viljoen, 2012, p. 48).

Financial performance. We measured financial performance using the return on assets (ROA) and return on equity (ROE) ratios. We will explain the ratio's in terms of defining them followed by practical examples to illustrate how to interpret resulting values.

Return on Assets. ROA is a traditional performance measure that firms use to represent financial performance. ROA is the key measure of profitability and is calculated by dividing the net profit for the year by total assets. ROA is therefore expressed as a ratio that shows pre-tax income relative to the company's total assets. ROA reflects the organisations efficiency in utilising total assets (Chen et al., 2005). In more simple terms, ROA "measures the overall effectiveness of management in generating profits with its available assets" (Gitman & Zutter, 2012, p. 59).

The formula used by Bloomberg (2017) to calculate ROA is provided below:

$$\frac{12\text{-}Month\ Net\ Income}{Average\ Total\ Assets} \text{ x } 100$$

If a company earned $2 500 000 and owned $17 000 000 worth of assets, its earnings divided by average total assets would amount to 0.15 or 15%. This means that the company earned 15% profit on the assets it owns.

Return on Equity. The return earned on shareholders' investments in the firm is represented by ROE and is an important financial indicator for investors. Gitman et al. (2012) highlight that ROE is interpreted by investors to make crucial decisions about whether investments should continue if the return is acceptable or if the investment should discontinue if the return is unsatisfactory. In summary, ROE "measures the return earned on the … shareholders' investment in the firm" (Gitman & Zutter, 2012, p. 59). Bloomberg define Return on Equity (ROE) more simply as a "measure of a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested, in percentage" (Bloomberg, 2017).

The formula used by Bloomberg to calculate the ROE ratio is presented below:

$$\frac{12\text{–}Month\ Net\ Income\ available\ to\ shareholders}{Average\ Total\ Common\ Equity} \text{ x } 100$$

Practically, if a company reported $1 800 000 revenue available to shareholders and owned $16 000 000 worth of equity, the revenue available to shareholders divided by average equity would amount to 0.11 or 11%. This means that the company earned 11% profit for every dollar shareholders have invested.

Data Collection

The study used secondary archival data sourced from Bloomberg (2017). It was decided that the data would be sourced using a public platform due to time resource savings. Furthermore, while ethical clearance was granted for this study, it was not required due to the

public availability and secondary classification of the data. Moreover, the Bloomberg (2017) is considered to be a credible, independent and objective source for data collection (Sharma, 2015).

Reliability and validity of the data. Bloomberg is ranked as one of the top three financial databases used by researchers and practitioners across the world. It is accepted as valid and reliable because Bloomberg (2017) is used by universities, governments, companies and experts to gather financial market data on themselves, competitors and allies, for the purpose of retrospective or real-time data analyses (Sharma, 2015). Multiple academic authors cite Bloomberg as the premium source for quantitative, financial data and defend the validity and reliability of the information provided (Li, 2017; Sharma, 2015). The step-by-step details of using the terminal to allow replication of this study are provided in Appendix A.

Publicly listed companies must file quarterly, semi-annual and annual reports that are stored on financial databases allowing access to the financial performance indicators (ROA and ROE) and the variables required to calculate HCROI. A detailed explanation of the data collection process using the Bloomberg Terminal is also provided in Appendix A.

Data preparation. We prepared the data in a specific manner. First, the values for all variables were extracted and copied to an Excel (2016) Spreadsheet. Second, we repeated the step of extracting the data following the process mentioned above and cross checked every 20^{th} cell on Excel (2016) to ensure export errors did not occur. Third, each column in the Excel (2016) file was filtered to remove blank cells. In other words, companies that did not report on a variable were filtered out. Finally, the data was imported into SPSS version 26 (IBM Corp, 2018) for analyses.

Security and survivorship of the data. We ensured the security of the data by storing it on an encrypted and password protected hard drive that could be accessed only by

us. We will store the data for 5 years after completion of the study and it is available to researchers seeking to replicate and / or address the limitations and recommendations noted on this study.

Survivorship bias refers to firms becoming privatised or nationalised resulting in them being dropped from the dataset. This may lead to subsequent overstatement or understatement of findings and inferences derived in the latter sections despite replicated procedures and should be noted for replicative research. The data for the present study were extracted in 2017 however we acknowledge the issue of survivorship bias.

Sampling Procedures

The present study used purposive non-probability sampling. We made an informed choice to use the sampling population instead of a random sample. The sampling population was decided to be the Global 1000 highest revenue companies that are listed on any national stock exchange hereafter referred to as the Global 1000 ranked in order of highest revenue.

The non-probability technique was employed because the measures used to operationalise financial performance indicators are relevant to the selected population. They are relevant because (1) they are publicly listed organisations exposing their financial performance for scrutiny by multiple stakeholders, (2) the participant companies as well as stakeholders evaluate success using these financial performance ratios. Furthermore, the use of financial performance ratios as the dependant variable and the use of a quantitative ratio to measure investment in human capital will be comprehensible to stakeholders.

Sample. There were two requirements for inclusion in the sample: (1) the firm must be a public company and (2) the firm must have reported on all focal variables we investigated. In total, data for ten thousand participant companies were extracted from Bloomberg. The population of the global 1000 were utilised as the sampling population. Table 1 contains a summary of the number of companies that were included in the study as

well as the companies that were excluded. Of the 10 000 companies, 6595 companies were non-qualifiers because they did not report on one or more of the variables included in the study. These 6595 participants were excluded from the sample. We therefore analysed a final sample of 3405 companies across all years.

Table 1

Summary of Number of Companies that Meet the Requirements for Inclusion in the Study

		2007	**2008**	**2007**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**Total**
N	**Included**	290	282	311	332	350	361	372	368	378	361	3405
	Excluded	710	718	689	668	650	639	628	632	622	639	6595
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	10000

Note: An illustration of the number of companies that reported on each variable for each year is available in Appendix B.

Next, the sample characteristics will be described by country of listing in order to describe the sample in terms of the country within which they operate. Figure 4 is a bar graph indicating the frequency of companies per country. The total sample of 3405 companies were listed across 45 countries. The country with the highest number of companies was Japan with 967 companies, while, Venezuela, and Zambia reported the fewest companies with each domiciling 2 companies.

In terms of spread across continents (figure 5), companies listed in Asia represented 53.98 % of total companies making it the continent domiciling majority of the companies represented in the dataset. Europe followed with a representation of 37.77% of total companies. The next four continents had a combined representation of 8.25%. South America was the continent that was the next highest represented by 3.82 % of companies, North America followed with 2.14%, followed by Australasia which was represented by 1.41% and

Africa was the least represented continent with 0.88% of companies included in the study. Appendix C contains graphs indicating frequency of companies per country of operation for each year of study (i.e., separately for each year including and in between 2007 - 2016).

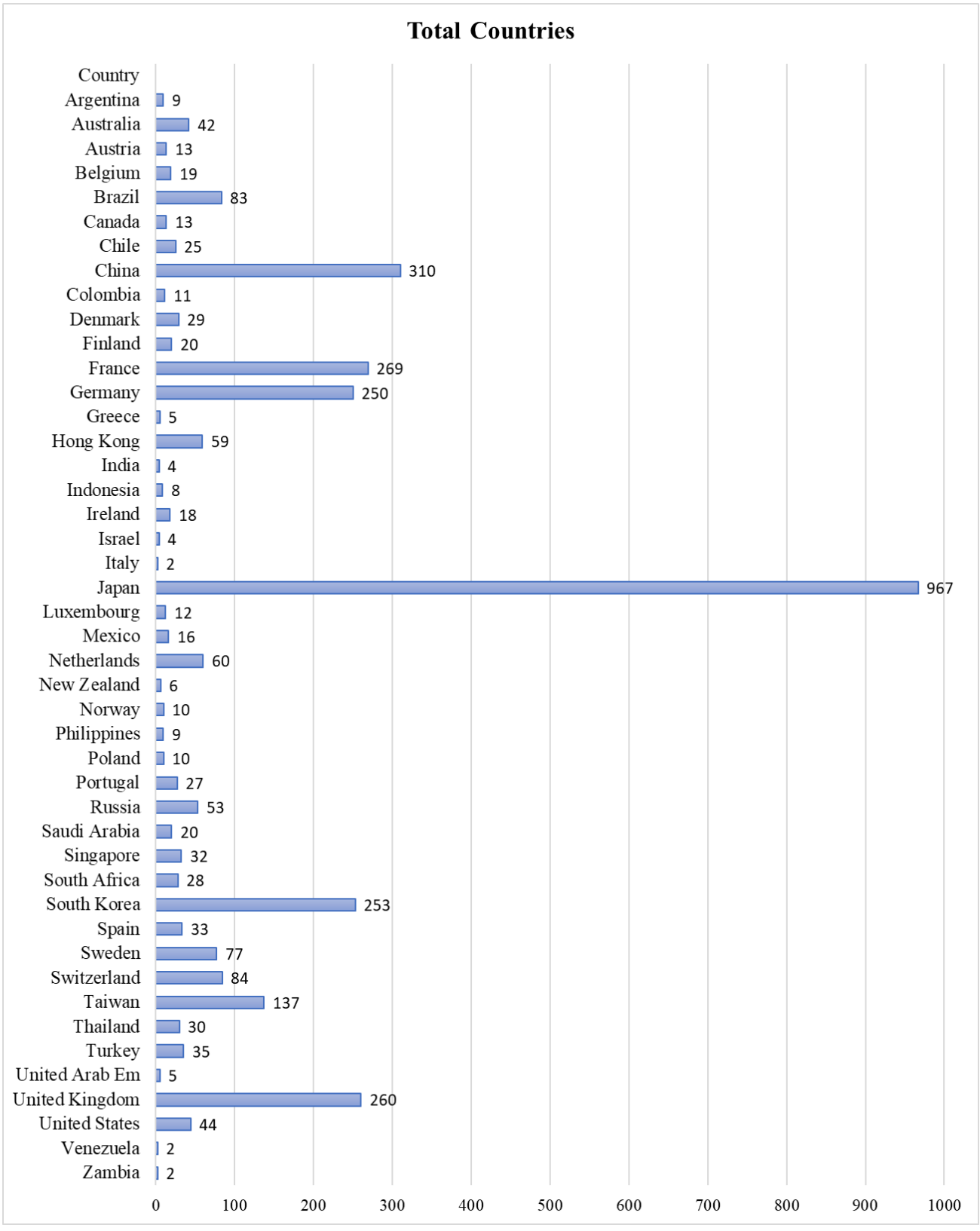


Figure 4. Bar graph created indicating the frequency of companies per country.

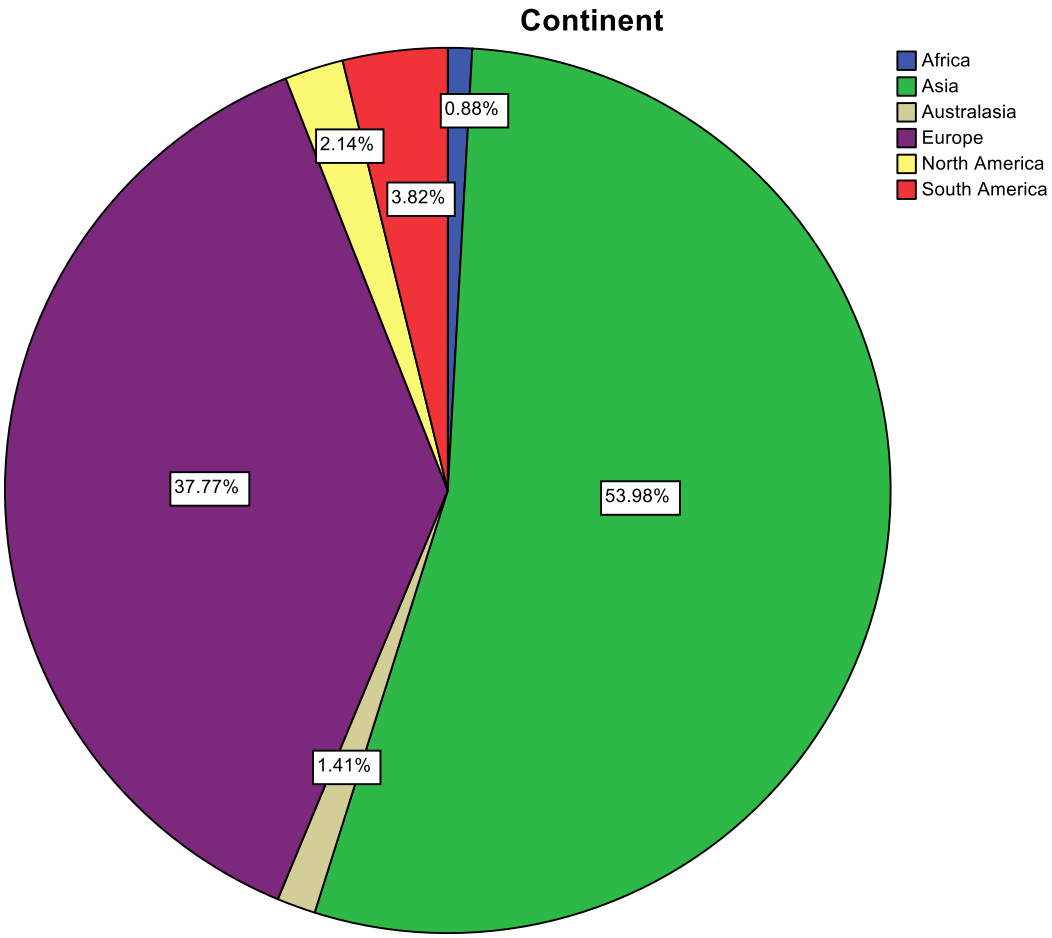


Figure 5. Pie Chart indicating the frequency of companies per country for the study period (2007 - 2016).

A concern was the inclusion of global companies which would each display unique macro and micro country specific circumstances (such as economic, social, political, labour policies and practises) that would influence the variables for study. However, due to globalisation some researchers are calling for studies to be conducted using samples of firms across countries (Blaine, 1994; Ling & Jaw, 2006). The concern for including global companies in the sample was because it was a risk in the validity[2] of the inferences that

[2] To address the country effect which posed a threat to the validity of the present study, the researcher included a panel data analysis as a supplementary analysis. This will be discussed later in the section.

would be derived. To address this concern, we maintained the sample as planned and conducted supplementary panel data analysis which is discussed later in this section.

Statistical Analysis

Correlational analysis. The inferential statistical technique we used was correlational analysis because it is an appropriate method to test if two constructs co-vary (Wilson & MacLean, 2009). In line with requirements for conducting inferential statistics, certain assumptions were tested to ensure that the appropriate statistical correlation technique was used. The assumptions we tested were regarding: (1) outliers (2) linearity, (3) normality, and (4) homoscedasticity. It was important to do these tests because if they are not done the conclusions drawn from subsequent analyses will not hold as accurate and reliable reflections of reality (Ghasemi & Zahediasl, 2012).

We found that some assumptions were violated (discussed in the results section). This informed the choice of the correlational analysis that we used. Spearman correlation was found to be robust against some of the assumptions that were violated and was therefore used to test hypothesis 1.

Statistical analysis was conducted using IBM Software Package for Social Sciences (SPSS), version 26. The data from the selected measures were imported into SPSS version 26 (IBM Corp, 2012) from the Excel (2016) file and Spearman's rho (r_s) was computed to correlate the variables for each year within the period of study. Appendix D provides a guide to interpreting the magnitude of significant correlation coefficients. The correlational analyses were then employed to inform the meta-analysis statistical test (Field, 1999; Wilson & MacLean, 2009).

Meta-analysis. We used meta-analysis to test hypothesis 2. The definition of Meta-analysis and the procedure followed will be discussed next.

Description. We used the meta-analysis technique to test hypothesis 2 for the following reasons. First, aggregating the correlations provided a higher statistical power than if this was not done (Field, 1999). Second, inconsistency of individual correlations can be analysed. Third, inconsistency due to sampling error can be determined (Field & Gillett, 2010). Fourth, the results of the meta-analysis can be generalized to a larger population (Bonett, 2016). Lastly, the use of meta-analysis shifted our reliance on tests of significance and broadened the analyses to include less investigated effect sizes, confidence intervals and credibility intervals (Schmidt, 2010).

There are two models that were tested, the fixed effects model which "extends only to the correlations included in the meta-analysis" and the random effects model which "allows inferences that can be generalised beyond the studies included in the meta-analysis" (Field & Gillett, 2010, p. 3). We used the random effects model because effect sizes are not anticipated to be homogenous given that the sample varied across years. Furthermore, using the random effects model will allow conclusions based on the results to extend beyond the present study.

There are two random effects models that can be used. The first is the Hedges-Vevea model which transforms the Spearman correlation coefficient (r_s) to a z-score and thereafter calculates the mean effect size, the upper and lower 95% confidence intervals, the z-test statistic the Chi-Squared statistic, the degrees of freedom and the significance (p-value). The results are thereafter transformed and reported on in the Spearman correlation coefficient format (r_s). The z-score transformation before calculating the meta-analysis is done to account for and eliminate sources of error.

The second model, the Hunter-Schmidt random-effects model, on the other hand, does not transform the original coefficients to account for error in the model but instead calculates (1) sample correlation variance, (2) sampling error variance and (3) variance in population correlations to account for error. These artefacts are accounted for in the calculation of the

meta-analysis statistics. The credibility intervals are reported on instead of confidence intervals, in addition to all other statistics that the Hedges-Vevea model reports. Credibility intervals are an estimate of the range of real differences after accounting for sampling error. In other words, confidence intervals are an estimate of the likely amount of error in the estimate of the mean value due to sampling error whereas the credibility intervals express the range of real differences after accounting for sampling error. It is therefore more important to express credibility intervals. We statistically tested both models however we will focus our results and discussion on the Hunter-Schmidt random-effects model because as discussed, it is a more robust method for meta-analysis.

Procedure. We inputted the Spearman correlation coefficient (r_s) referred to as the effect size[3] and the sample size (*n)* into SPSS version 26 (IBM Corp 2018) using syntax developed by Field and Gillett (2010) to test the random effects model. A table containing brief descriptions of the statistics used in reporting the meta-analysis are provided in Appendix E. This can be useful when interpreting the results in the next chapter

Supplementary analysis

We used panel data analysis to test the robustness of our findings from a financial perspective. This was necessary because ROA and ROE are grounded in the accounting nomological network and we were concerned that influences from underlying effects or time invariant effects such as sector, industry or country would influence the relationship between HCROI and ROA and ROE, negating the correlation and meta-analysis results (de Jager, 2008).

Panel data analysis is an analysis technique native to accounting and economics which tracks multiple factors such as industry, country and other effects of particular companies

[3] Correlation coefficient and effect size are used interchangeable when referring to meta-analysis.

over a number of time periods. It allows control of indirect fixed effects that distort correlations found between focal constructs (Walker, 2006). When controlling these effects, the correlation between only the focal variables can be tested (Arellano, 2003). The data was sorted to include companies present in the Global 1000 firms across all ten years. Industry and sector data were extracted from Bloomberg and the analysis was run using Statsoft Statistica software, version 1 (2017).

Results

This chapter presents the results obtained from the statistical analyses discussed in the previous chapter. The first section of this chapter discusses descriptive statistics of the elements used to calculate HCROI, namely, revenue, total expenses, and pay and benefits. The second section presents descriptive statistics for the independent (HCROI) and dependant (ROA and ROE) variables. The third section presents the results from the tests of assumptions. The fourth section presents results from the tests of hypotheses namely, Spearman correlation analyses and meta-analysis. Lastly, the results of the panel data analysis are briefly described.

Descriptive Statistics of HCROI Elements

The descriptive statistics of the variables used to calculate HCROI, namely, revenue, expenses and pay and benefits across all years of study will be discussed in this section. All values presented are listed in billions of Unites States Dollar (USD) format for uniformity of reporting and generalisability, enabling comparison of data for companies from different countries.

Revenue. The descriptive statistics for revenue are summarised in Table 2. The maximum values for turnover increased from 2007 to 2008 (2007: 355782000600, 2008: 458361012200) however a considerable decrease is noted in the year 2009 (2009: 278187999200) where revenue was halved. Following the downturn of 2009, revenue increased in 2010 and 2011 (2010: 368056008700, 2011: 470170992600) while remaining stagnant in 2012, 2013 and 2014 (2012: 467152994300, 2013: 451234988000, 2014: 421105008600). A sharp downturn is noted for 2015 (264960000000) and another slight drop in revenue is noted in 2016 (240478269700).

Next, the measures of central tendency will be presented. The mean is calculated by adding all values in the dataset and dividing it by the number of entries. The median is

calculated by ordering the data from smallest numerical value to the largest and selecting the middle value of the data as the median (Manikandan, 2011). The average mean (*M*) for revenue over the study period also showed the upswings and downturns noted in the maximum revenue descriptive figures. In other words, there was an increase in the mean from 2007 to 2008 with a decrease from 2008 to 2009 (2007: *M* = 26195847140, 2008: *M* = 29982990490, 2009: *M* = 28223683760). A sharp increase took place in 2010 and a slight increase in 2011 (2010: *M* = 29822591590, 2011: *M* = 32990233260). The mean was constant for 2012, 2013 with a very slight increase in 2014 (2012: *M* = 34098060810, 2013: *M* = 34507923430, 2014: *M* = 35079310230). A sharp downturn is noted in 2015 with another slight drop from 2015 to 2016 (2015: *M* = 31202898950, 2016: *M* = 30495694230).

The second measure of central tendency, the median (*Mdn*) indicates a slightly different scenario when compared to the maximum statistic and the mean. If the median and the mean for the years of study are plotted graphically (Figure 6), the line is fairly similar to the mean however the values for the median do not range as vastly as the mean does. The median depicts the upswings and troughs noted in the mean however the median (*Mdn*) is a more constant line that rests within a smaller range of values across all years. Revenue for the study period starts with a low median in 2007 and increases in 2008 (2007: *Mdn* =15544508000, 2008: *Mdn* = 18117808680). A very slight decrease is noted in 2009 and a slight increase in 2010 (2009: *Mdn* = 17867319260, 2010*: Mdn* = 18282654300). An increase is noted in 2011 and remains stagnant across 2012 and 2013 (2011: *Mdn* = 20337442300, 2012: *Mdn* = 207350005800, 2013: *Md*n = 20987765270). 2014 shows a slight increase followed by a decrease 2015 and then a slight increase in 2016 (2014: *Mdn* = 22257746270, 2015: *Mdn* = 19686911030, 2016: *Mdn* = 204804029900).

The slight difference between the median and the mean could be attributed to outliers in the dataset. The mean and median for all the elements to follow also slightly differed due

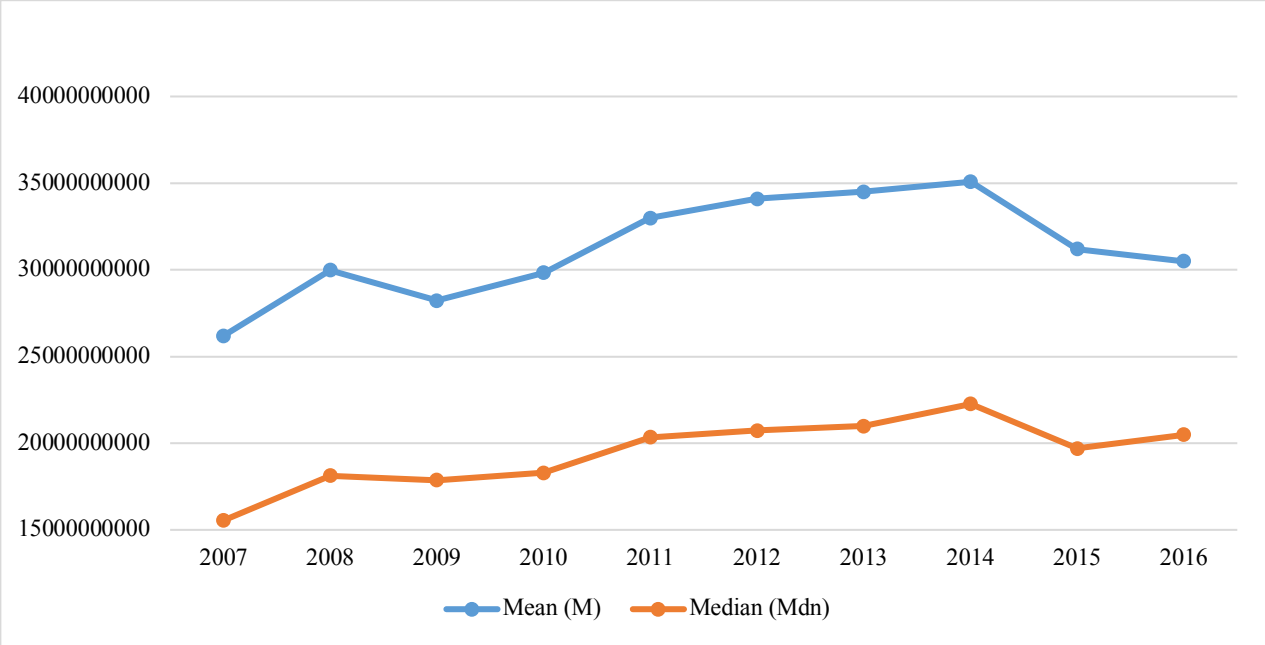
to the effect of outliers on the mean. The median (*Mdn*) is a more stable measure of central tendency because it is not distorted by outliers making it the more appropriate measure of central tendency to summarise the revenue dataset (Manikandan, 2011), therefore going forward the median for all elements will be discussed as measure of centrality instead of the means.

Table 2

Descriptive Statistics for Revenue for the Study Period 2007 – 2016

Revenue									
Year	**n**	**Median (Mdn)**	**Mean (M)**	**Std. Deviation (SD)**	**Minimum**	**Maximum**	**Range**	**Skewness**	**Kurtosis**
2007	290	15544508000	26195847140	33065589410	8841476997	355782000600	346940523600	5.826	47.023
2008	282	18117808680	29982990490	40288878940	10000618070	458361012200	448360394200	6.796	61.348
2009	311	17867319260	28223683760	30156956890	9465694930	278187999200	268722304300	4.350	26.453
2010	332	18282654300	29822591590	34201263530	10284762320	368056008700	357771246400	5.434	41.915
2011	350	20337442300	32990233260	40620979640	11482332560	470170992600	458688660100	6.269	54.483
2012	361	207350005800	34098060810	41329469790	12194969460	467152994300	454958024800	5.954	49.054
2013	372	20987765270	34507923430	41580447200	12494712930	451234988000	438740275100	5.714	44.302
2014	368	22257746270	35079310230	40351418490	12727354370	421105008600	408377654300	5.305	38.326
2015	378	19686911030	31202898950	32696384570	11111172490	264960000000	253848827500	3.967	20.275
2016	361	204804029900	30495694230	29263204060	11671151680	240478269700	228807118100	3.822	19.008

Note. Values in USD (‘000. 000. 000)



Note. Minimum gridline set to 15 000 000 000

Figure 6. Difference between the mean and median for Revenue for the study period (2007 - 2016)

Expenses. Total expenses are the sum of two items on the income statement, (1) operating expenses and (2) cost of goods sold. The expense figure represents the total costs incurred for turnover and operations for the year. Table 3 reports descriptive statistics for the expense variable for the study period. Over the study period (2007 - 2016), the annual minimum expense value decreased steadily from 2007 to 2009 (2007: 5828013541, 2008: 4291258436, 2009: 4125537074). In 2009 the lowest minimum value is noted. An increase was noted in 2010 (6207999744) and 2011 (7644000000) followed by a decline in 2012 (6050119476), an increase in 2013 (6330504699), and a decrease in 2014 (6001302542). The year 2015 saw an increase (9189391660), which was when the minimum expense figure was at its highest. This was followed by a drop in 2016 (6931075916).

The maximum value started at $319247003648 in 2007 and increased in 2008 (419461996544) followed by a drop in 2009 (263567003648), a steady increase began from 2010 until 2012 (2010: 335604013312, 2011: 419812008192, 2012: 423380883660),

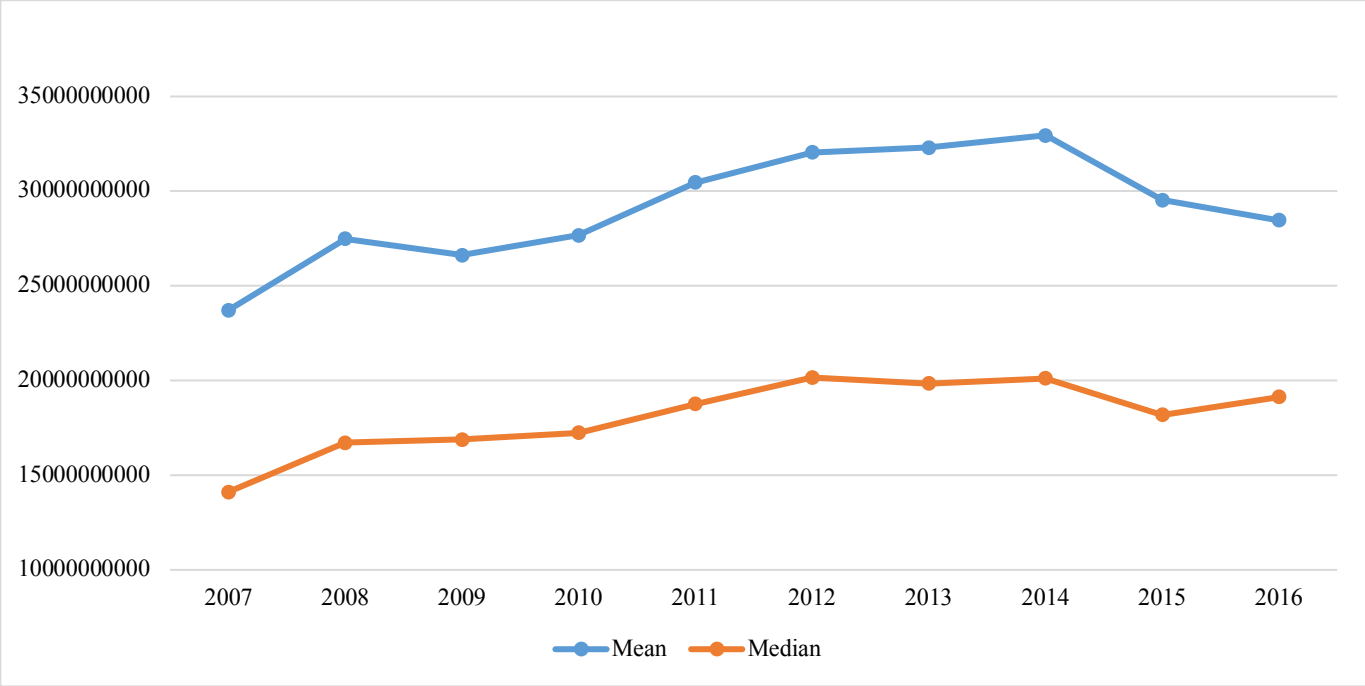
stagnated for 2013 (424364998656), decreased in 2014 (401226002432) followed by another decline in 2015 (268221005824) and again in 2016 (242922163701). The expense maximum value was at its lowest in 2016.

The results for centrality for the expense variable indicate that the median increased steadily from 2007 – 2012 (2007: 14118576965, 2008: 16708991536, 2009: 16886699881, 2010: 17230801124, 2011: 30461387875, 2012: 20157981446). In 2013 (19844434158) a slight decline occurred, followed by an increase in 2014 (20108377678), a decrease in 2015 (18178472590) and an increase in 2016 (19134592007). The mean and median are depicted in figure 7.

Table 3

Descriptive Statistics for Expenses Variable for the Study Period 2007 – 2016

Expenses									
Year	**n**	**Median (Mdn)**	**Mean (M)**	**Std. Deviation (SD)**	**Minimum**	**Maximum**	**Range**	**Skewness**	**Kurtosis**
2007	290	14118576965	23716739882	29978905574	5828013541	319247003648	313418990107	5.747	45.697
2008	282	16708991536	27480498354	37225986983	4291258436	419461996544	415170738108	6.660	59.090
2009	311	16886699881	26621710113	29046801364	4125537074	263567003648	259441466574	4.313	25.638
2010	332	17230801124	27670013472	33013165919	6207999744	341812013056	335604013312	5.641	43.711
2011	350	18752476774	30461387875	37571876444	7644000000	427456008192	419812008192	6.147	52.164
2012	361	20157981446	32054069999	39162685469	6050119476	429431003136	423380883660	5.890	47.530
2013	372	19844434158	32307364922	39317414845	6330504699	424364998656	418034493957	5.731	44.668
2014	368	20108377678	32950182844	38735306235	6001302542	401226002432	395224699890	5.356	39.170
2015	378	18178472590	29519793309	32071176275	9189391660	268221005824	259031614164	4.115	22.041
2016	361	19134592007	28465944573	28414543217	6931075916	242922163701	235991087786	4.003	21.180



Note. Minimum gridline set to 10 000 000 000

Figure 7. Difference between the mean and median for Expenses over the study period (2007 - 2016)

Pay and benefits. The pay and benefits variable denotes all expenses related to compensation in the form of "wages and salaries, social security, pension, profit-sharing expenses and other benefits related to personnel (Bloomberg, 2017). Table 4 reports descriptive statistics for the pay and benefits variable for the study period.

The pay and benefits variable minimum value decreased steadily from 2007 – 2011 (2007: 23661715, 2008: 7533237, 2009: 4356364, 2010: 1725398, 2011: 1603062), increased in 2012 (2382665), decreased again from 2013 – 2015 (2013: 974878, 2014: 229661, 2015: 210270) and increased again in 2016 (483524).

The maximum values for pay and benefits increased in 2008 (38549050956), decreased in 2009 (33427638209) and 2010 (29690537958), increased in 2011 – 2014 (2011:

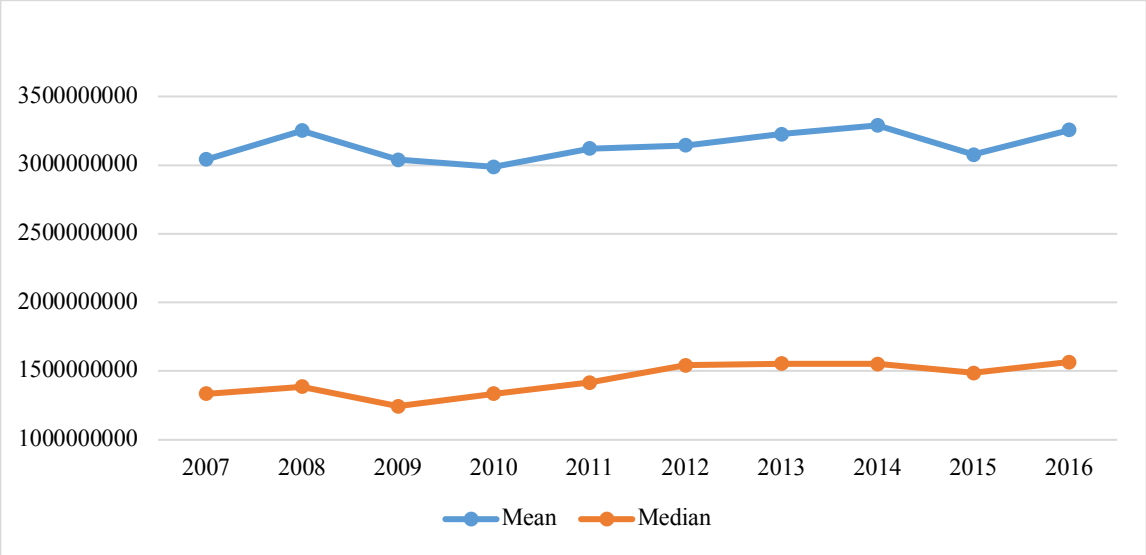
33214502493, 2012: 37937184914, 2013: 42169990643, 2014: 44949395430), decreased in 2015 (40257784845) and remained stagnant in 2016 (40971637593).

Figure 8 illustrates the mean and median for the pay and benefits variable. The median increased in 2008 (1386908757), decreased in 2009 (1245350728), increased steadily from 2010 – 2013 (2010: 1334584441, 2011: 1417925423, 2012: 1543485508, 2013: 1555138419), remained the same in 2014 (1552944144), decreased in 2015 (1487530277) and increased in 2016 (1566828667).

Table 4

Descriptive Statistics for Pay and Benefits Variable for the Study Period 2007 – 2016

		Pay and Benefits							
Year	**n**	**Median (Mdn)**	**Mean (M)**	**Std. Deviation (SD)**	**Minimum**	**Maximum**	**Range**	**Skewness**	**Kurtosis**
2007	290	1336000000	3041312851	4435828460	23661715	31744999424	31721337709	3.327	14.606
2008	282	1386908757	3251822533	4749242980	7533237	38549050956	38541517719	3.210	14.519
2009	311	1245350728	3039432028	4353576480	4356364	33427638209	33423281845	3.065	12.507
2010	332	1334584441	2987721278	4129528704	1725398	29690537958	29688812560	3.084	12.474
2011	350	1417925423	3121656254	4497656653	1603062	33214502493	33212899430	3.311	14.664
2012	361	1543485508	3144827309	4586812778	2382665	37937184914	37934802249	3.709	19.244
2013	372	1555138419	3226400455	4737862601	974878	42169990643	42169015765	3.739	19.919
2014	368	1552944144	3289553650	4946338005	229661	44949395430	44949165769	3.879	21.349
2015	378	1487530277	3075398929	4546246888	210270	40257784845	40257574575	3.900	21.026
2016	361	1566828667	3255029450	4762195408	483524	40971637593	40971154069	3.834	20.597



Note. Minimum gridline set to 1 000 000 000

Figure 8. Difference between the mean and median for Pay and Benefits over the study period (2007 - 2016)

Descriptive Statistics of HCROI, ROA and ROE Variables

HCROI. Table 5 presents the descriptive statistics for HCROI for the sample. The measures of central tendency for HCROI reveal certain anomalies in the data. The maximum HCROI for all years except 2007 and 2009 are extreme values considering that HCROI is a ratio value. The minimum values in 2009 and 2010 were also extreme, negative values. These extreme minimum and maximum values appear to be outliers in the data.

The mean for 2014 (275.638) and 2015 (324.561) were notably higher than for all other years clearly indicating the effect of the outliers given that the mean is more susceptible to outliers than the median. The median ranges between a value of 1.5 to just above 2 which can be attributed to the median being robust against outliers. The median for 2007 (2.065) and 2008 (2.026) were reported at a ratio of approximately 2 and for all years that followed, 2009 – 2016, HCROI values were centred around a ratio of 1 (2009: 1.584, 2010: 1.745, 2011: 1.846, 2012: 1.722, 2013: .699, 2014: 1.723, 2015: 1.683, 2016: 1.755).

Figure 9 illustrates the mean and median for HCROI for all years. While the mean is clear and visible, the median is not. This is due to the numbering on the graph and the particularly high maximum figure. The exceptionally high maximum means' in 2014 and 2015 increased the X axis to a value of 350 while the ratios in the median ranged from 1.5 to just above 2. The median is presented separately in figure 10 to accurately illustrate the mean line on a graph. Given that the HCROI variable has a number of outliers in some years, the data is skewed making the mean an inappropriate measure of centrality because, as mentioned earlier, it is susceptible to outliers. The median is a more meaningful measure of centrality because it is robust against outliers. Hereafter, the median will be the measure of centrality for all variables because a similar trend was noticed for HCROI as in the case of the ROA and ROE variables (Bonett, 2016; Field, 2009; Field, 2013). Additionally, the percentiles will be reported for only HCROI.

The original HCROI ratio values were converted to percentile rank scores (Table 6) to be used a benchmarking[4] tool to determine where a company's score falls in relation to other companies'. For example, if a company's HCROI was calculated to be 4.3953 for 2007, it would denote that the company had an equal or higher HCROI ratio than 90% of the companies that reported on HCROI for 2007.

[4] This is for the benefit of potential future studies and for stakeholders intending to compare HCROI scores

Table 5

Summary of Descriptive Statistics for HCROI for the Study Period 2007 – 2016

HCROI											
Year	**n**	**Median (Mdn)**	**Mean (M)**	**Std. Deviation (SD)**	**Minimum**	**Maximum**	**Range**	**Skewness**	**Std. Error of Skewness**	**Kurtosis**	**Std. Error of Kurtosis**
2007	290	2.065	2.720	3.24073	-0.73	44.20	44.93	8.420	0.143	96.553	0.285
2008	282	2.026	5.544	49.53174	-1.93	833.41	835.34	16.735	0.145	280.683	0.289
2009	311	1.584	2.057	10.60730	-151.91	86.52	238.42	-7.927	0.138	157.656	0.276
2010	332	1.745	4.241	24.83197	-74.61	400.12	474.73	13.252	0.134	202.085	0.267
2011	350	1.846	11.750	96.24084	-2.44	1628.22	1630.65	14.449	0.130	232.718	0.260
2012	361	1.722	9.644	62.00030	-6.72	890.71	897.43	10.656	0.128	130.433	0.256
2013	372	1.699	26.593	281.50585	-3.47	4065.27	4068.74	13.342	0.126	180.386	0.252
2014	368	1.723	275.638	5194.85171	-1.67	99658.06	99659.73	19.183	0.127	367.980	0.254
2015	378	1.683	324.561	6151.01035	-5.52	119590.75	119596.27	19.439	0.125	377.914	0.250
2016	361	1.755	20.639	225.14061	-0.57	4072.72	4073.29	16.714	0.128	295.538	0.256

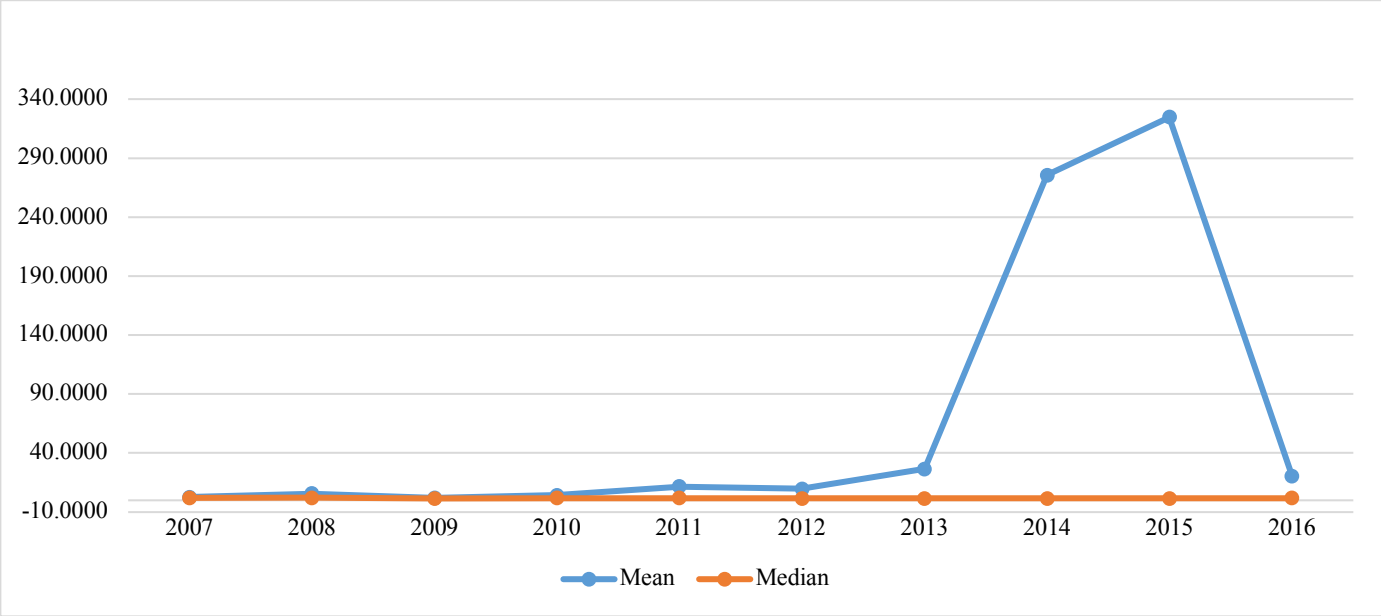
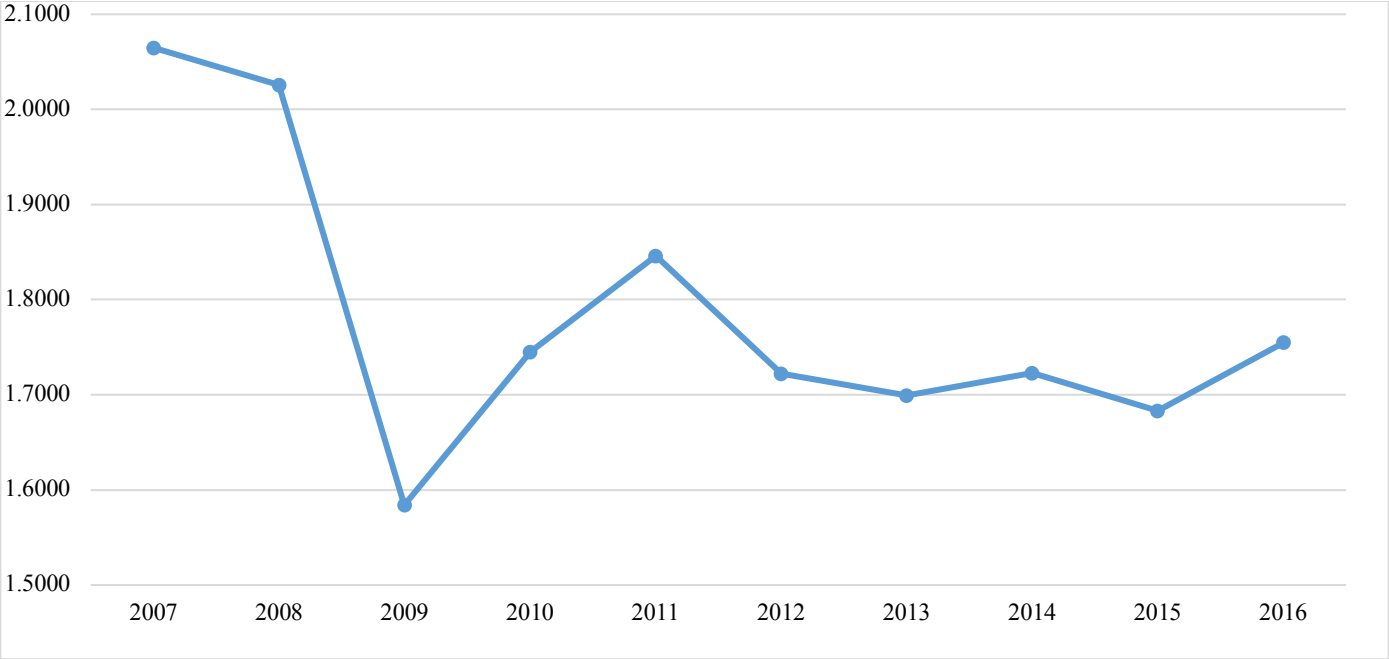


Figure 9. Difference between the mean and median for HCROI over the study period (2007 - 2016)



Note. Minimum gridline set to 1.5

Figure 10. The median for HCROI over the study period (2007 - 2016)

Table 6

Descriptive Statistics for Benchmarking for HCROI variable (2007 - 2016)

HCROI		**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
n		290	282	311	332	350	361	372	368	378	361
Mean (M)		2.719	5.543	2.056	4.240	11.750	9.644	26.592	275.637	324.561	20.639
Median (Mdn)		2.064	2.025	1.584	1.744	1.846	1.722	1.699	1.722	1.682	1.754
Mode		-.73[a]	-1.93[a]	1.42[a]	2.16	1.69[a]	1.09[a]	2.26	2.36	2.19	2.27
Percentile	10	1.200	1.120	.826	1.089	1.106	.955	1.118	1.077	1.023	1.110
(*P*)	20	1.335	1.315	1.071	1.239	1.307	1.200	1.260	1.264	1.236	1.286
	30	1.498	1.453	1.224	1.368	1.454	1.350	1.370	1.380	1.354	1.409
	40	1.774	1.744	1.394	1.514	1.632	1.487	1.478	1.484	1.458	1.503
	50	2.064	2.025	1.584	1.744	1.846	1.722	1.699	1.722	1.682	1.754
	60	2.337	2.317	1.812	1.962	2.192	1.954	1.918	1.988	1.927	2.101
	70	2.634	2.621	2.115	2.257	2.649	2.277	2.245	2.308	2.260	2.520
	80	3.257	3.140	2.710	2.993	3.276	2.813	2.720	2.868	2.929	3.144
	90	4.395	4.469	4.015	4.221	4.322	4.317	4.198	4.177	3.972	4.549

Note. [a]. Multiple modes exist. The smallest value is provided.

ROA. The descriptive statistics for the ROA variable are presented in Table 7 and will be discussed in this section. The highest maximum value for ROA was reported in 2007 (58.26) which then decreased in 2008 (32.90) and 2009 (31.03), increased in 2010 (32.91), decreased to the lowest maximum value point in 2011 (27.86), increased steadily in 2012 (32.88), 2013 (37.03) and 2014 (45.55) while decreasing in 2015 (41.29) and in 2016 (40.06).

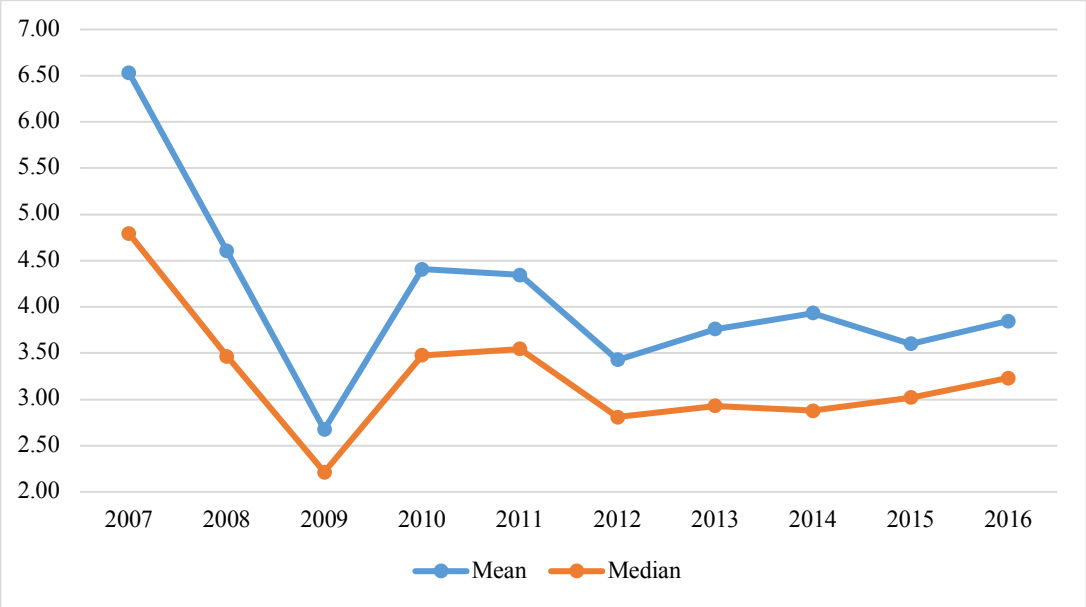
The minimum values for ROA decreased in 2008 (-25.84), increased in 2009 (-20.10) and in 2010 (-4.91), decreased in 2011 (-14.33), increased slightly in 2012 (-13.68), decreased in 2013 (-23.20), increased in 2014 (-11.85), decreased in 2015 (-13.50) and in 2016 (-20.69).

When analysing the mean, upon inspection of figure 11, the mean and median for ROA followed a similar pattern. The median however was placed at a lower point on the graph indicating that the mean was influenced by some outliers. The median was at the highest point in 2007 (4.794), it then decreased in 2008 (3.464) and 2009 (2.215), increased in 2010 (3.476) and remained the same in 2011 (3.546), decreased in 2012 (2.809) and increased slightly in 2013 (2.928), decreased slightly in 2014 (2.878) and increased in 2015 (3.018) and 2016 (3.232).

Table 7

Descriptive Statistics for ROA variable for the Study Period 2007 – 2016

ROA											
Year	**n**	**Median (Mdn)**	**Mean (M)**	**Std. Deviation (SD)**	**Minimum**	**Maximum**	**Range**	**Skewness**	**Std. Error of Skewness**	**Kurtosis**	**Std. Error of Kurtosis**
2007	290	4.794	6.533	6.25970	-11.70	58.26	69.96	2.800	0.143	17.367	0.285
2008	282	3.464	4.604	5.28582	-25.84	32.90	58.74	0.388	0.145	6.883	0.289
2009	311	2.215	2.674	5.15430	-20.10	31.03	51.13	0.586	0.138	4.313	0.276
2010	332	3.476	4.408	4.85639	-4.91	32.91	37.81	1.926	0.134	6.986	0.267
2011	350	3.546	4.345	5.01621	-14.33	27.86	42.19	0.980	0.130	4.683	0.260
2012	361	2.809	3.427	4.88623	-13.68	32.88	46.56	1.053	0.128	6.105	0.256
2013	372	2.928	3.759	4.86909	-23.20	37.03	60.23	1.286	0.126	9.619	0.252
2014	368	2.878	3.933	5.22459	-11.85	45.55	57.40	2.688	0.127	15.802	0.254
2015	378	3.018	3.600	4.93358	-13.50	41.29	54.79	1.347	0.125	10.805	0.250
2016	361	3.232	3.847	4.56935	-20.69	40.06	60.75	1.372	0.128	14.624	0.256



Note. Minimum gridline set to 2

Figure 11. Difference between the mean and median for ROA over the study period (2007 - 2016)

ROE. Table 8 presents descriptive statistics for ROE and is discussed in this section. The maximum for ROE increased in 2008 (137.17), decreased in 2009 (74.06) and 2010 (61.80), increased in 2011 (70.37), decreased in 2012 (54.90), increased in 2013 (84.96), decreased slightly in 2014 (83.29) followed by notable increases in 2015 (210.11) and 2016 (238.68).

The minimum value for ROE decreased in 2008 (-114.40) and 2009 (-188.60) while increasing in 2010 (-43.22), decreasing in 2011 – 2013 (2011: -55.28, 2012: -75.41, 2013: -145.32), increased in 2014 (-44.61), decreased to the lowest point in 2015 (-197.36) and increased in 2016 (-117.28).

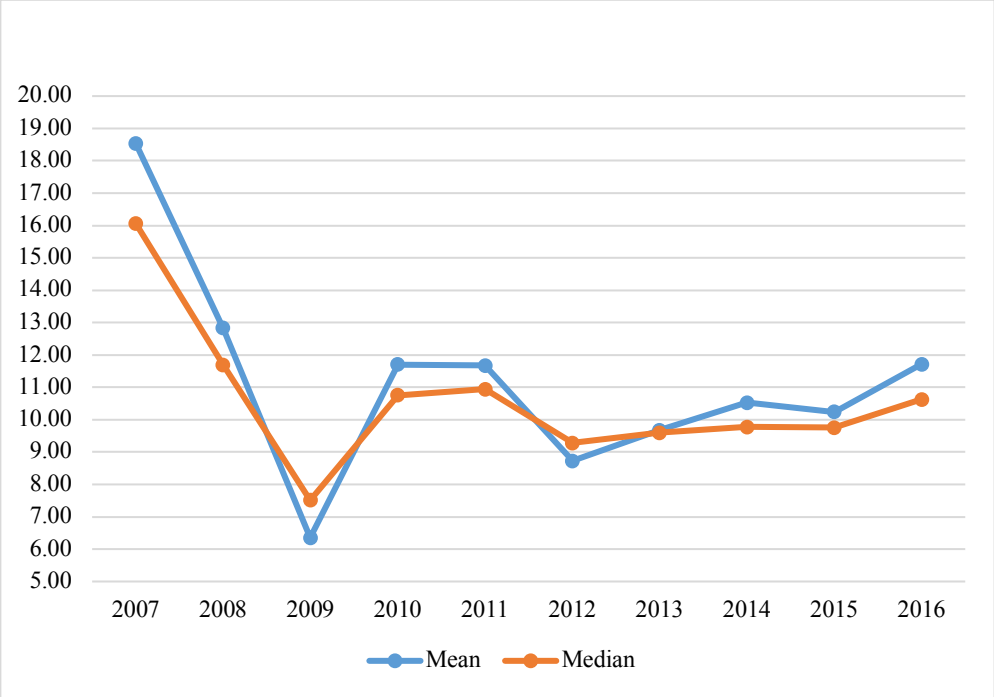
Inspection of figure 12 indicates that the mean and median follow a similar pattern on the graph and superimpose on each other at most points. This indicates that ROE had fewer outliers than HCROI and ROA. Therefore, both the mean or the median could be used to

describe central tendency of ROE. However, the median will be used for uniformity. The median for 2007 was 16.062 which was the highest for all the years. It then decreased in 2008 (11.691) and 2009 (7.510), increased in 2010 (10.749), remained the same in 2011 (10.945), decreased in 2012 (9.281), remained the same in 2012 – 2015 (2012: 9.281, 2013: 9.597, 2014: 9.773, 2015: 9.751) and increased in 2016 (10.628). To conclude this section, the medians for HCROI, ROA and ROE over the study period (2007 - 2016) are presented in figure 13 below.

Table 8

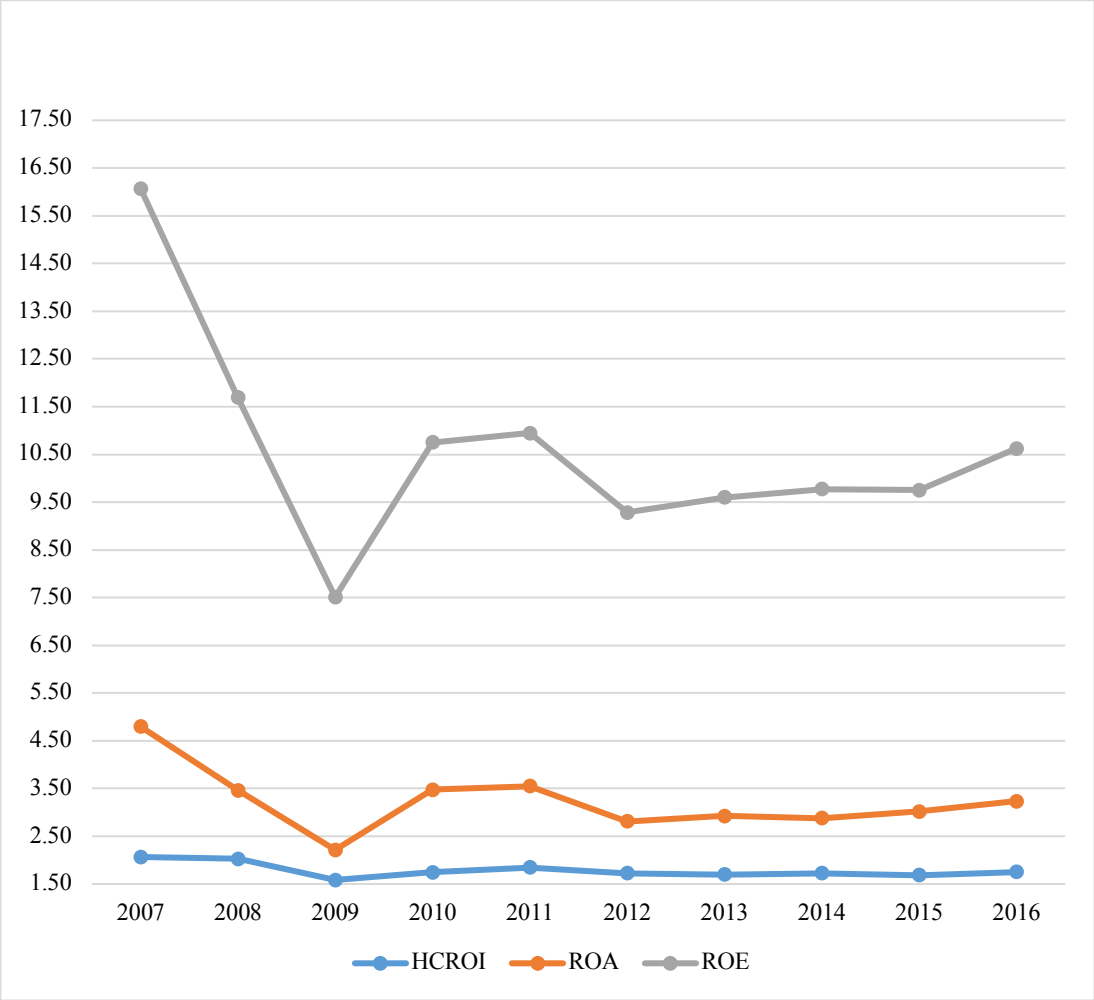
Descriptive Statistics for ROE variable for the Study Period 2007 – 2016

ROE											
Year	**n**	**Median (Mdn)**	**Mean (M)**	**Std. Deviation (SD)**	**Minimum**	**Maximum**	**Range**	**Skewness**	**Std. Error of Skewness**	**Kurtosis**	**Std. Error of Kurtosis**
2007	290	16.062	18.537	14.47223	-33.56	122.96	157	1.806	0.143	10.443	0.285
2008	282	11.691	12.834	18.60617	-114.40	137.17	252	-0.791	0.145	17.463	0.289
2009	311	7.510	6.354	19.41937	-188.60	74.06	263	-3.567	0.138	33.557	0.276
2010	332	10.749	11.707	11.92718	-43.22	61.80	105	0.028	0.134	3.131	0.267
2011	350	10.945	11.671	13.45633	-55.28	70.37	126	-0.430	0.130	5.034	0.260
2012	361	9.281	8.727	14.53945	-75.41	54.90	130	-1.479	0.128	6.933	0.256
2013	372	9.597	9.678	15.90319	-145.32	84.96	230	-2.356	0.126	27.613	0.252
2014	368	9.773	10.529	13.47172	-44.61	83.29	128	0.260	0.127	6.178	0.254
2015	378	9.751	10.238	22.36440	-197.36	210.11	407	0.901	0.125	44.857	0.250
2016	361	10.628	11.713	19.33351	-117.28	238.68	356	4.224	0.128	60.345	0.256



Note. Minimum gridline set to 5

Figure 12. Difference between the mean and median for ROE over the study period (2007 - 2016)



Note. Minimum gridline set to 1.5

Figure 13. Medians for HCROI, ROA and ROE over the study period (2007 - 2016)

The following section will present the results of tests of the various assumptions underlying multivariate statistical analysis.

Assumptions Underlying Multivariate Statistical Analysis

The section above presented a description of how the focal variables manifest in the target population. While we have understood nature of the variables in the sample population. It is unlikely that the results derived from a sample will be duplicated in the population or in another randomly drawn sample. For this purpose, there are two methods of statistical inference that have been developed, the first is testing statistical hypotheses and the second is

the use of confidence intervals to estimate population values. The first subsection to follow uses the first method, namely, hypothesis testing to test the assumptions underlying multivariate procedures and the second part of this section applies the second method namely, meta-analysis which uses confidence intervals to estimate population values.

When testing hypotheses using inferential techniques, the validity of the results are dependent on preconditions that must be met before conducting statistical inferential tests. The hypothesis in the present study used correlational analysis. There are two types of correlations that can be conducted, (1) Pearson correlation which requires that certain assumptions are met prior to computing the analyses and (2) Spearman correlation which is robust against violation of assumptions. A number of (assumptions) preconditions were tested to ensure transparency in terms of the collected data and to ensure the appropriate selection of inferential statistical procedures so that we make accurate and honest inferences based on our findings.

In this regard 5 assumptions[5] were tested: namely, level of measurement, normality, outliers, linearity and homoscedasticity. The results of the tests of the above assumptions will be discussed next.

Level of measurement. The variables in a correlation analysis should be continuous (i.e., measured at the interval or ratio level). The variables used in the present study are measured at the ratio level.

[5] The tests of assumptions are to a certain extent dependant on sample size. Field (2013) asserts that in large sample sizes, as in the case of this study tests for normality and homoscedasticity need not be done because "in large samples they can be significant even for small and unimportant effects" (Field, 2013, p. 13). Nevertheless, we tested these assumptions for transparency and an honest understanding of the data. Additionally, these analyses were deemed useful in discussion section.

Normality. Normality of variables can be tested via a number of methods. The Kolmogorov-Smirnov test tests univariate normality of each variable alternatively, the skewness and kurtosis values can be analysed to test bivariate normality. The presented study used both methods to test normality. Kolmogorov-Smirnov test of univariate normality was conducted first followed by an analysis of the skewness and kurtosis values.

The results from the Kolmogorov-Smirnov test (output contained in Appendix F and Appendix G) for all variables across all years indicated that they did not follow a normal distribution. The multivariate test for normality was consequently investigated which confirmed these results.

The skewness and kurtosis values for all variables revealed that they deviated significantly (i.e., values were found beyond the $p = .001$ criterion and exceeded the range of either +2 and / or -2) from the assumption of normality. Tables containing the skewness and kurtosis calculations for all variables across all years are contained in Appendix H. Based on results from the tests for normality, the data did not follow a normal distribution. While the data did not meet the criteria for normality, Field (2013) argues that this should not be a cause for concern if the data set is larger than approximately 160 units, which is the case of this study. In a large data set, which is the case in this study, "outliers are a more pressing concern" (Field, 2013, p. 7) which is discussed next.

Outliers. An outlier is a score very different from the rest of the data. Outliers could be due to blatant errors in the dataset or they could contain valuable information. Figure 13 in the section above which illustrates the medians for HCROI across all years of study indicates a notable spike in the years 2014 and 2015 which were caused by outliers. While analysing the outliers in the dataset, there were a number of outliers identified for each variable, particularly HCROI.

The number of outliers noted for HCROI are tabulated for all years in Appendix I Furthermore, Appendix J contains boxplots as a visual representation of the outliers for HCROI. The HCROI dataset contained 119 outliers across the 10 year period being studied.

After an inspection of the boxplots and dataset, we found that in the years 2013, 2014 and 2015 only 4 outliers were identified to be blatant errors in the HCROI dataset. While this doesn't sound substantial, they would have substantially affected the analyses. There were two options to proceed, the removal of outliers (Aguinis, Gottfredson, & Joo, 2013) which is controversial or the retention of the outliers which distorts the results. This decision impacted the choice between using a parametric or non-parametric statistical test for correlation therefore additional procedures were conducted to understand the implications of both options.

Additional procedures were conducted to determine whether the transformation of the data or deletion of outliers would affect the final outcome. These procedures were done on the 2013 dataset which contained blatant outliers (which was also the case in 2014 and 2015). Two procedures were conducted (a) trimming and (b) windsorizing the data. Each technique was used independently on the raw dataset. There was no succession of procedures as this in itself would impact the results from the procedures resultant decisions.

Trimming the data involved removing a certain number of outliers from the dataset. The removal of outliers in turn resulted in the removal of ROA and ROE data points which did not contain errors. The deletion of accurate data was an undesirable effect of using this method and a concern to the researchers. Additionally, the removal of outliers results in boxplots producing further outliers which would have resulted in an ongoing iterative process of deletion. We therefore decided against trimming outliers.

Windsorizing involved substituting "outliers with the highest value that isn't an outlier" (Field, 2013, p. 16). In this case, the outliers are removed within specific parameters and the remaining data is analysed. The results are presented in Appendix K.

Prior to windsorizing the data, the Pearson's correlation (r) and Spearman's rho correlation (r_s) was calculated on the original dataset for comparison following windsorizing. Pearson's correlations (r) for the original data indicated no correlation between the variables and no statistical significance while the Spearman correlation (r_s) indicated a moderate correlation in the focal relationships between (1) HCROI and ROE and (2) HCROI and ROA. However, after windsorizing the data, Pearson correlation's for both focal relationships were both weak in strength and statistically significant. The Spearman correlation remained the same as we predicted, given that the technique is robust to outliers. It is clear that windsorizing the data transforms it to an extent that we can now see a significant Pearson correlation. This finding raised a contentious concern about whether the data is being altered to display significant results rather than the truth. We therefore opted to use the original dataset without windsorizing nor trimming the data because Spearman correlation is robust against the violated assumptions and therefore can be used on the original dataset with statistically valid results that represent true relationships between the variables in the original dataset.

Homoscedasticity. We found the data to be slightly heteroscedastic following inspection of scatterplots however this could be attributed to the outliers which stretch the data set. We did not investigate homoscedasticity further because at this point we had made the decision to use Spearman correlation which is robust against this violation.

In summary, some assumptions were violated however, the Spearman technique is robust against these violations. We therefore opted to maintain the integrity of our dataset, instead of altering the dataset and used Spearman's rho to test correlation (Field, 2013).

Tests of Hypotheses

Two variations of statistical analyses were conducted to test the hypotheses. Hypothesis 1 was tested using the Spearman's rho technique. Hypothesis 2 was tested using meta-analysis particularly the mixed effects method to determine if the correlations uncovered using the Spearman rho were stable over time. Panel data analysis was then conducted corroborate the findings of the first two tests from a financial perspective.

Hypothesis 1

Correlational Analysis testing whether HCROI and ROA and ROE are related.

Hypothesis 1 stated that HCE expressed as HCROI and Financial performance expressed as ROA and ROE are positively related. We computed Spearman correlation coefficients to test whether the relationship between HCROI and financial performance outcomes, ROA and ROE in particular, exists. The results are presented in Table 9 and are discussed in detail below. When discussing correlation, the effect size (also referred to as the coefficient) will also be discussed. Cohens interpretation of the effect size (presented in Appendix D) will guide our interpretations of the effect size.

Spearman's rho revealed positive statistically significant relationships ($p < .001$) between HCROI and ROA in all years of study (2007: $r_s = .333$, 2008: $r_s = .425$, 2009: $r_s = 618$, 2010: $r_s = .456$, 2011: $r_s = .419$, 2012: $r_s = .476$, 2013: $r_s = .430$, 2014: $r_s = .354$, 2015: $r_s = .362$, 2016: $r_s = .262$). The effect sizes of these relationships varied across years. Most correlations, namely the correlations for 2007,2008, 2010, 2011, 2012, 2013, 2014 and 2015 were a medium effect size, i.e. they ranged between .03 to .05 (2007: $r_s = 333$, 2008: $r_s = .425$, 2010: $r_s = .456$, 2011: $r_s = .419$, 2012: $r_s = .476$, 2013: $r_s = .430$, 2014: $r_s = .354$, 2015: $r_s = .362$) (Cohen, 1988). The years which deviated from the effect size norm were 2009 which indicated a large effect size ($r_s = .618$) and 2016 which indicated a small effect size ($r_s = .262$) (Cohen, 1988).

Positive, statistically significant ($p < 0.001$) correlations were found between HCROI and ROE for all years of study. (2007: $r_s = .209$, 2008: $r_s = .370$, 2009: $r_s = 634$, 2010: $r_s = .409$, 2011: $r_s = .388$, 2012: $r_s = .430$, 2013: $r_s = .397$, 2014: $r_s = .355$, 2015: $r_s = .319$, 2016: $r_s = .241$). The effect sizes of these relationships varied across years. Most correlations, namely the correlations for 2008, 2009, 2010, 2011, 2012, 2013, 2014 and 2015 were a medium effect size, i.e. they ranged between .03 to .05 (2008: $r_s = .370$, 2009: $r_s = 634$, 2010: $r_s = .409$, 2011: $r_s = .388$, 2012: $r_s = .430$, 2013: $r_s = .397$, 2014: $r_s = .355$, 2015: $r_s = .319$) (Cohen, 1988). The years which deviated from the norm in terms of effect size were 2007 and 2016 which indicated small effect sizes (2007: $r_s = .209$, 2016: $r_s = 241$).

Table 9

Summary of Intercorrelations, Means and Standard Deviations for HCROI and Financial Performance Outcomes for 2007 – 2016

	Variable	*ROA*	*ROE*	*M*	*SD*	*N*
2007						290
	HCROI	.333**	.209**	2.719	6.259	
	ROA	-	.765**	6.533	6.259	
	ROE		-	18.537	14.472	
2008						282
	HCROI	.425**	.370**	5.543	49.531	
	ROA	-	.863**	4.603	5.285	
	ROE		-	12.833	18.606	
2009						311
	HCROI	.618**	.634**	2.056	10.607	
	ROA	-	.922**	2.673	5.154	
	ROE		-	6.353	19.419	
2010						332
	HCROI	.456**	.409**	4.240	24.83	
	ROA	-	.903**	4.408	4.856	
	ROE		-	11.706	11.927	
2011						350
	HCROI	.419**	.388**	11.749	96.240	
	ROA	-	.888**	4.345	5.016	
	ROE		-	11.671	13.456	
2012						361
	HCROI	.476**	.430**	9.644	62.000	
	ROA	-	.877**	3.426	4.886	
	ROE		-	8.726	14.539	
2013						372
	HCROI	.430**	.397**	26.592	281.505	
	ROA	-	.880**	3.758	4.869	
	ROE		-	9.677	15.903	
2014						368
	HCROI	.354**	.355**	275.637	5194.851	
	ROA	-	.884**	3.932	5.224	
	ROE		-	10.529	13.471	
2015						378
	HCROI	.362**	.319**	324.561	6151.010	
	ROA	-	.853**	3.600	4.933	
	ROE		-	10.237	22.364	
2016						361
	HCROI	.262**	.241**	20.639	225.140	
	ROA	-	.807**	3.847	4.569	
	ROE		-	11.712	19.333	

Note: ** $p < .01$ (two-tailed).

Squaring the correlation coefficient indicates the percentage of variance in the focal relationships. Table 10 below indicates the percentage variances in the two relationships namely, (1) between HCROI and ROA, and (2) HCROI and ROE, in each year of study.

Table 10

Percentage Variance Caused by HCROI and ROA, and HCROI and ROE

Year	Variable	HCROI
2007	ROA	11%
	ROE	4%
2008	ROA	18%
	ROE	13%
2009	ROA	38%
	ROE	40%
2010	ROA	20%
	ROE	16%
2011	ROA	17%
	ROE	15%
2012	ROA	22%
	ROE	18%
2013	ROA	18%
	ROE	15%
2014	ROA	12%
	ROE	12%
2015	ROA	13%
	ROE	10%
2016	ROA	6%
	ROE	5%

Reverting to findings in table 9, the correlations between the dependant variables were statistically significant ($p < .001$) and strong correlations were found for all years (2007: $r_s = .765$, 2008: $r_s = .863$, 2009: $r_s = .922$, 2010: $r_s = .903$, 2011: $r_s = .888$, 2012: $r_s = .877$, 2013: $r_s = .880$, 2014: $r_s = .884$, 2015: $r_s = .853$, 2016: $r_s = .807$). These large correlations between the dependant variables being studied are likely due to the fact that they contain similar elements in the equation used in their calculation. Additionally, this may indicate collinearity between the dependant variables. However, the relationship between the independent variable (HCROI) and each of the dependant variables differ therefore while collinearity was suspected, variance in each relationship differs and the relationship between HCROI and ROA is stronger than the relationship to ROE. Therefore, collinearity is an unlikely effect.

The correlations, effect sizes and percentage variance values indicate that there is more variance in the relationship between ROA than in ROE. While the strength of the relationship between HCROI and both dependant variables are medium, there is a slightly stronger relationship between HCROI and ROA than HCROI and ROE.

The Spearman correlation for each year of study (2007 - 2016) together with the sample size were exposed to further statistical analysis, specifically meta-analysis, to test hypothesis 2. The next section discusses the tests of hypothesis 2.

Hypothesis 2

Meta-analysis testing whether HCROI and ROA and HCROI and ROE are related over time. Hypothesis 2 states that the positive relationship between HCE expressed as HCROI and Financial performance expressed as ROA and ROE is consistent over time. Meta-analysis was applied to analyse Spearman correlations from multiple years (2006 - 2017) to produce an overall estimate of the relationship between HCROI and ROA and ROE.

The results for both the Hedges-Vevea random-effects model and the Hunter-Schmidt random-effects model were calculated however the we will describe the results for the Hunter-Schmidt model. The results for the Hedges-Vevea random-effects models are presented and discussed in Appendix L.

First the meta-analysis that evaluates the relationship between HCROI and ROA will be presented followed by results for HCROI and ROE (Table 11). The Q-statistic for the Hunter-Schmidt random-effects model shows that the population effect is significant, $\chi 2$ (9) = 39.830, $p < .000$. The effect size reported within 95% credibility intervals are .411 (95% CI [.258, .563]). Based on both tests there is a significant relationship between HCROI and ROA over the period of study. Additionally, based on the estimate of population effect size and the credibility intervals, the strength of the relationship between HCROI and ROA is moderate.

The Q-statistic for the Hunter-Schmidt random-effects model also shows that the population effect is significant, $\chi 2$ (9) = 51,694, $p < .000$. The effect size reported within 95% credibility intervals are .374 (95% CI [.187, .561]). Based on the estimate of population effect size and the credibility intervals, the strength of the relationship between HCROI and ROE is also moderate. The overall relationship between HCROI and ROA is confirmed to be slightly stronger than the relationship between HCROI and ROE. This concludes our discussion on our findings regarding hypothesis two. In the next section, we will briefly discuss a supplementary analysis we conducted on a panel version of the data.

Table 11[6]

Results of Hunter-Schmidt Random-Effects Meta-Analyses Measuring HCROI Relationships Across 10 Years'

Variables	K	Q (df)	*p*	Mean	95% credibility interval for mean *r*	
					Lower Limit	Upper Limit
ROA	10	39.830 (9)	.000**	.411	.258	.563
ROE	10	51,694 (9)	.000**	.374	.187	.561

Note: df and $\chi 2$ are used interchangeably

Supplementary Analysis

Panel data analysis. Following the results of the meta-analysis we conducted a test of robustness using panel data statistical analysis. We did this to corroborate that the correlations we found were due to relationships between the constructs and not underlying latent constructs. The panel data analysis is able to corroborate the findings by holding constant the underlying constructs related to ROA, ROE and HCROI that may be causing variance (de Jager, 2008). Underlying constructs such as financial leverage and industry size were held constant.

The results will be discussed briefly because this is not a method used in organisational psychology and is a periphery analysis to reinforce our findings and pre-empt any threats. Panel data analysis confirmed that the correlations we reported are robust to these underlying effects suggesting that a relationship between HCROI and ROA and ROE is present and likely to exist. The output for the panel data is available in Appendix N.

[6] SPSS version 26 (IBM Corp, 2012) output which were used to draw up Table 11 are available in Appendix M

Discussion

The value of human capital is established in research and practise. Employees are regarded as assets and are referred to as human capital (Becker, 1962). The term capital is used to illustrate that like other forms of capital, HC can be invested in resulting in a contribution of more value to the firm. This logic is theoretically supported in the literature and generally accepted in practise. Employees are found to be assets that drive the success of the organisation through their contribution to productivity and in turn revenue (Crook et al., 2011).

While prior research on the theoretical link between investments in HC resulting in valuable outcomes is demonstrated in the literature, empirical support is limited. Business stakeholders raise recurring criticisms about whether investments in HC can result in outcomes over and above theory. Business stakeholders require evidence of this relationship and such evidence should be provided and communicated using terminology and methods relevant to them. Stakeholders consider the impact on the bottom line as the ultimate indicator of a worthwhile investment therefore if we can empirically show that investments in HC has an influence on the bottom line, then stakeholders will confidently and generously invest in HC.

Resultantly we embarked upon this study to (1) respond to increasing calls for HRM professionals to become more evidence based and (2) respond to the request for proof that indicates whether HC investment has a relationship with financial performance.

This discussion chapter is presented in six key sub-sections. The first section discusses the main findings while drawing upon existing literature. The second section briefly discusses a supplementary analysis that was done using panel data. The third section stipulates key assumptions we made when carrying out the study. The fourth section highlights theoretical and practical contributions of the present study. The fifth section

acknowledges limitations of the study which is followed by the sixth section in which recommendations are proposed in the interest of advancing and directing future research. Lastly, the conclusion which summarises the findings of this study is presented.

Main Findings

We hypothesised that HCE and financial performance are related and this hypothesis was underpinned by the resource-based view. The independent variable, HCE, was operationalised using one measure (HCROI) while the dependant variable, financial performance was operationalised using two measures (ROA and ROE). The resulting two relationships were analysed to test the hypothesis. The relationships were first analysed independently, each year, using Spearman correlation over a period of ten years. Following which, the relationships were meta-analysed in combination, with sample effects taken into account, to determine the overall relationship between the variables across the total period of study. We will first discuss the findings regarding relationships tested in each year of study (H1).

The relationship between HCROI and ROE and ROA. With respect to the hypothesis on the relationship between HCROI and ROA and ROE in each of the ten years we studied, the results indicate a positive association between the variables. For most years the association was moderate in strength however there were deviations from this trend for HCROI's association with both ROA and ROE. In the case of the relationship between HCROI and ROA a large correlation was noted in 2009 with a small correlation noted in 2016. Small correlations were noted in 2007 and 2016 while a large correlation was noted for ROE in 2009.

These associations that deviate from the trend could be due to "antecedents and consequents" that Bontis and Fitz-enz (2002, p. 1) outlined in their article which was discussed earlier in the literature review. They advised that there are two variables that affect

HCE, (1) human capital depletion which has a negative effect and (2) human capital investment which has a positive effect.

Higher than usual correlations could be attributed to a recovery following human capital depletion leading to an increase in human capital investment and subsequently valuation. This might have manifested due to the effects of decisions made during the global financial crisis in 2007. Companies may have retrenched staff in 2007 and 2008 resulting in reduced salaries and benefits, an expense which features in the calculation of HCROI. Additionally, bonuses were rarely paid out during this time. However, in 2009, companies would have recovered from the financial crisis. They would have resumed business as usual, increasing earnings, operating with a higher staff contingent and spending more on pay and benefits as well as bonuses. Resultantly, the association between HCROI and ROA and ROE was larger than other years of study.

The smaller associations noted in three of the ten years could be due to human capital depletion (Bontis & Fitz-enz, 2002). It could be that companies are becoming more conscious of how money is spent therefore less is spent on pay and benefits. A novel approach to justifying this occurrence in 2016 is considering the effect of the rise of the millennial workforce who prefer temporary work (Schreuder & Coetzee, 2016). They generally constitute the temporary workforce or contractors and may thus not be included in the HCROI ratio which calculated pay and benefits for permanent employees (Fitz-enz, 2000). This would however account for a small variance in the lower association because this is more relevant to first world countries with a modern approach to the workplace and workforce. In second and third world countries with more traditional norms at work, global pressure to impose more fair and liberal work practises might be a contributor to the smaller correlation. This would lead to a strained relationship between HCROI and ROA and ROE because companies may employ less people on a permanent basis which would lead to a

lower spend on pay and benefits. Employing less people on a permanent basis and classifying them as contingent workers may be a strategy for companies to reduce the salary and benefits expense that is reported. This was a tactic that Fitz-enz (2000) warned against when discussing metrics and dedicated a section in his book to this.

Interestingly, the HCROI and ROA relationship is stronger than the relationship between HCROI and ROE. This suggests that HCE may have a bigger influence on the organisations ability to leverage assets to increase revenue than on the ability to leverage invested equity. Given that causation cannot be attributed, the opposite would hold true. In other words, ROA may be a stronger indicator of HCROI compared to ROE. Next, we will discuss the findings related to hypothesis 2.

The relationship between HCE and financial performance over time. The second hypothesis we proposed stated that (H2): The relationship between HC and Financial performance is consistent over time. The results of our meta-analysis revealed that the relationship between HCE and financial performance over a time depth of ten years is moderate and positive which supports the proposed hypothesis.

In explaining the positive association between HCROI and ROA, it is important to draw upon the work of noted authors that were referenced in our review of the literature. The positive relationship between HCE and financial performance are consistent with predictions made by Fitz-enz (2000) as well as findings by, Chen et al. (2005) Crook et al. (2011), Kamath (2008) and Ling and Jaw (2006). Our findings resultantly build on their related findings, all of which assert that a positive relationship between HC and financial performance exists.

In line with findings by Crook et al. (2011), under the RBV framework we found a positive association between HCE and financial performance which is a type of firm

performance. This suggests that HC is a strategic resource that can be leveraged to achieve the financial performance outcome and ultimately sustained competitive advantage.

The scepticism implied by findings in some studies located within the intellectual capital framework should be addressed. Firer and Williams (2003) and Carla (2015) found that HC is not related to financial performance which is in contention with the findings of this study and studies mentioned in the paragraph above. We highlighted that the constraint in these studies was perhaps due to the operationalisation of the variables. The conceptual framework that was used to understand and operationalise HC is crucial and may affect conclusions. Our findings by extension supports the framework proposed by Fitz-enz (2000), more specifically, the operationalisation of HCE using HCROI when investigating an association to financial performance.

These results which support the notion that HCROI can be used to predict important financial outcomes such as ROA and ROE should be noted by stakeholders. It shows that the human element in the firm is a powerful resource that can be invested in to leverage higher financial returns (Fitz-enz, 2009a). The clear indication that the cost of investing in HC is significant should convince stakeholders that the high cost of human capital which far exceeds the cost of financial capital is justified.

Under the principle of RBV, the findings demonstrate that the contribution of this internal, intangible scarce resource can be leveraged to achieve important outcomes such as financial performance which contributes to sustained competitive advantage and leads to more valuable benefits than the costs. Next, we will consider the results from the stakeholder point of view.

In the case of management, investments directed at HC particularly through salaries and benefits may result in increased revenues and will positively relate to the ROA they

report. The opposite is also true, companies that have higher revenues are perhaps in a better position to make investments in HCE through salaries and benefits.

In the case of shareholders, the association between HCE and ROE in particular suggests that they should consider the manner in which companies invest in their human element when making investment decisions. HCROI can be used by investors seeking possible indicators of expected financial performance from HCE. In doing so we suggest that the focus should expand from the bottom line to include consideration for the people that make the bottom line possible.

In the case of SHRM, the findings are an indication that there is value in HCE and though HCE may be intangible, it is certainly not unmeasurable (Cascio & Boudreau, 2011). HRM should attempt to make sense of HR related data in systematic ways and associate it with the goals of the business to strategically defend, understand and invest in employees. Furthermore, expressing their function in relation to that of stakeholders will enhance their credibility in the contemporary management team.

While we have discussed our findings in a positive light, we must acknowledge that focussing solely on the bottom line is not healthy for the business nor employees. The *human* element in human capital should consistently be considered. While we should strive for lean investments to ensure financial success, the well-being of the workforce should not be compromised in the solitary pursuit of effectiveness ratios and higher revenue. We should manage human capital with the intention of increasing benefit for both the firm and employees (Schreuder & Coetzee, 2016).

In summary, the contribution of employees to the achievement of business goals, particularly financial performance, are made clear through our findings. Contributions to organisational goals are not exclusively through investment in physical capital and resources

such as equipment. A proportion of increased financial performance can be attributed to HCE.

Supplementary findings

Benchmarking. A corollary of the study is that we established global benchmarks for HCROI. We found that medians are the appropriate measure of central tendency when attempting comparison between companies given that the dataset is susceptible to outliers. The average median across years was noted to be 1.784 i.e. companies yielded $1.784 for every $1 spent on compensation. HCROI could be used as a general benchmark for normative comparisons of HCE.

Panel data analysis. We were considerate of using dependant variables extracted from the accounting field therefore additional panel data analyses were run to test whether confounding effects might influence the association we found using psychology related techniques. The results showed that companies can evaluate the relationship between HCE and financial performance regardless of industry, size, or country in which it is domiciled. That is particular industries, countries or category of organisation in terms of size do not necessarily experience higher HCROI's than others. Resultantly, we can confirm with a degree of certainty that the investment made in HC is related to financial performance and not the confounding factors we tested.

Key Assumptions of the Research

The study was undertaken with the assumption that organisations are open to the measurement of HC with the intention to make decisions based on the results. The concern around this assumption is that in the past, the American National Standards Institute (1970) (ANSI) attempted to create a framework for HC measurement and practices for listed companies. This framework was tentative and feedback was encouraged before tabling. However, the framework was rejected following feedback from organisations. The feedback

from organisations was that they did not want to be regulated on how they measure HC and to be obligated by standards.

We assume that the research will not be received in the same light as ANSI given that it is not regulatory. Instead, we expect that the findings will encourage business and academia to consider the proposal from ANSI in a different light following the empirical findings of this study. We hope that organisations will see the value in reporting on HC to employees who are key contributors to the organisation as well as see value in relating this information to key decision makers such as investors and executives.

Contributions

Theoretical contributions. The research will contribute to the extant literature of both HC and financial performance by firstly, providing benchmarks (through the data[7] that was collected) that can be used when analysing HCROI of a firm. Secondly, the conclusions from the study support findings and predictions made by authors who are proponents of the HCE and financial performance relationship. Thirdly, the use of meta-analysis to study correlations across a wide time-depth gives a deeper understanding of the relationship between HCE and financial firm performance. Fourth, the study will hopefully encourage researchers and academics to embark on empirical research to support conceptual arguments so that businesses are able to apply theories that are proven to have an impact. Lastly, we hope that the study will inspire researchers to challenge existing research by conducting deeper analysis of the results of previous studies to uncover other useful patterns and information. Recommendations will be made for future research in a latter part of the discussion section.

[7] This data may be made available upon request from the authors for use in further research.

Practical contributions. The study makes a contribution to practise in a number of ways and to multiple constituents. First, in the case of the organisation, the findings of the study are novel and serve as empirical support for the relationship between HC and financial performance which opens up a case for the use of HCROI as a metric in practise. Therefore, we advocate that organisations should consider measuring HC using the HCROI ratio and including it in reporting frameworks available to external constituents of the organisation to support decision making and insight into the HC related health of the organisations.

Second, when considering business executives and shareholders, the consistent and positive relationships between HCROI and ROE and ROA should indicate to business executives that the investment in human capital through salaries and benefits is not in vain and should not be seen as a grudge purchase. Furthermore, this relationship supports the case that investing in human capital will allow both shareholders and the organisation to experience relative financial performance outcomes such as moderate ROA in the case of the organisation and a moderate ROE in the case of the shareholder.

Third, proponents of HC accounting can use the present study to support the inclusion of HC in financial statements because investors may use the results to inform investment decisions by analysing HC in relation to ROE.

Fourth, the HRM fraternity can benefit in having quantitative data expressed in financial terms to present to business. HRM professionals should gain confidence from the positive findings of the present study to increase their use of metrics in various areas of HRM. This will improve their credibility in the eyes of other departments, management and other relevant stakeholders that rely on quantitative data (Schiemann & Ulrich, 2017). Furthermore, HRM can expand the use of metrics to measure the impact of specific investments in HC such as HC development and any other HC related initiative.

Limitations of the Research

Like all studies, this study is not without limitation. The first limitation of the study is that the results may not easily be used in benchmarking of companies domiciled in specific countries. The sample was broad and varied which was an advantage in wide analyses however this slight limitation regarding generalisability is acknowledged. Second, when using ROA and ROE as a measure of performance, employees who are powerful (e.g. in possession of valuable HC) may acquire above-market prices for their HC contribution. This may dilute and reduce the HCROI ratio and subsequently the positive impact (profitability) of HC on the firm's global performance measures (e.g. ROA, ROE). Third, the use of top 1000 highest revenue companies as the sample implies a range restriction that must be acknowledged. These companies can generally afford to employ high wage workers so the inferences may not extend to small to medium enterprises.

Lastly, we acknowledge that the findings do not deduce causation. In other words, while the findings suggest a clear relationship between the focal variables, this does not automatically mean that a change in one variable will result in a causal change in the other variables. Further analysis such as regression would have to be performed to attribute causation. This is discussed in the next section which proposes recommendations for future research.

Recommendations for Future Research

The present study used a global sample to gather a general understanding of whether a relationship between HCE and financial performance can be found in firms across the globe and across years. Now that the findings imply that a moderate relationship exists, the first recommendation we make is that future studies should employ a more focussed approach by analysing HCE and firm performance in either specific countries or industries. This will

allow findings to be more specific and appropriate to a particular country with consideration for the firm's macro and micro national economic circumstances.

Now that we presented findings implying a positive association between HC investment and important financial performance outcomes, the second imperative recommendation we endorse is that future research should investigate the casual relationship between HC and firm performance. That is, using the same operationalisation of the variables, researchers should conduct a regression analysis to determine the cause and effect relationship between the variables.

The present study is a basis for retrospectively analysing data to gather an *understanding* of HC within business. Our third recommendation is that the data in the present and future be used to ascend research into *predicting* outcomes. The HCROI data could be analysed to determine whether ratios from year one can be used to anticipate the outcomes of year five. This would contribute to workforce analytics which is the route that many successful organisations are taking to strategically predict the people aspect of business (Fitz-enz, 2009a).

Research contributions and Practical implications

Quantitative analyses using data across a time depth of 10 years and the use of the global 1000 population to test the hypotheses allowed the present study to contribute relevant evidence-based support for investing in human capital through salaries and benefits. Furthermore, the findings of this study emphasised that investing in human capital should allow both shareholders and the organisation to experience important financial performance outcomes such as (1) moderately higher ROA in the case of the organisation and (2) moderately higher ROE in the case of the shareholder, over time. Moreover, the descriptive data provides global HCROI benchmarks allowing normative comparison across firms regardless of where they are domiciled. Additionally, the implications for HRM practitioners

in using metrics will encourage an evidence-based approach and will in turn increase their credibility to other stakeholders. Furthermore, HRM can expand the use of metrics to measure the impact of specific investments in HC such as HC development interventions. Lastly, the finding of a moderate relationship between HCE and financial performance outcomes is the starting point for HRM to use evidence-based tools to communicate the value of investing in HC to stakeholders.

Conclusion

Acknowledging the value of employees by acknowledging them as human capital is an important consideration in both practice and academia. Understanding whether HC can be leveraged to achieve important financial outcomes has always been a concern for stakeholders and more recently, the scientific community. The present study investigated whether this relationship might exist in a sample of 1000 highest revenue companies, whose existence and continuation, depends on such empirical information. Our objective was to establish whether a consistent relationship between HCE and financial firm performance exists. We tested the hypothesis that HCE is positively related to financial performance. We did this by measuring effectiveness of HC using a return on investment measure (HCROI) and correlated this with financial outcomes namely, ROA and ROE. We found that a significant correlation between HCROI and ROA and ROE is present. These associations were positive and moderate supporting the proposed hypotheses. This is an important finding which is a valuable contribution to the extant HC literature as well as to stakeholders of firms. We can now set aside hesitations when firms report substantial amounts spent on salaries and benefits knowing that it is not in vain. We should gain confidence that the investment in people through salaries and benefits are meaningfully spent by impacting external stakeholders who can realise higher financial profitability.

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Appendix A

Data collection process using the Bloomberg Terminal

A detailed explanation of the data collection process using the Bloomberg Terminal is provided in this section. The Bloomberg terminal is accessed using a login username and password provided by University of Cape Town (UCT) Library. The process will be explained using bullet points for ease of reference:

- To begin the process of gathering a list of companies that meet specific criteria, navigate to the Equity screening (EQS) function. Once on the EQS screen, to create a list of highest revenue companies, the following steps were followed:
- In the “Enter Query” box
- All values were reported in dollars.

The following source codes were used to request the data for the key variables of the study on the Bloomberg terminal:

- Revenue
- Personnel Expenses
- Cost of Goods Sold
- Operating Expenses
- Return on Assets
- Return on Common Equity

The Bloomberg (2017) information icon on the website gave the following explanations for the source codes mentioned above:

- Revenue - Before providing the definition of revenue according to Bloomberg, the inconsistencies when using the term revenue will be explained. Revenue, income and sales are terms that are often used interchangeably. Revenue for the purpose of this study and in accordance with accounting principles and corporate governance is defined as the total amount of cash generated through the sale of the companies' products or services less any returns or discounts. According to Bloomberg revenue is defined as the "amount of sales generated by a company after the deduction of sales returns, allowances, discounts and sales-based taxes. Includes subsidies from federal or local government in certain industries (i.e. transportation or utilities). Excludes turnover from joint ventures and / or associates. Excludes inter-company revenue. Excludes revenues from discounted operations". This definition is in accordance with the Fitz-Enz definition of revenue and is therefore appropriate to use in the calculation of HCROI.
- Personnel Expenses – "Includes wages and salaries, social security, pension, profit-sharing expenses and other benefits related to personnel (Bloomberg, 2017).
- Cost of Goods Sold (COGS) – "are the direct costs attributable to the production of the goods sold by a company. This amount includes the cost of the materials used in creating the good along with the direct labour costs used to produce the good. Also referred to as 'cost of sales'".

  Cost of goods sold represents the company's total cost of the turnover for the year
- Operating Expenses – Operating expenses "are those expenditures that a business incurs to engage in any activities not directly associated with the production of goods or services. It includes selling and administrative expenses after cost of goods sold (COGS)" (Bloomberg, 2017).

- Return on Assets (ROA) – ROA is an "indicator of how profitable a company is relative to its total assets, in percentage. ROA gives an idea as to how efficient management is at using its assets to generate earnings" (Bloomberg, 2017).

- Return on Assets is calculated in the following manner:

$$\frac{\text{12-Month Net Income}}{\text{Average Total Assets}} \times 100$$

- Return on Equity (ROE) – ROE is a "measure of a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested, in percentage".

  Return on Equity is calculated in the following manner:

$$\frac{\text{12-Month Net Income available to shareholders)}}{\text{Average Total Common Equity}} \times 100$$

Appendix B

Descriptive Data for Sample

The tables below indicate each variable and the number of companies that reported on the stated variable. Interestingly, the personnel expense is the variable that has been reported on the least. This should change now that the findings suggest that we can use this information to better understand financial performance of the firm.

Table 12

Number of Companies That Reported on Revenue

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
n	Reported	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	Did not report	0	0	0	0	0	0	0	0	0	0
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table 13

Number of Companies That Reported on Personnel Expenses

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
n	Reported	542	540	574	587	604	608	619	616	622	606
	Did not report	458	460	426	413	396	392	381	384	378	394
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table 14

Number of Companies That Reported on Cost of Revenue (COGS)

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
n	Reported	628	634	638	646	652	660	663	664	670	660
	Did not report	372	366	362	354	348	340	337	336	330	340
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table 15

Number of Companies That Reported on Operating Expenses

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
n	Reported	979	975	993	990	990	991	991	991	988	987
	Did not report	21	25	7	10	10	9	9	9	12	13
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table 16

Number of Companies That Reported on Return on Assets

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
n	Reported	967	963	952	964	975	970	976	975	978	975
	Did not report	33	37	48	36	25	30	24	25	22	25
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table 17

Number of Companies That Reported on Return on Common Equity

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016

n	Reported	938	930	920	929	937	939	943	947	952	940
	Did not report	62	70	80	71	63	61	57	53	48	60
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Appendix C

Country Data for sample

This section contains graphs indicating frequency of companies per country of operation for each year of study (i.e., separately for each year including and in between 2007 -2016)

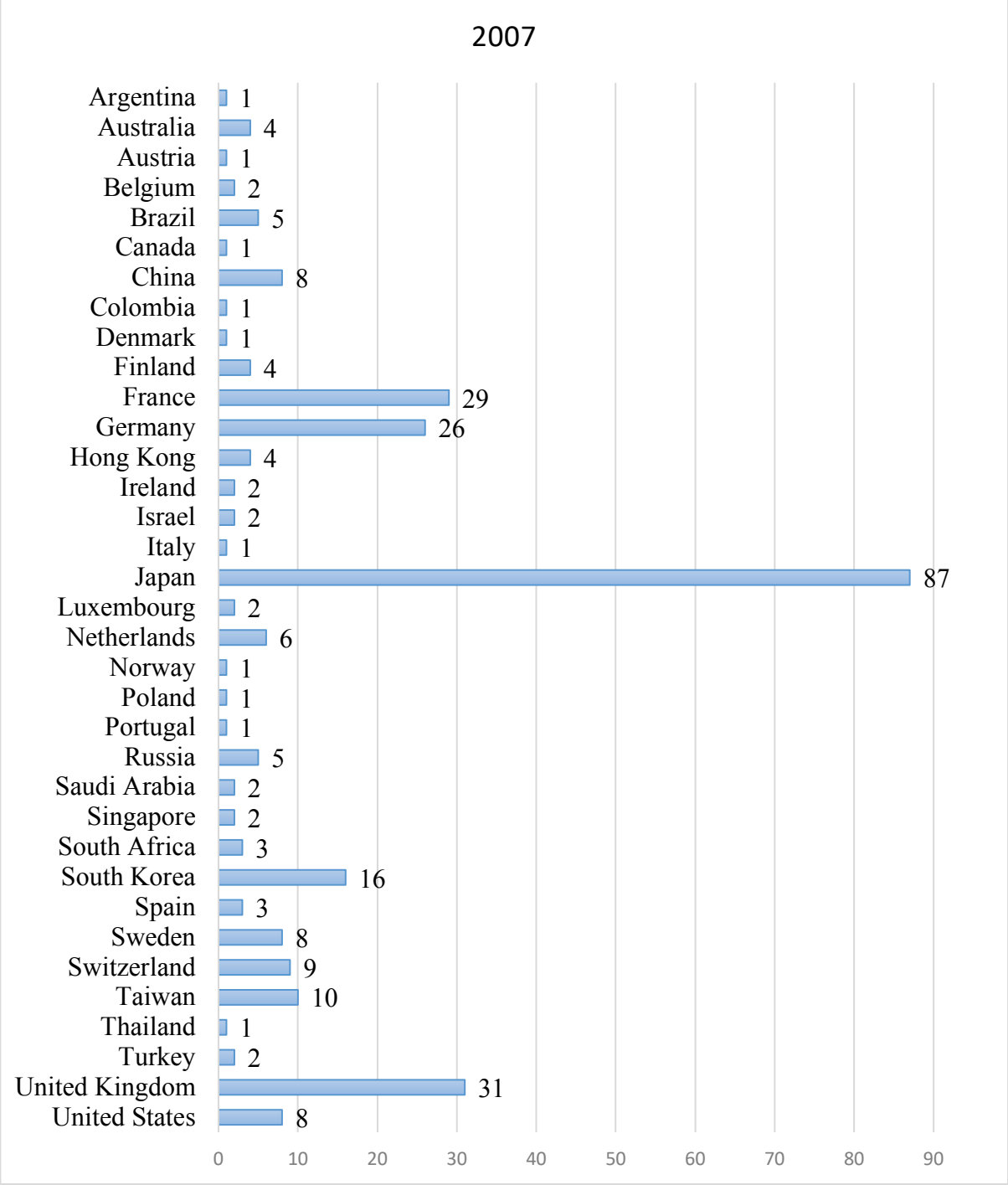


Figure 14. Bar graph indicating the frequency of companies per country for the year 2007.

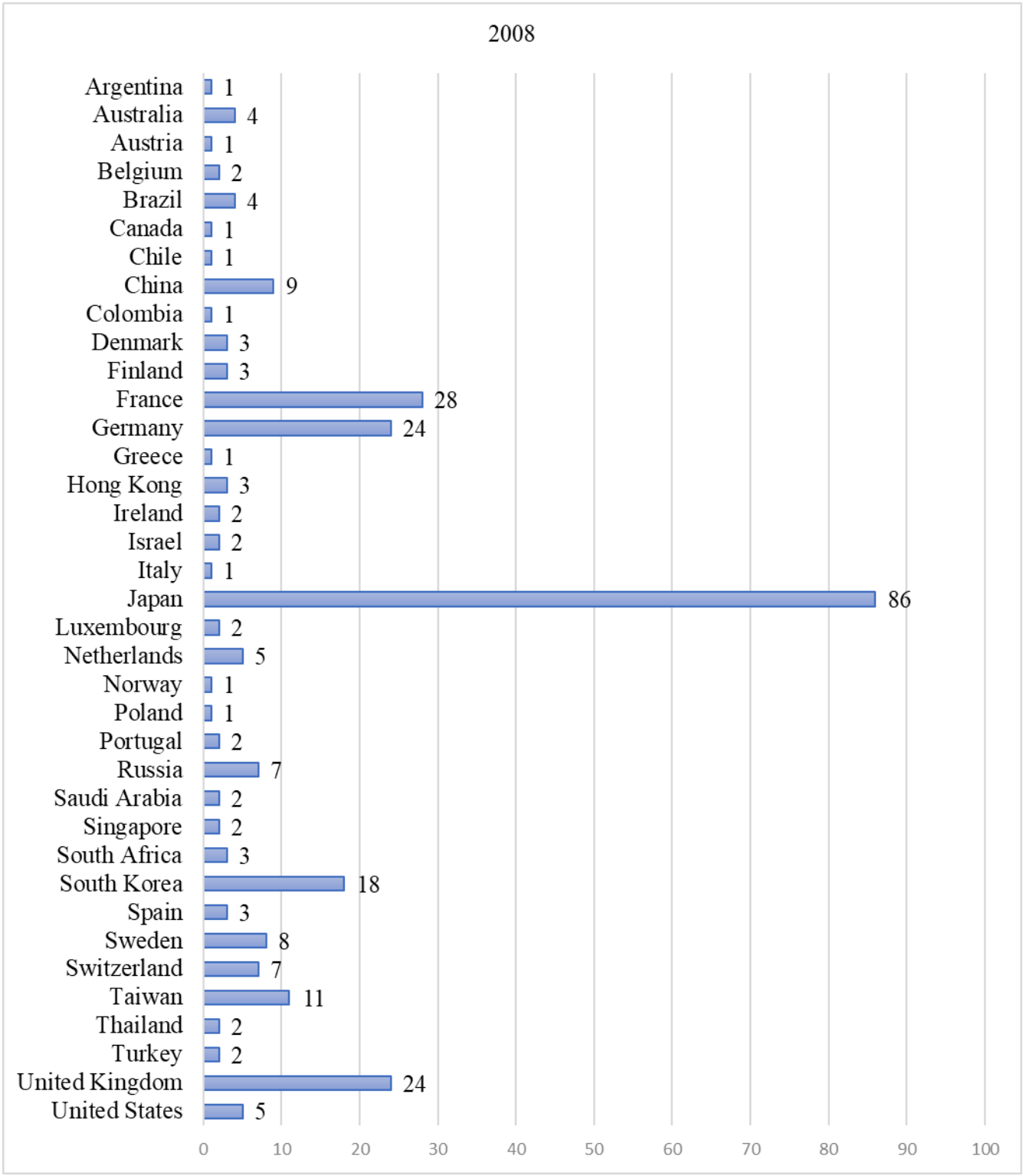


Figure 15. Bar graph indicating the frequency of companies per country for the year 2008.

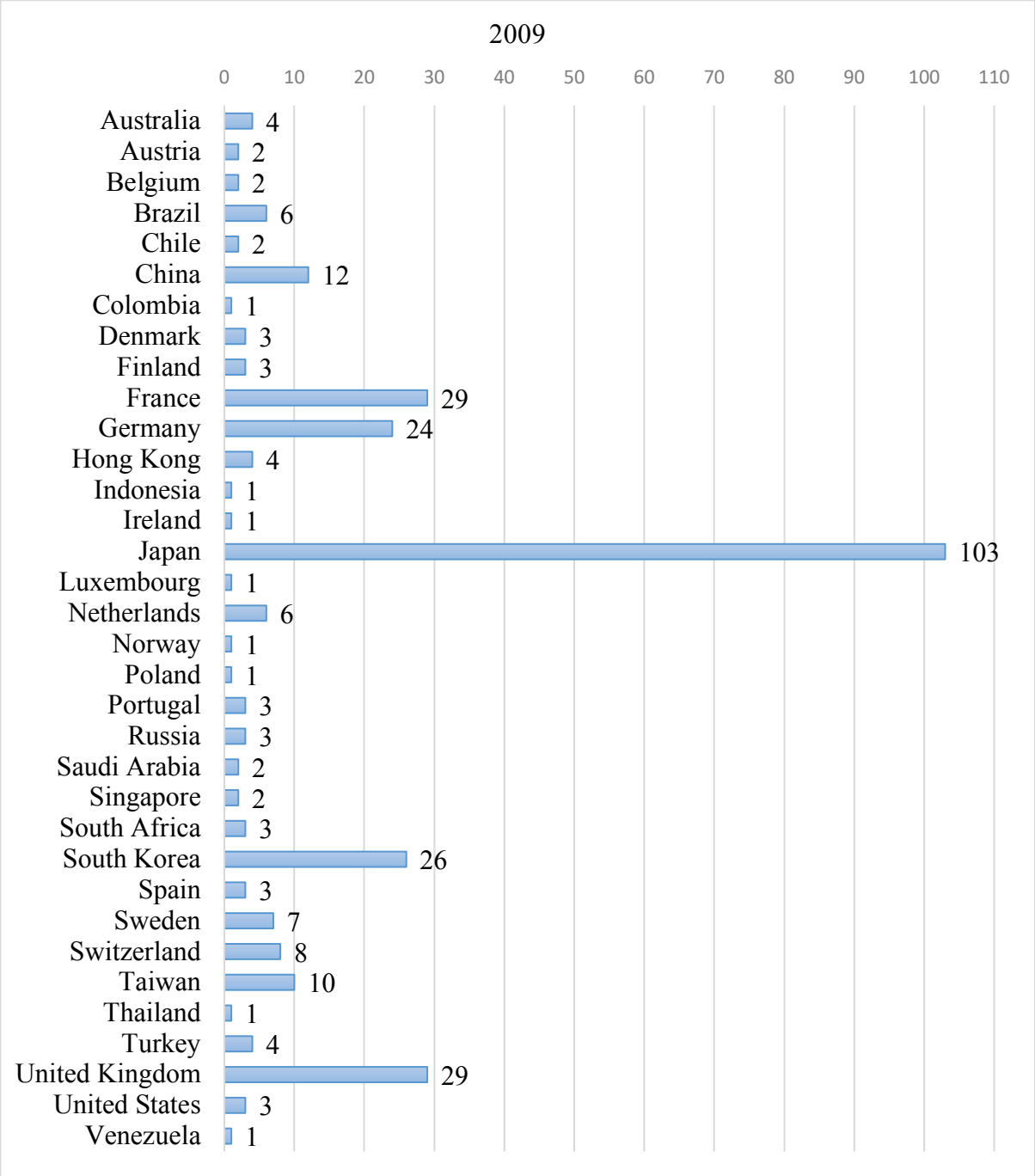


Figure 16. Bar graph indicating the frequency of companies per country for the year 2009.

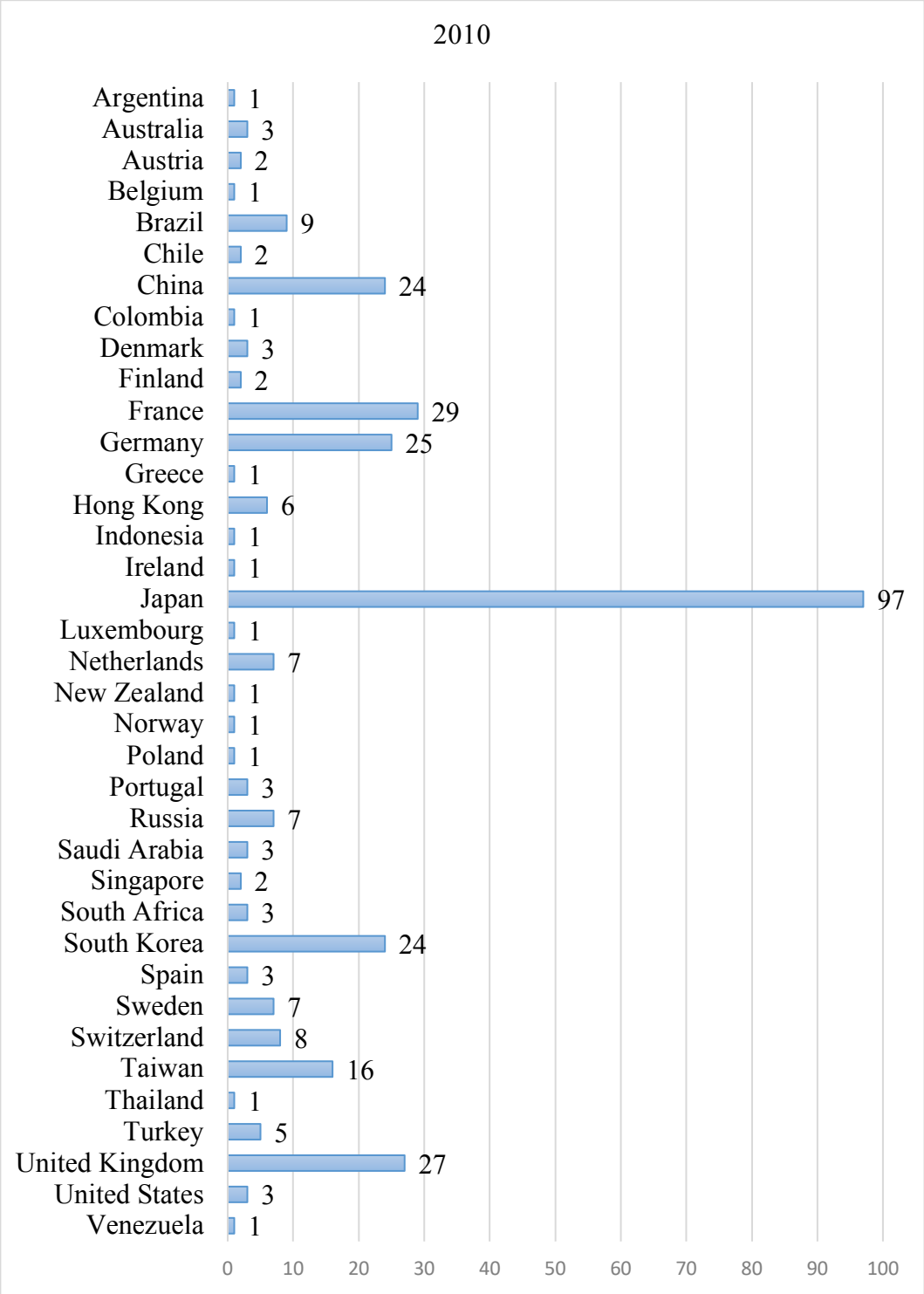


Figure 17. Bar graph indicating the frequency of companies per country for the year 2010.

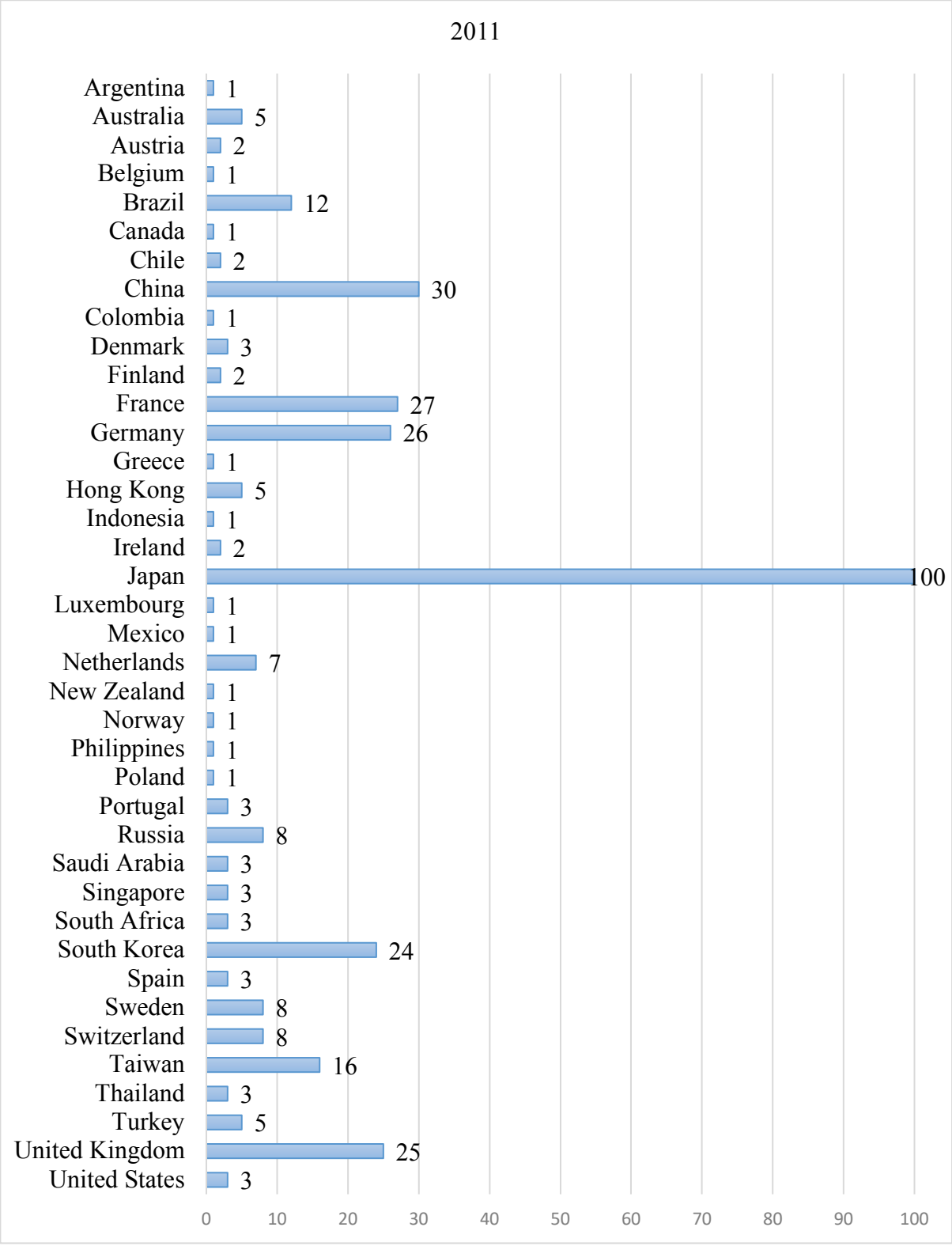


Figure 18. Bar graph indicating the frequency of companies per country for the year 2011.

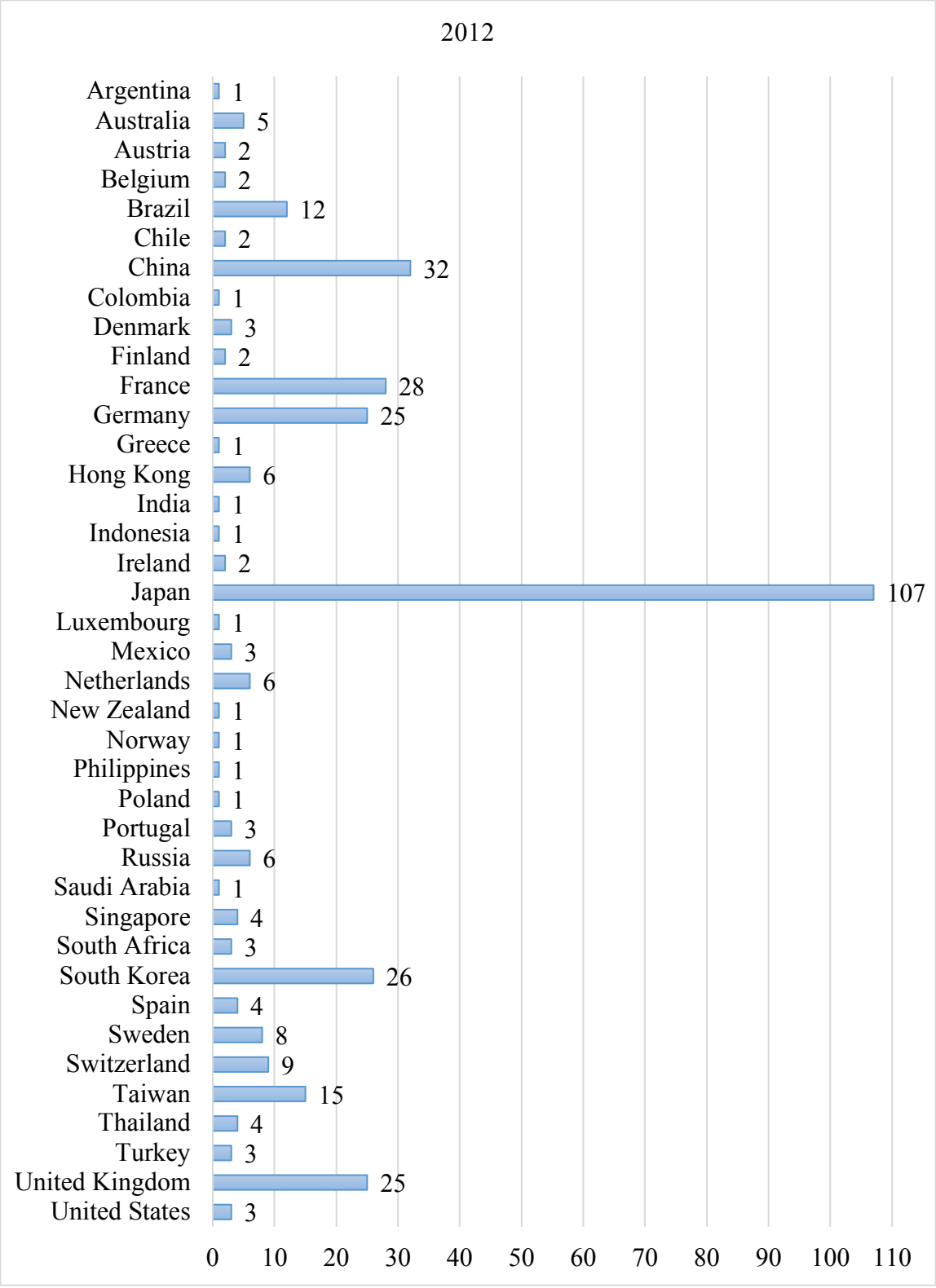


Figure 19. Bar graph indicating the frequency of companies per country for the year 2012.

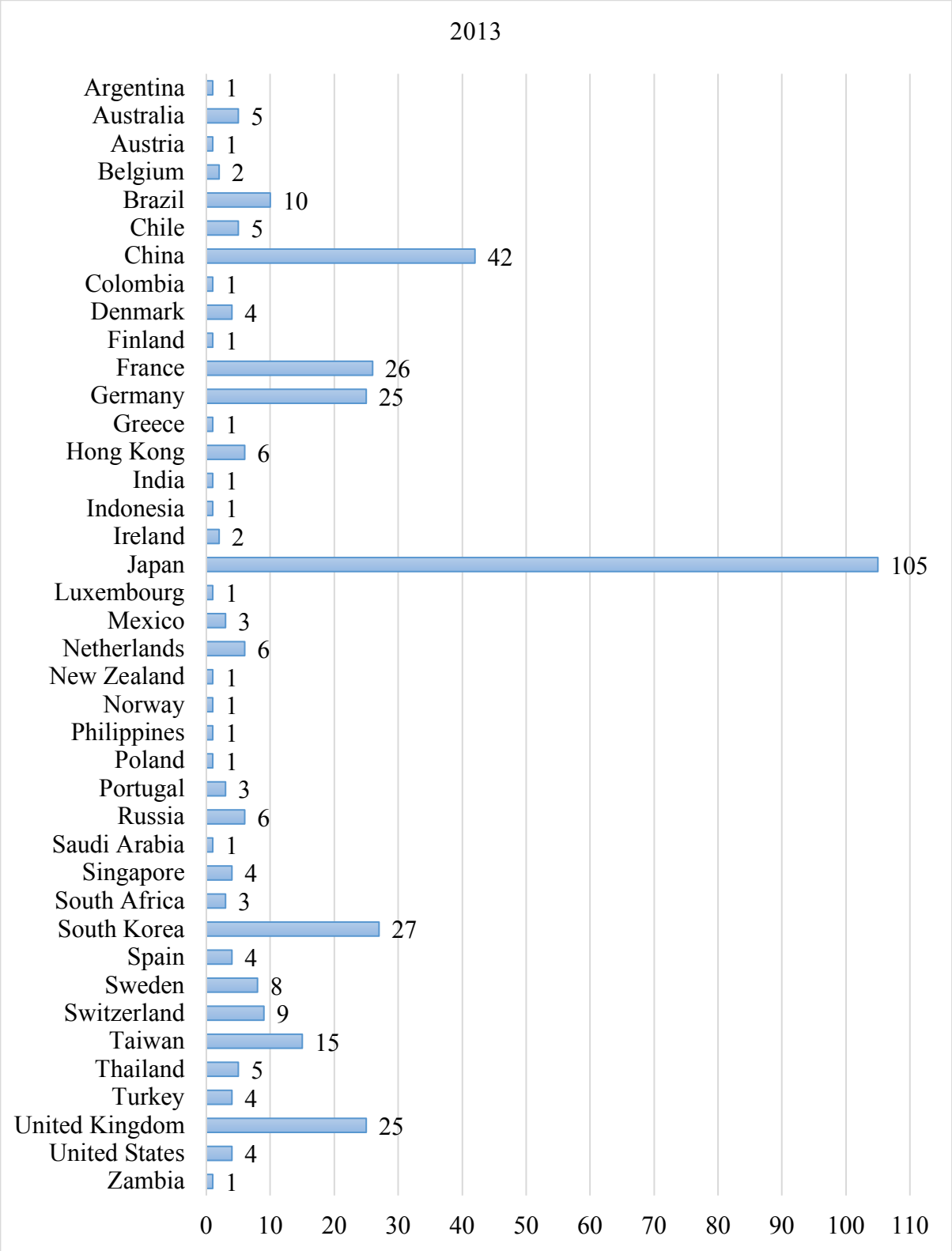


Figure 20. Bar graph indicating the frequency of companies per country for the year 2013.

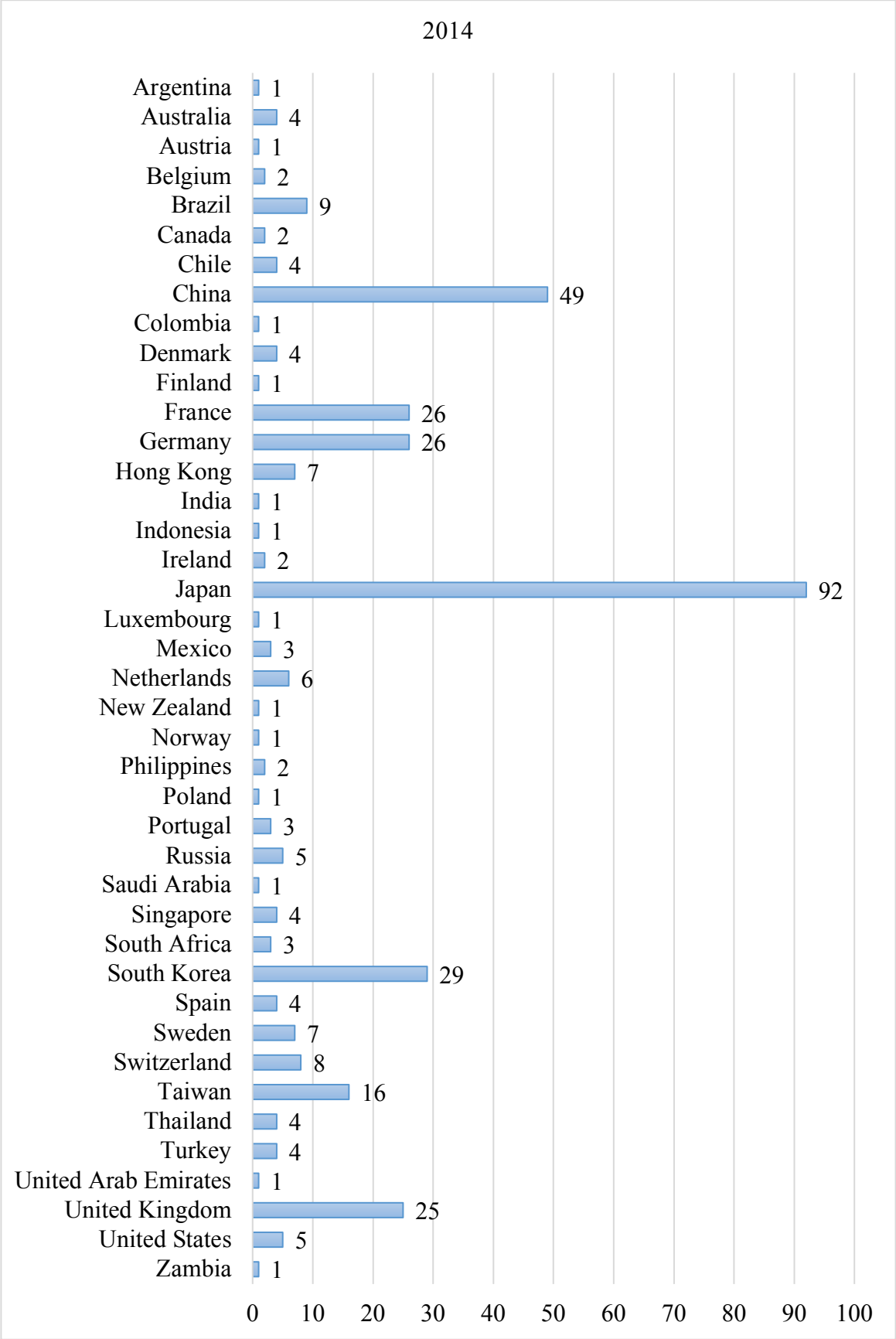


Figure 21. Bar graph indicating the frequency of companies per country for the year 2014.

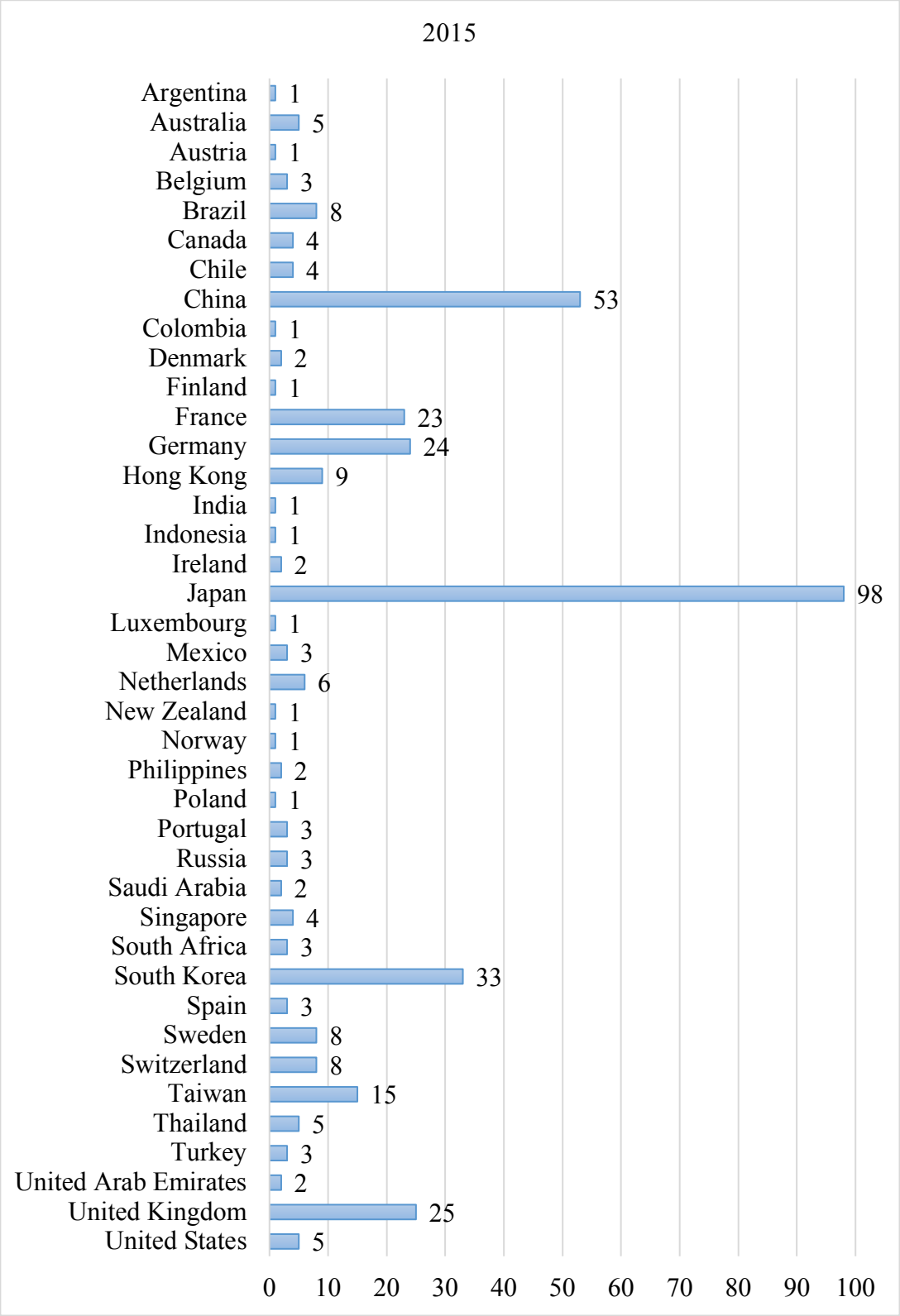


Figure 22. Bar graph indicating the frequency of companies per country for the year 2015.

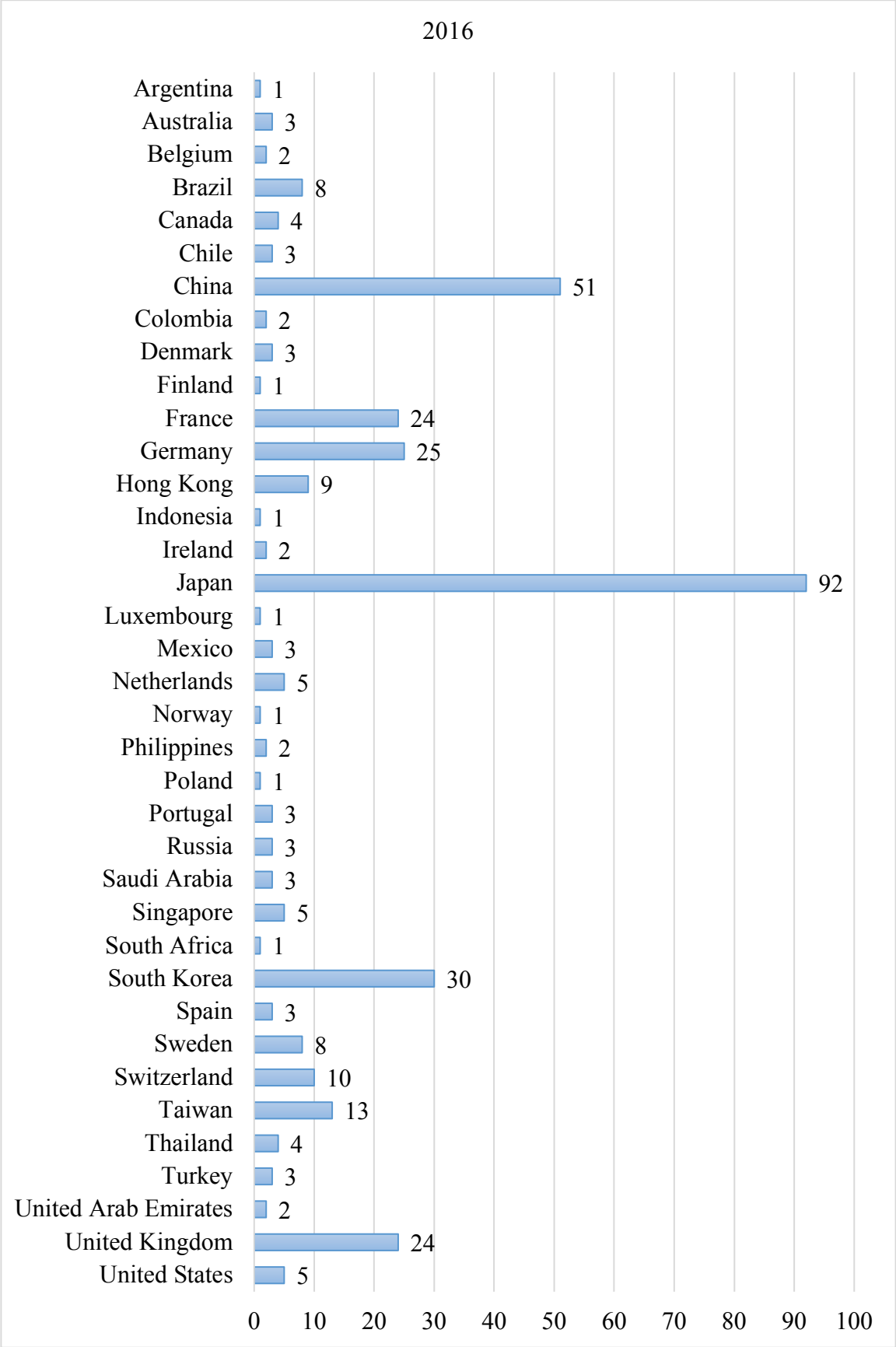


Figure 23. Bar graph indicating the frequency of companies per country for the year 2016.

Table 18

Number of Companies Included in Study Across All Years

Country	Number of companies
Argentina	9
Australia	42
Austria	13
Belgium	19
Brazil	83
Canada	13
Chile	25
China	310
Colombia	11
Denmark	29
Finland	20
France	269
Germany	250
Greece	5
Hong Kong	59
India	4
Indonesia	8
Ireland	18
Israel	4
Italy	2
Japan	967
Luxembourg	12
Mexico	16
Netherlands	60
New Zealand	6
Norway	10

Philippines	9
Poland	10
Portugal	27
Russia	53
Saudi Arabia	20
Singapore	32
South Africa	28
South Korea	253
Spain	33
Sweden	77
Switzerland	84
Taiwan	137
Thailand	30
Turkey	35
United Arab Emirates	5
United Kingdom	260
United States	44
Venezuela	1
Zambia	2

Appendix D

Cohen's Interpretation of Correlation Magnitude

The table below presents a guide for interpreting the magnitude of correlations found in this study.

Table 19

Cohen's Interpretation of the Magnitude of Significant r or r_s

Correlation	**Negative**	**Positive**
Small	-0.3 to -0.1	0.1 to 0.3
Medium	-0.5 to -0.3	0.3 to 0.5
Large	-1.0 to -0.5	0.5 to 1.0

Note. Table presenting terms for strength of correlation that can be derived from the correlation coefficient by Cohen (1988). Adapted from Statistical Power Analysis for the Behavioral Sciences (2nd ed.).

Appendix E

Definitions of Statistics Used in Reporting Meta-Analysis

When interpreting the results for meta-analysis, it is important to become familiar with the statistics used given that "none of the usual requirements for null hypothesis significance testing is met in a meta-analysis" (Hak, Van Rhee, & Suurmond, 2016, p. 8). We created Table 3 to provide a brief description of the statistics used in reporting the meta-analysis.

Table 20

Definitions of Statistics Used in Reporting Meta-Analysis

Statistic	Definition
K	indicates the total number of individual correlations that were included for analyses which was 10 in the case of the present study.
Q	The Q-statistic (also referred to as "Cochrane's Q") is the weighted sum of squared differences between the observed effects and the weighted average effect.
(df)	Degrees of freedom
p	Calculated probability of finding the computed result to be true if generalized to the population
Mean	Average / in the middle value
Confidence Intervals	Distribution of effect size estimates reported in the present study
Credibility Intervals	Distribution of actual effect size in the population.

Appendix F

Graphical Illustration of Kolmogorov-Smirnov tests for HCROI, ROA and ROE

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of HCROI_2007 is normal with mean 2.72 and standard deviation 3.241.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
2	The distribution of HCROI_2008 is normal with mean 5.54 and standard deviation 49.532.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
3	The distribution of HCROI_2009 is normal with mean 2.06 and standard deviation 10.607.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
4	The distribution of HCROI_2010 is normal with mean 4.24 and standard deviation 24.832.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
5	The distribution of HCROI_2011 is normal with mean 11.75 and standard deviation 96.241.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
6	The distribution of HCROI_2012 is normal with mean 9.64 and standard deviation 62.000.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
7	The distribution of HCROI_2013 is normal with mean 26.59 and standard deviation 281.506.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
8	The distribution of HCROI_2014 is normal with mean 275.64 and standard deviation 5,194.852.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
9	The distribution of HCROI_2015 is normal with mean 324.56 and standard deviation 6,151.010.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
10	The distribution of HCROI_2016 is normal with mean 20.64 and standard deviation 225.141.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

[1]Lilliefors Corrected

Figure 24. Kolmogorov-Smirnov test of normality for HCROI for all years of study (2007 - 2016)

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of ROA:2007C is normal with mean 7 and standard deviation 6.260.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
2	The distribution of ROA:2008C is normal with mean 5 and standard deviation 5.286.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
3	The distribution of ROA:2009C is normal with mean 3 and standard deviation 5.154.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
4	The distribution of ROA:2010C is normal with mean 4 and standard deviation 4.856.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
5	The distribution of ROA:2011C is normal with mean 4 and standard deviation 5.016.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
6	The distribution of ROA:2012C is normal with mean 3 and standard deviation 4.886.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
7	The distribution of ROA:2013C is normal with mean 4 and standard deviation 4.869.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
8	The distribution of ROA:2014C is normal with mean 4 and standard deviation 5.225.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
9	The distribution of ROA:2015C is normal with mean 4 and standard deviation 4.934.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
10	The distribution of ROA:2016C is normal with mean 4 and standard deviation 4.569.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

[1]Lilliefors Corrected

Figure 25. Kolmogorov-Smirnov test of normality for ROA for all years of study (2007 - 2016)

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of ROE:2007C is normal with mean 19 and standard deviation 14.472.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
2	The distribution of ROE:2008C is normal with mean 13 and standard deviation 18.606.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
3	The distribution of ROE:2009C is normal with mean 6 and standard deviation 19.419.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
4	The distribution of ROE:2010C is normal with mean 12 and standard deviation 11.927.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
5	The distribution of ROE:2011C is normal with mean 12 and standard deviation 13.456.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
6	The distribution of ROE:2012C is normal with mean 9 and standard deviation 14.539.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
7	The distribution of ROE:2013C is normal with mean 10 and standard deviation 15.903.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
8	The distribution of ROE:2014C is normal with mean 11 and standard deviation 13.472.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
9	The distribution of ROE:2015C is normal with mean 10 and standard deviation 22.364.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.
10	The distribution of ROE:2016C is normal with mean 12 and standard deviation 19.334.	One-Sample Kolmogorov-Smirnov Test	.000[1]	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

[1]Lilliefors Corrected

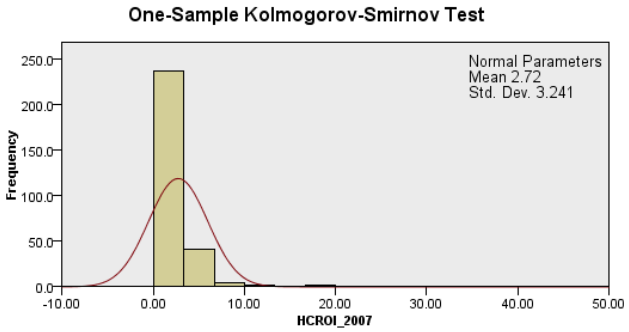
Figure 26. Results of Kolmogorov-Smirnov test of normality for ROE for all years of study (2007 - 2016)

Appendix G

Histograms from Kolmogorov-Smirnov tests

Below are histograms from the Kolmogorov-Smirnov tests depicting the distribution curve for all variables across all years are contained in this section.

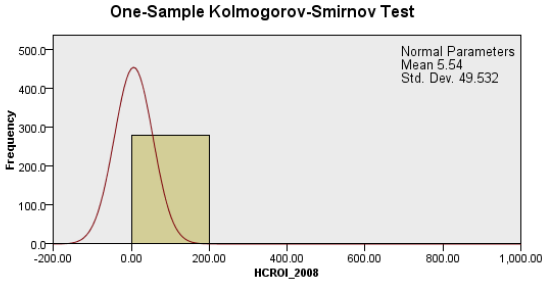
HCROI



Total N		290
Most Extreme Differences	Absolute	.279
	Positive	.249
	Negative	-.279
Test Statistic		.279
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

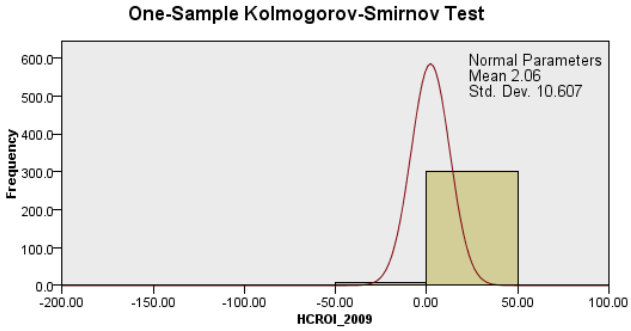
Figure 27. Histogram and distribution curve HCROI Kolmogorov- Smirnov test 2007



Total N		282
Most Extreme Differences	Absolute	.454
	Positive	.447
	Negative	-.454
Test Statistic		.454
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

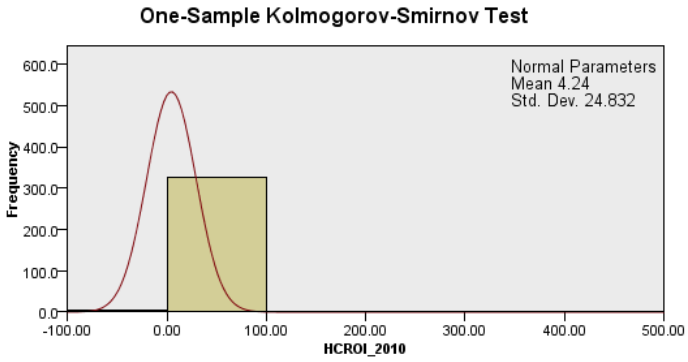
Figure 28. Histogram and distribution curve HCROI Kolmogorov- Smirnov test for 2008



Total N		311
Most Extreme Differences	Absolute	.401
	Positive	.332
	Negative	-.401
Test Statistic		.401
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

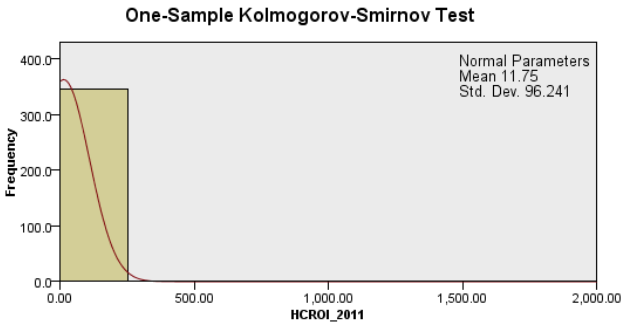
Figure 29. Histogram and distribution curve HCROI Kolmogorov- Smirnov test for 2009



Total N		332
Most Extreme Differences	Absolute	.427
	Positive	.427
	Negative	-.422
Test Statistic		.427
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

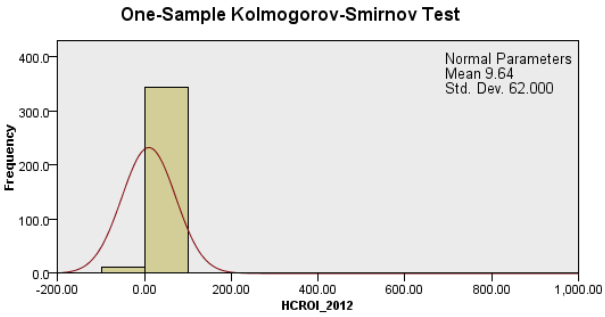
Figure 30. Histogram and distribution curve HCROI Kolmogorov- Smirnov test for 2010



Total N		350
Most Extreme Differences	Absolute	.482
	Positive	.482
	Negative	-.445
Test Statistic		.482
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

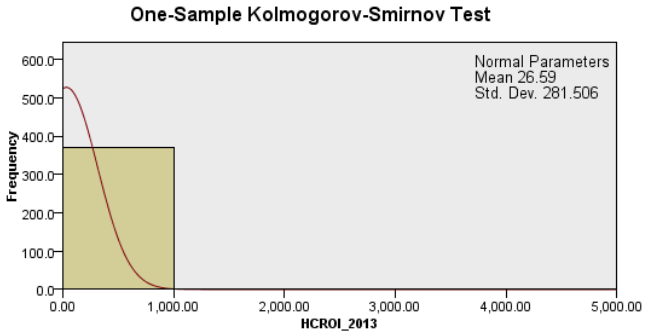
Figure 31. Histogram and distribution curve HCROI Kolmogorov- Smirnov test for 2011



Total N		361
Most Extreme Differences	Absolute	.476
	Positive	.476
	Negative	-.428
Test Statistic		.476
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

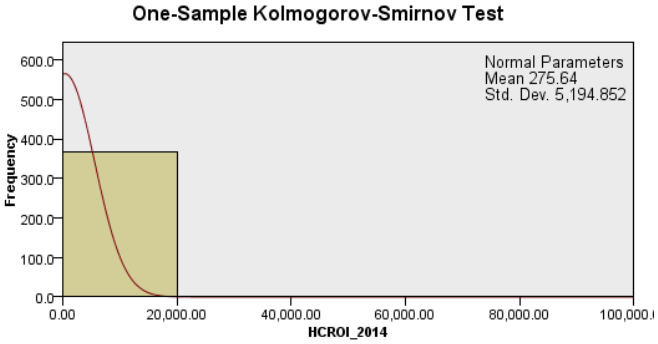
Figure 32. Histogram and distribution curve HCROI Kolmogorov- Smirnov test for 2012



Total N		372
Most Extreme Differences	Absolute	.493
	Positive	.493
	Negative	-.457
Test Statistic		.493
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

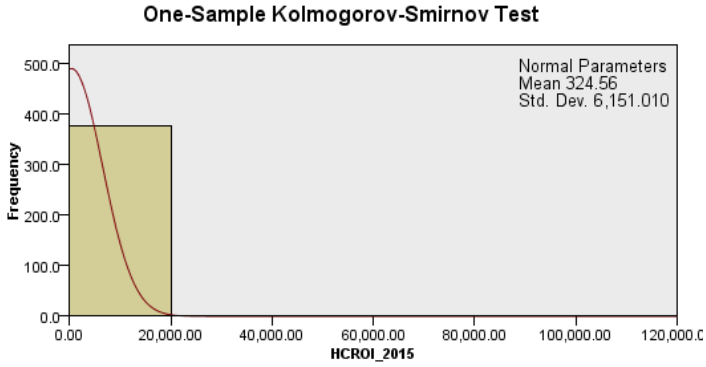
Figure 33. Histogram and distribution curve HCROI Kolmogorov- Smirnov test for 2013



Total N		368
Most Extreme Differences	Absolute	.505
	Positive	.505
	Negative	-.479
Test Statistic		.505
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

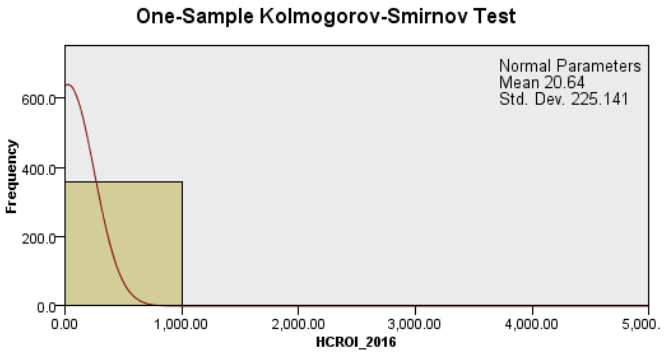
Figure 34. Histogram and distribution curve HCROI Kolmogorov- Smirnov test for 2014



Total N		378
Most Extreme Differences	Absolute	.501
	Positive	.501
	Negative	-.479
Test Statistic		.501
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

Figure 35. Histogram and distribution curve HCROI Kolmogorov- Smirnov test for 2015

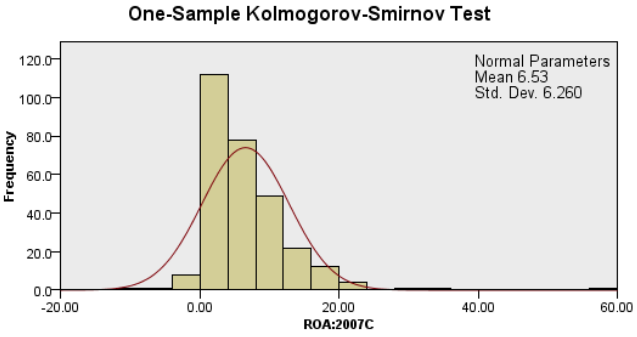


Total N		361
Most Extreme Differences	Absolute	.481
	Positive	.481
	Negative	-.462
Test Statistic		.481
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

Figure 36. Histogram and distribution curve HCROI Kolmogorov- Smirnov test for 2016

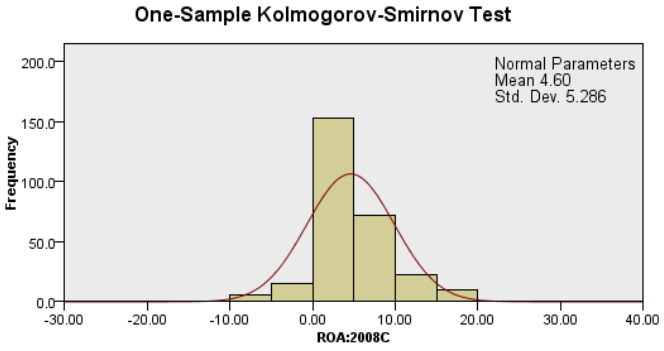
ROA



Total N		290
Most Extreme Differences	Absolute	.131
	Positive	.127
	Negative	-.131
Test Statistic		.131
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

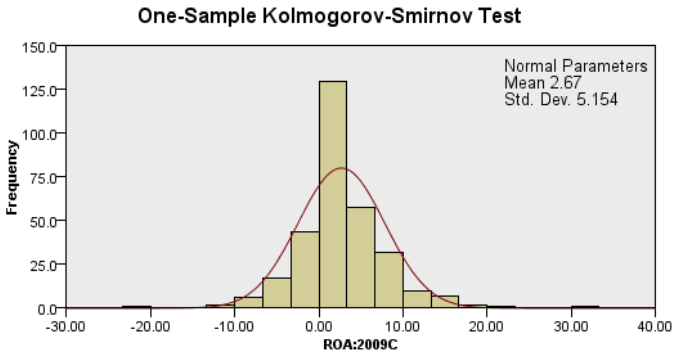
Figure 37. Histogram and distribution curve for ROA Kolmogorov- Smirnov test for 2007



Total N		282
Most Extreme Differences	Absolute	.115
	Positive	.097
	Negative	-.115
Test Statistic		.115
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

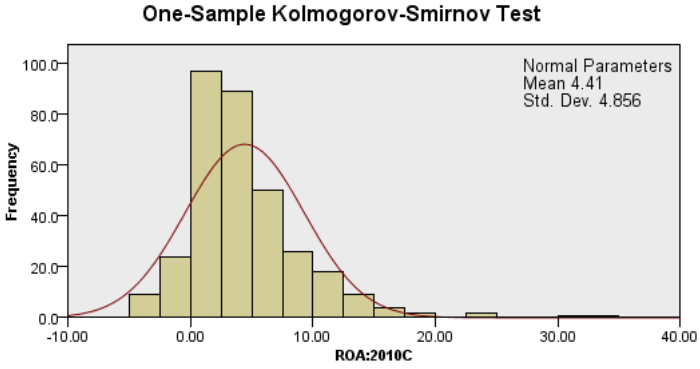
Figure 38. Histogram and distribution curve for ROA Kolmogorov- Smirnov test for 2008



Total N		311
Most Extreme Differences	Absolute	.100
	Positive	.100
	Negative	-.081
Test Statistic		.100
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

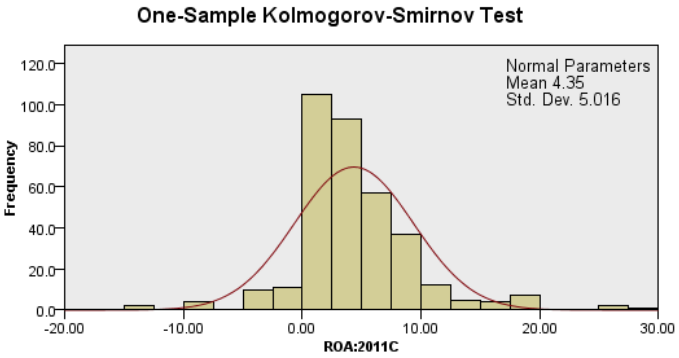
Figure 39. Histogram and distribution curve for ROA Kolmogorov- Smirnov test for 2009



Total N		332
Most Extreme Differences	Absolute	.122
	Positive	.122
	Negative	-.088
Test Statistic		.122
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

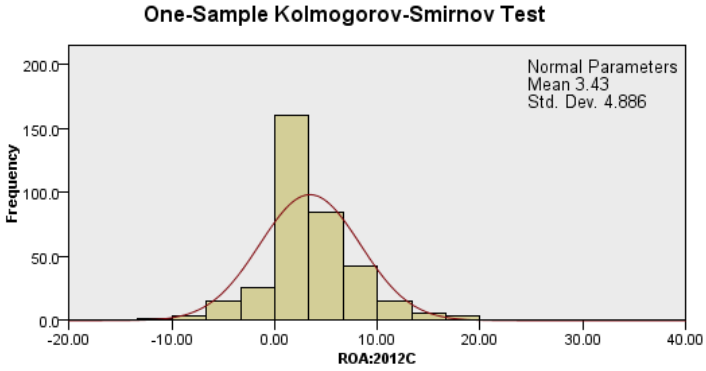
Figure 40. Histogram and distribution curve for ROA Kolmogorov- Smirnov test for 2010



Total N		350
Most Extreme Differences	Absolute	.117
	Positive	.102
	Negative	-.117
Test Statistic		.117
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

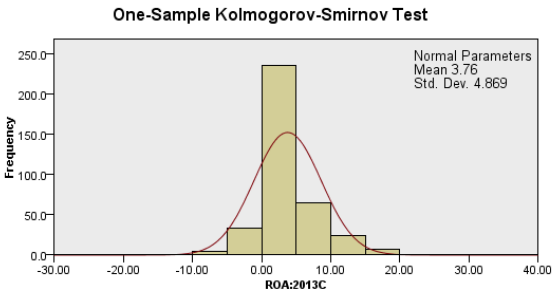
Figure 41. Histogram and distribution curve for ROA Kolmogorov- Smirnov test for 2011



Total N		361
Most Extreme Differences	Absolute	.121
	Positive	.121
	Negative	-.112
Test Statistic		.121
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

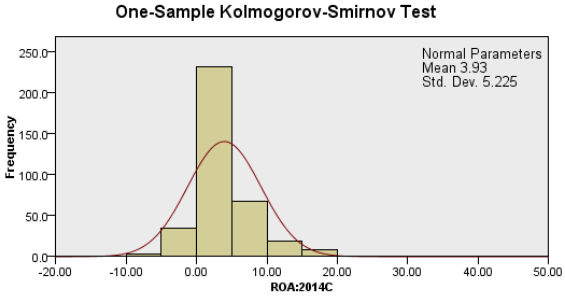
Figure 42. Histogram and distribution curve for ROA Kolmogorov- Smirnov test for 2012



Total N		372
Most Extreme Differences	Absolute	.141
	Positive	.141
	Negative	-.118
Test Statistic		.141
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

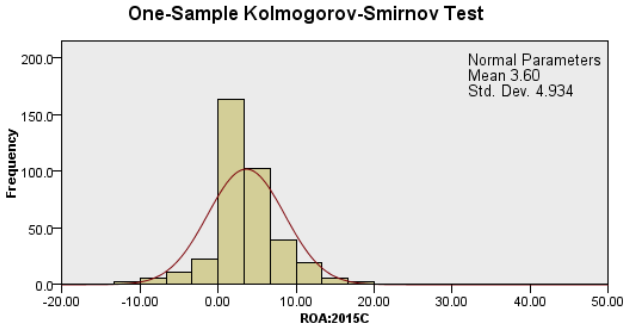
Figure 43. Figure. Histogram and distribution curve ROA Kolmogorov- Smirnov test for 2013



Total N		368
Most Extreme Differences	Absolute	.152
	Positive	.152
	Negative	-.127
Test Statistic		.152
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

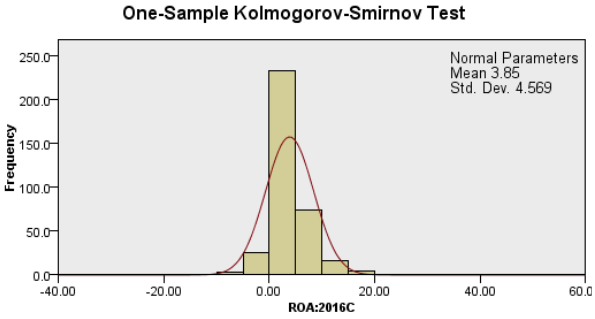
Figure 44. Histogram and distribution curve ROA Kolmogorov- Smirnov test for 2014



Total N		378
Most Extreme Differences	Absolute	.121
	Positive	.105
	Negative	-.121
Test Statistic		.121
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

Figure 45. Histogram and distribution curve ROA Kolmogorov- Smirnov test for 2015

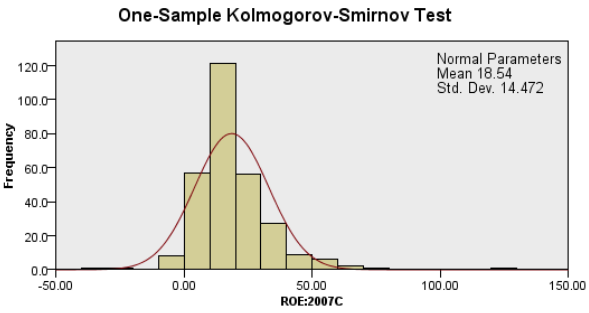


Total N		361
Most Extreme Differences	Absolute	.138
	Positive	.138
	Negative	-.118
Test Statistic		.138
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

Figure 46. Histogram and distribution curve ROA Kolmogorov- Smirnov test for 2016

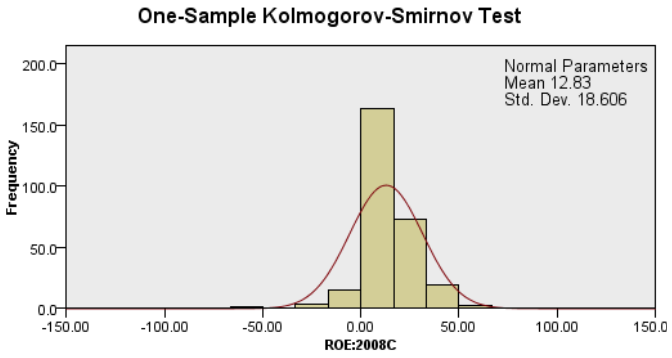
ROE



Total N		290
Most Extreme Differences	Absolute	.108
	Positive	.108
	Negative	-.108
Test Statistic		.108
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

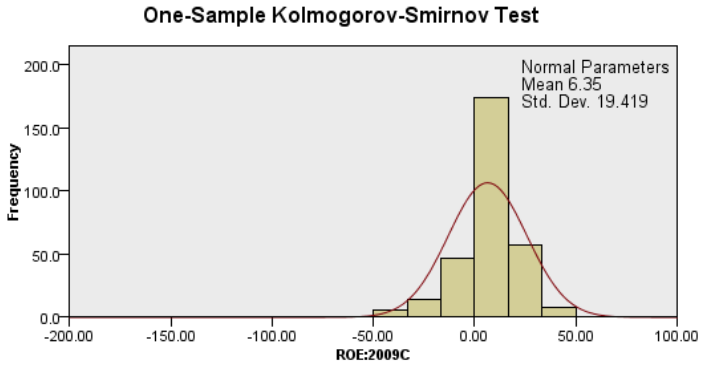
Figure 47. Histogram and distribution curve for ROE Kolmogorov- Smirnov test for 2007



Total N		282
Most Extreme Differences	Absolute	.166
	Positive	.113
	Negative	-.166
Test Statistic		.166
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

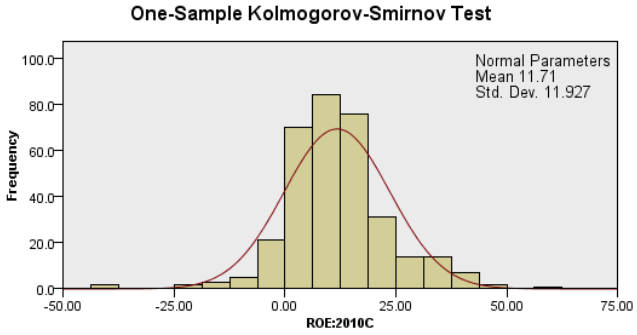
Figure 48. Histogram and distribution curve for ROE Kolmogorov- Smirnov test for 2008



Total N		311
Most Extreme Differences	Absolute	.150
	Positive	.100
	Negative	-.150
Test Statistic		.150
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

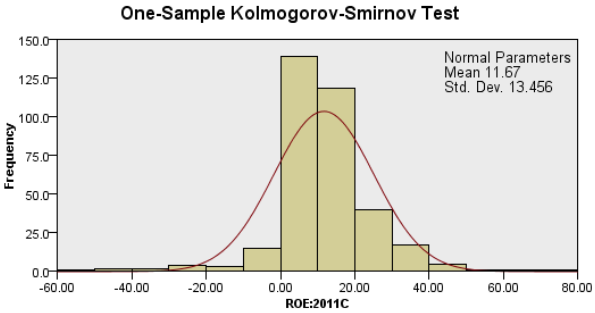
Figure 49. Histogram and distribution curve for ROE Kolmogorov- Smirnov test for 2009



Total N		332
Most Extreme Differences	Absolute	.080
	Positive	.078
	Negative	-.080
Test Statistic		.080
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

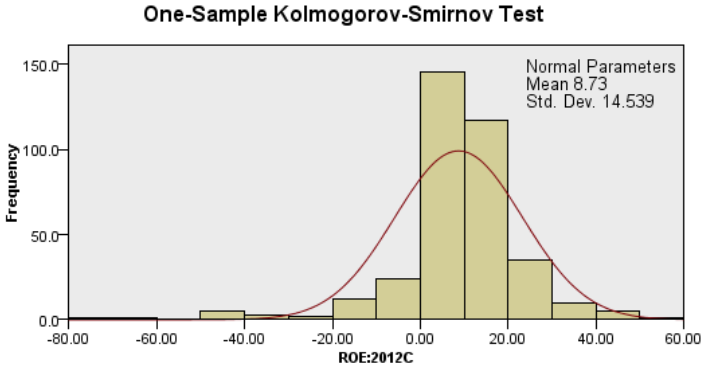
Figure 50. Histogram and distribution curve for ROE Kolmogorov- Smirnov test for 2010



Total N		350
Most Extreme Differences	Absolute	.117
	Positive	.090
	Negative	-.117
Test Statistic		.117
Asymptotic Sig. (2-sided test)		0[1]

[1]Lilliefors Corrected

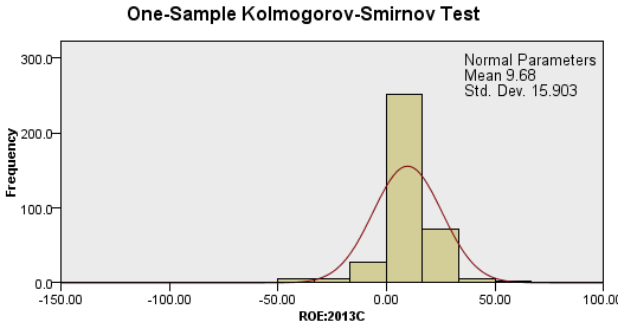
Figure 51. Histogram and distribution curve for ROE Kolmogorov- Smirnov test for 2011



Total N		361
Most Extreme Differences	Absolute	.147
	Positive	.085
	Negative	-.147
Test Statistic		.147
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

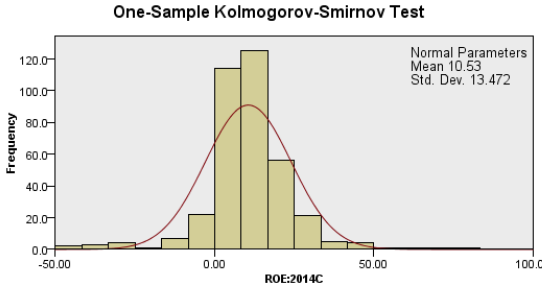
Figure 52. Histogram and distribution curve for ROE Kolmogorov- Smirnov test for 2012



Total N		372
Most Extreme Differences	Absolute	.170
	Positive	.130
	Negative	-.170
Test Statistic		.170
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

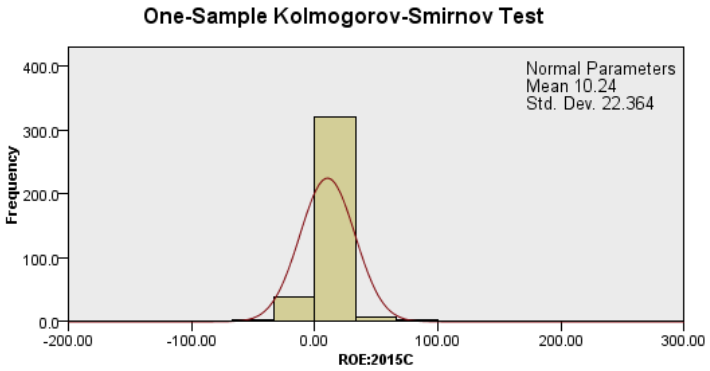
Figure 53. Histogram and distribution curve ROE Kolmogorov- Smirnov test for 2013



Total N		368
Most Extreme Differences	Absolute	.129
	Positive	.095
	Negative	-.129
Test Statistic		.129
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

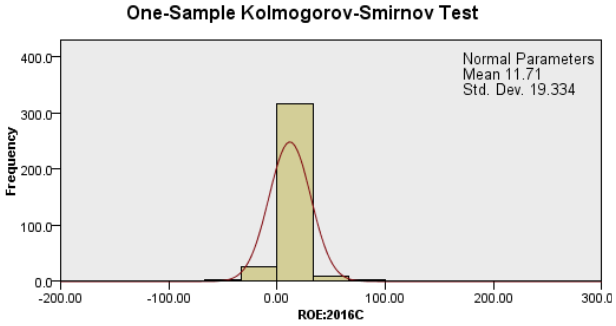
Figure 54. Histogram and distribution curve ROE Kolmogorov- Smirnov test for 2014



Total N		378
Most Extreme Differences	Absolute	.211
	Positive	.197
	Negative	-.211
Test Statistic		.211
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

Figure 55. Histogram and distribution curve ROE Kolmogorov- Smirnov test for 2015



Total N		361
Most Extreme Differences	Absolute	.218
	Positive	.218
	Negative	-.189
Test Statistic		.218
Asymptotic Sig. (2-sided test)		0[1]

[1] Lilliefors Corrected

Figure 56. Histogram and distribution curve ROE Kolmogorov- Smirnov test for 2016

Appendix H

Skewness and Kurtosis Calculations

The Table below contains the variables used in the skewness and kurtosis calculations as well as the results, for all variables across all years of study.

The values of skewness and kurtosis should be zero to indicate a normal distribution, the further the values are from zero, the more likely it is that the distribution is not normal. Values that fall between +2 and -2 are considered to be acceptable and prove normal distribution. The skewness and kurtosis values for all variables revealed that they deviated significantly (i.e., values were found beyond the $p = .001$ criterion and exceeded the range of either +2 and / or -2) from the assumption of normality.

Table 21

Calculation of z-score for Skewness

Year	Skewness	Std. Error of Skewness	Mean	Skewness Z score
2007	8,420	0,143	2,720	-10,601
2008	16,735	0,145	5,544	-21,4995
2009	-7,927	0,138	2,057	-22,8328
2010	13,252	0,134	4,241	-18,3973
2011	14,449	0,130	11,750	-75,9356
2012	10,656	0,128	9,644	-64,6878
2013	13,342	0,126	26,593	-197,714

2014	19,183	0,127	275,638	-2151,19
2015	19,439	0,125	324,561	-2577,05
2016	16,714	0,128	20,639	-144,528

Table 22

Calculation of z-score for Skewness

Year	**Kurtosis**	**Std. Error of Kurtosis**	**Mean**	**Kurtosis Z Score**
2007	96,553	0,285	2,720	87,00914
2008	280,683	0,289	5,544	261,4996
2009	157,656	0,276	2,057	150,2031
2010	202,085	0,267	4,241	186,2011
2011	232,718	0,260	11,750	187,5257
2012	130,433	0,256	9,644	92,76113
2013	180,386	0,252	26,593	74,85822
2014	367,980	0,254	275,638	-717,209
2015	377,914	0,250	324,561	-920,33
2016	295,538	0,256	20,639	214,9169

Appendix I

Summary of Outliers Contained in HCROI Dataset

Table 23

Number of Outliers contained in HCROI dataset Per Year According to Boxplots

Year	***Number of Outliers***
2007	14
2008	8
2009	12
2010	13
2011	16
2012	15
2013	13
2014	8
2015	8
2016	12
Total	119

Appendix J

Boxplots for HCROI

Below are boxplots for the independent variable HCE measured using HCROI for all years, presented as a visual representation of the outliers. Boxplots for the dependant variable financial performance expressed as ROA and ROE are not provided as they did not present substantial outliers as compared to HCROI.

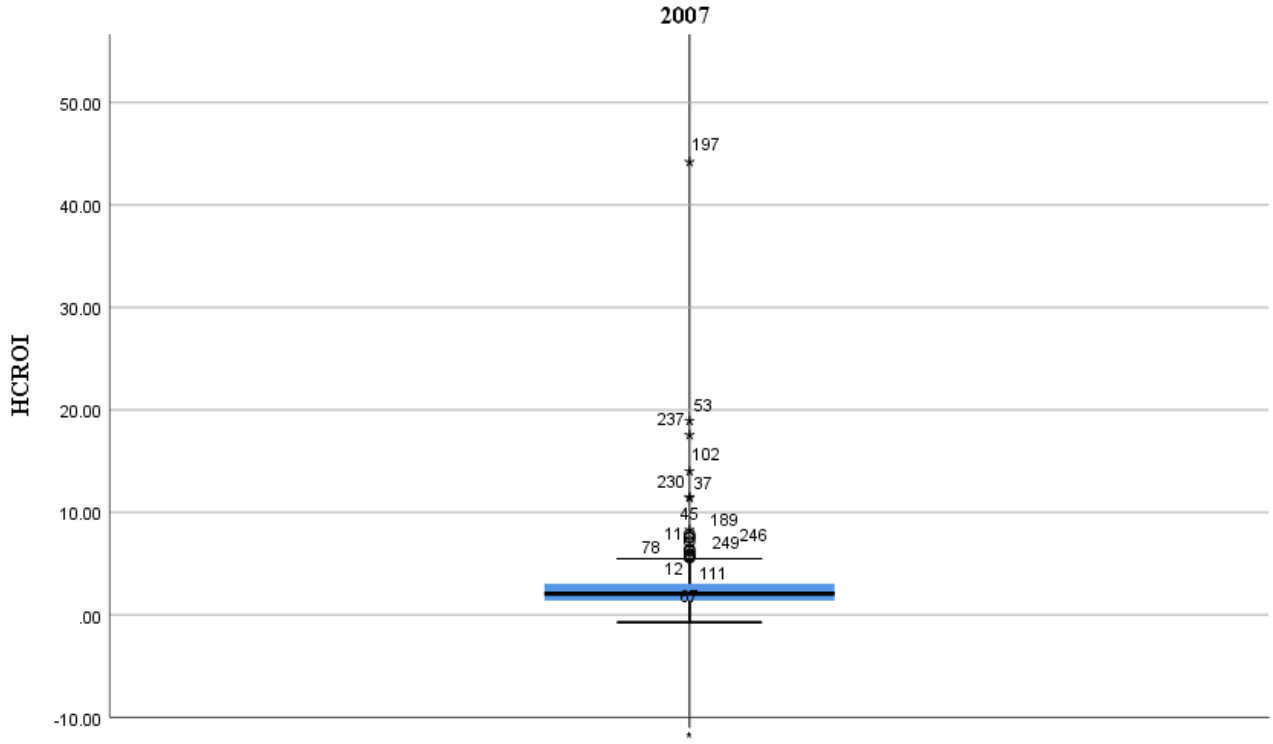


Figure 57. Boxplot depicting outliers for HCROI for 2007

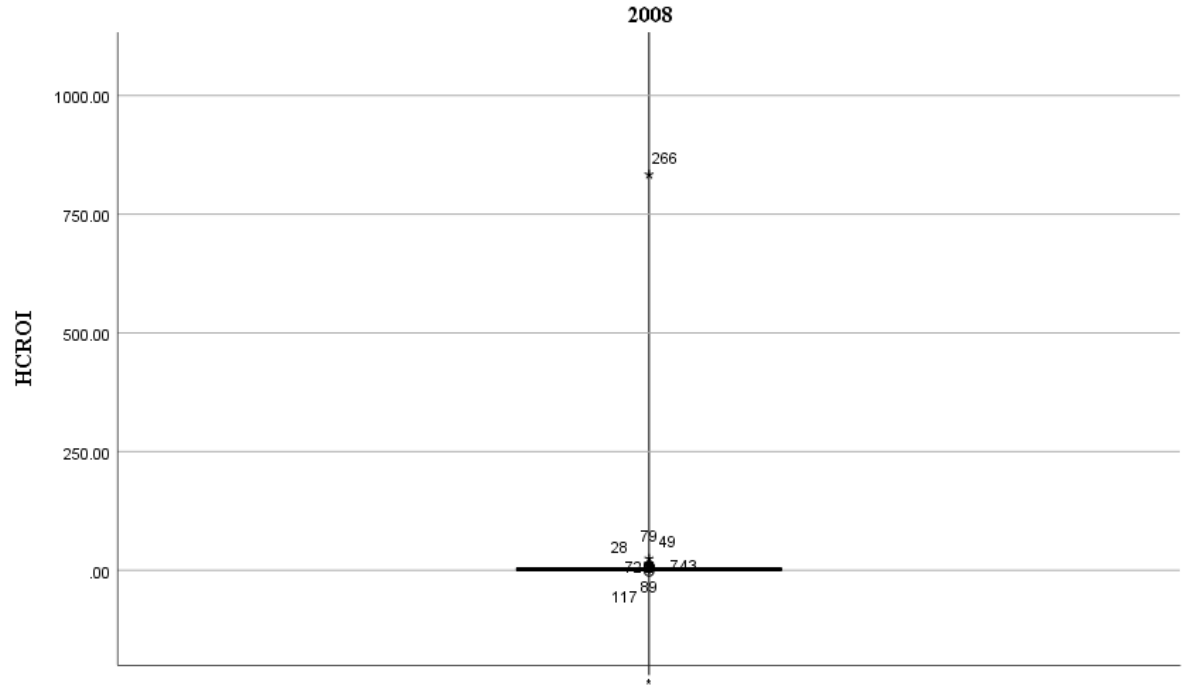


Figure 58. Boxplot depicting outliers for HCROI for 2008

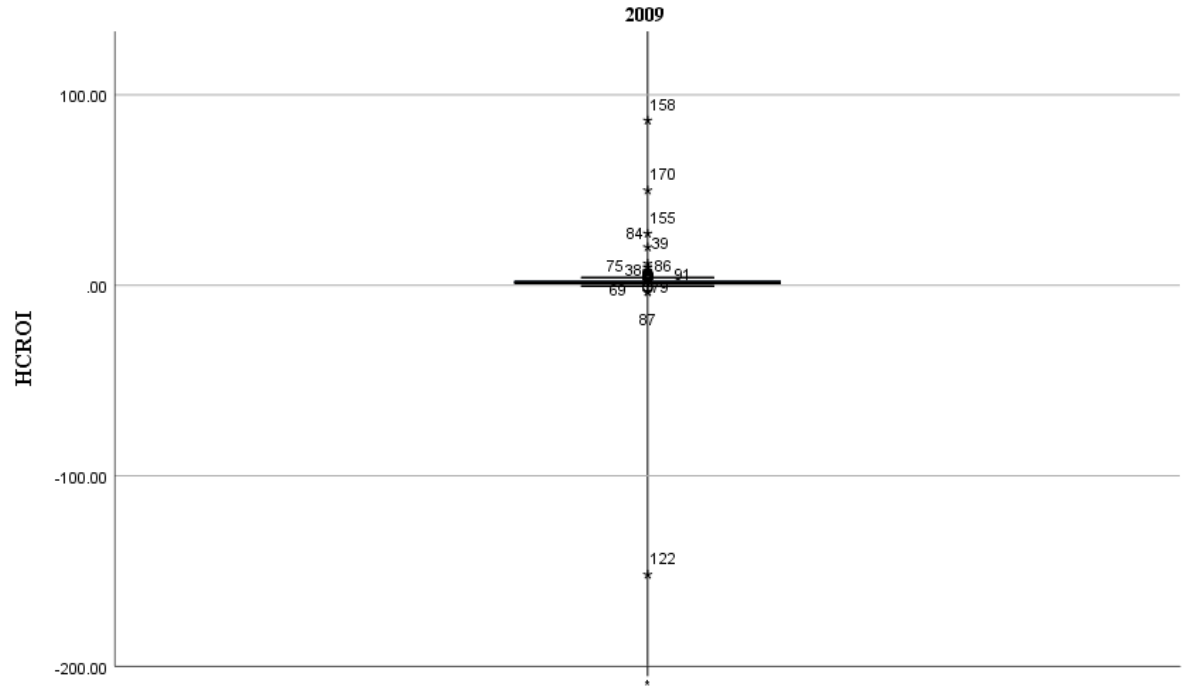


Figure 59. Boxplot depicting outliers for HCROI for 2009

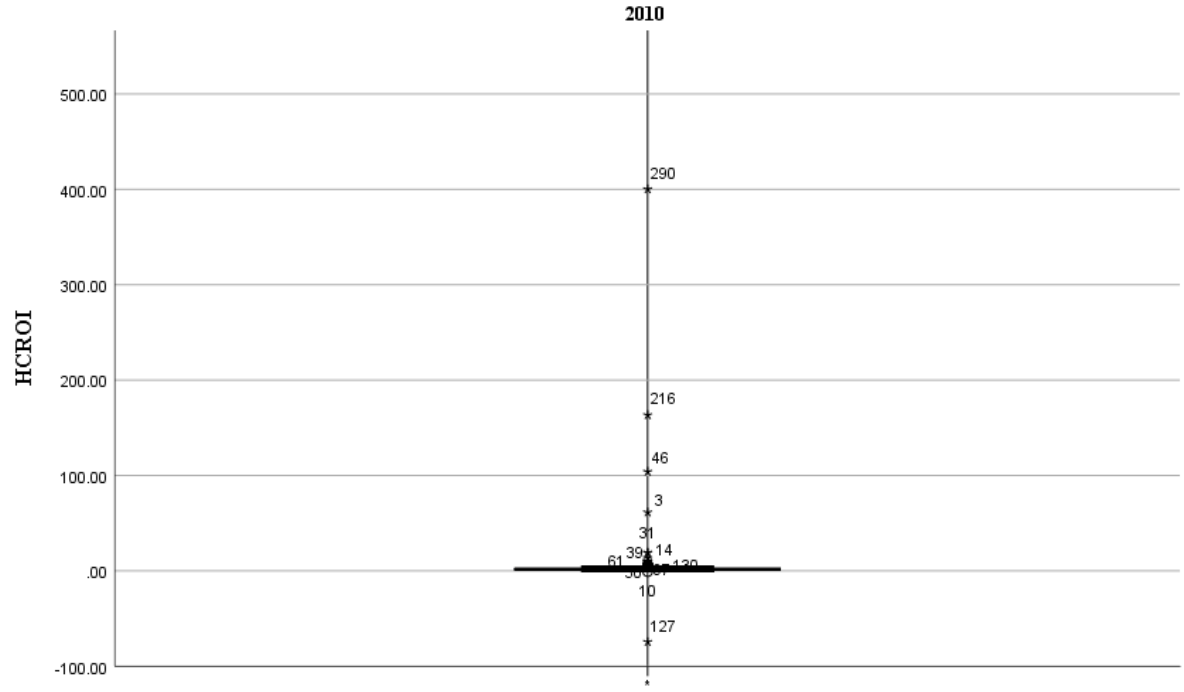


Figure 60. Boxplot depicting outliers for HCROI for 2010

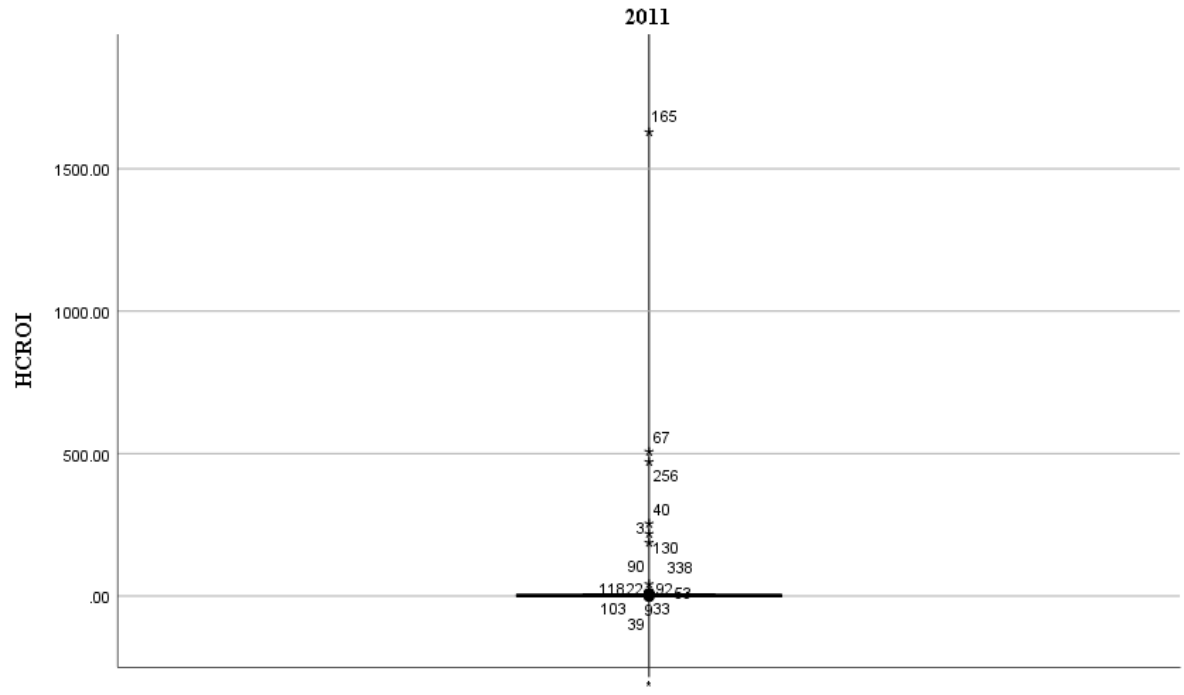


Figure 61. Boxplot depicting outliers for HCROI for 2011

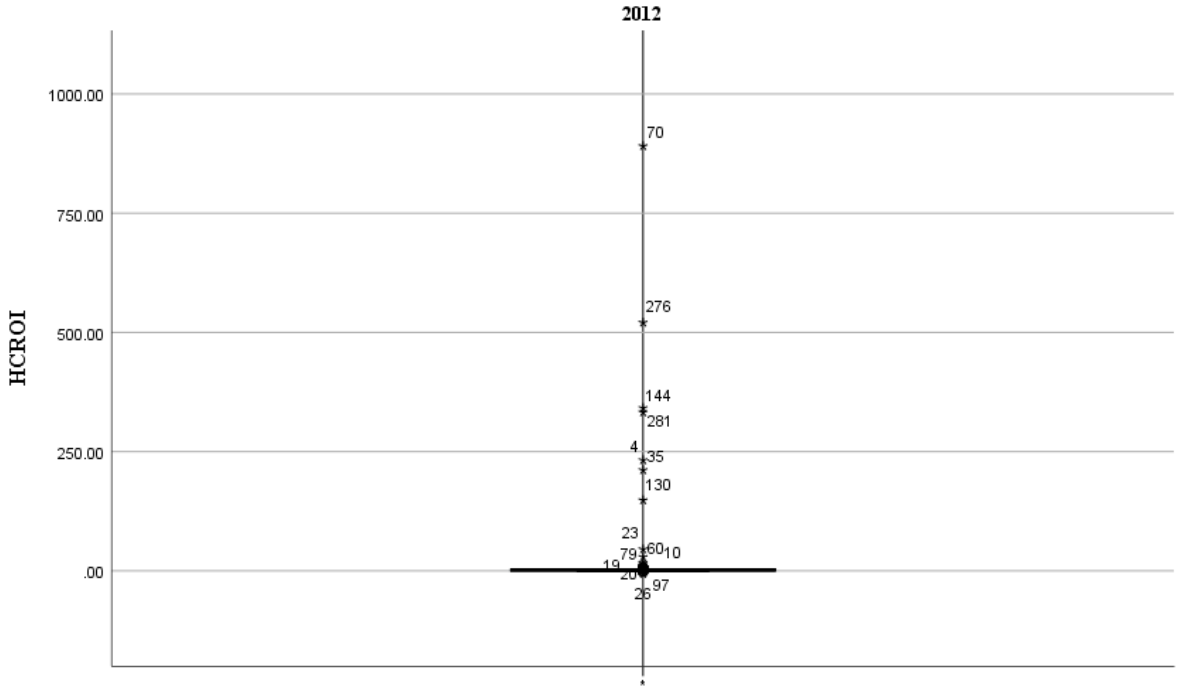


Figure 62. Boxplot depicting outliers for HCROI for 2012

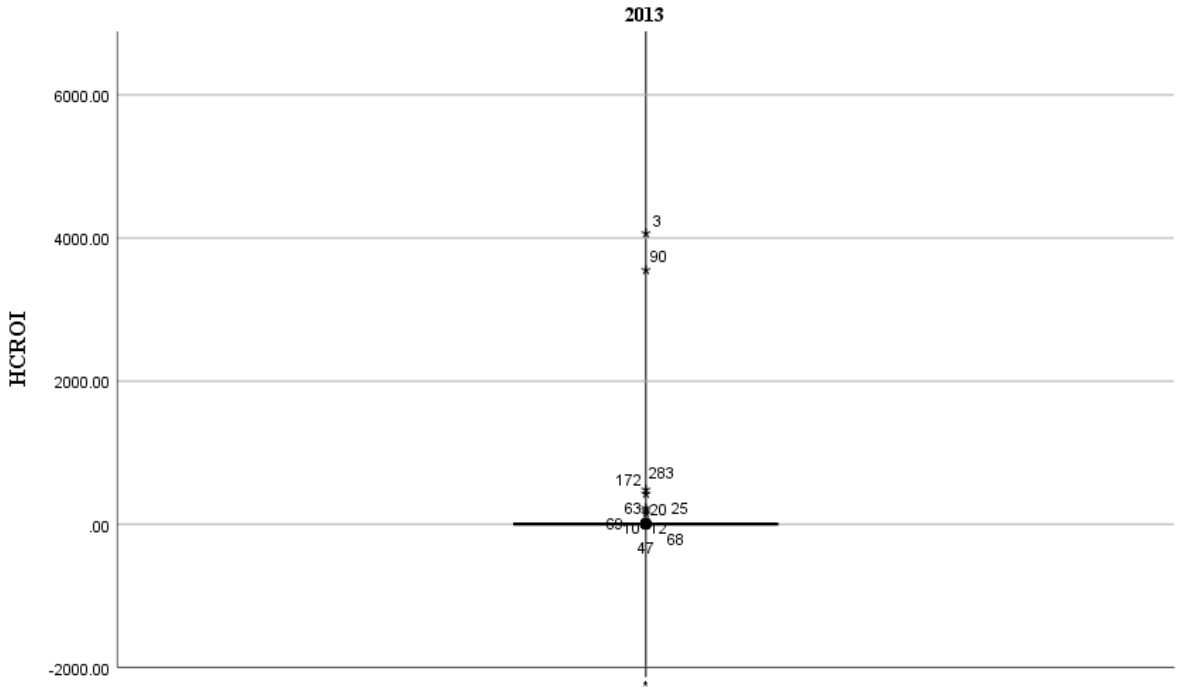


Figure 63. Boxplot depicting outliers for HCROI for 2013

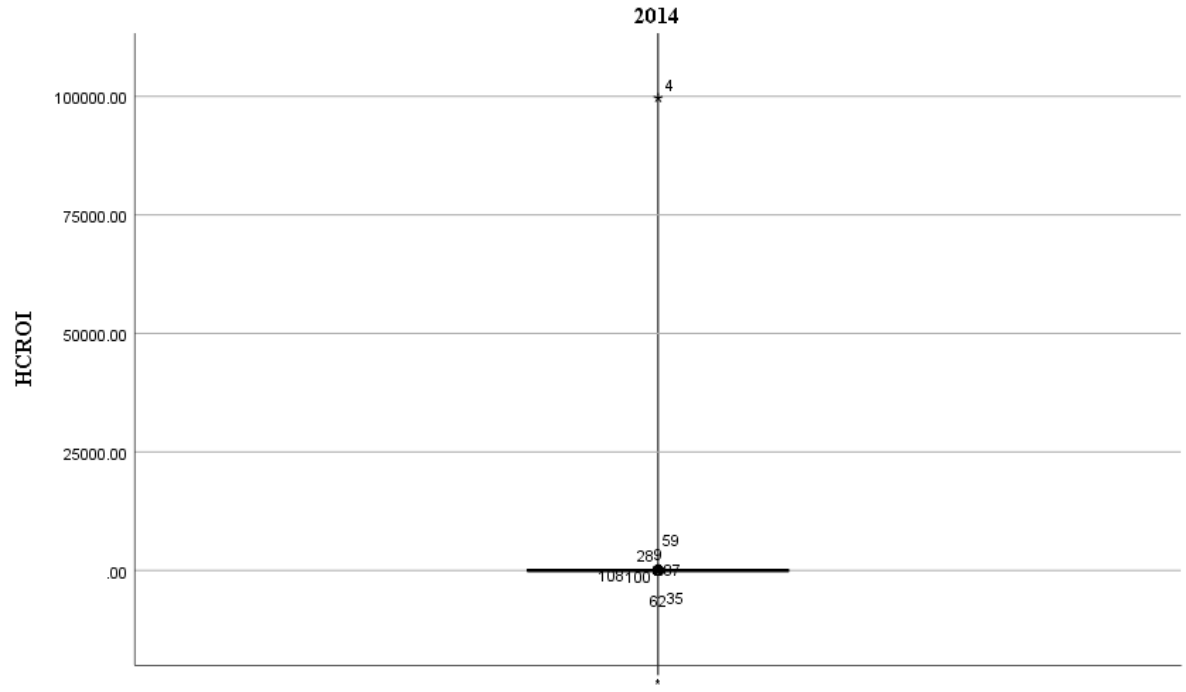


Figure 64. Boxplot depicting outliers for HCROI for 2014

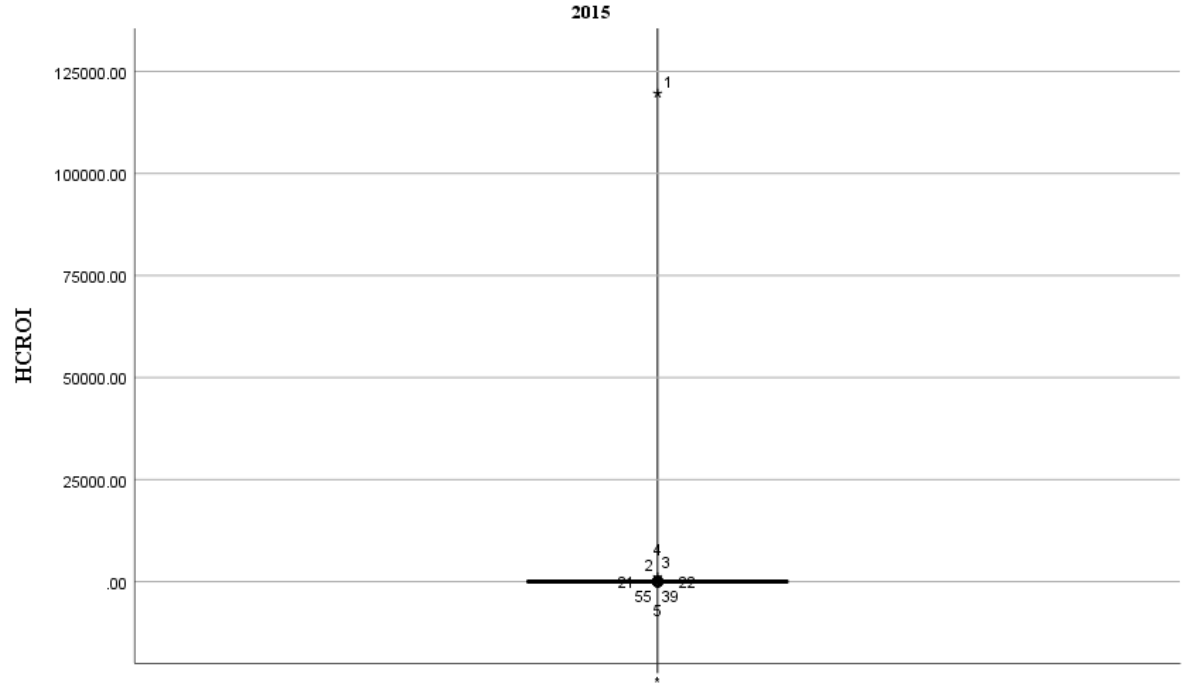


Figure 65. Boxplot depicting outliers for HCROI for 2015

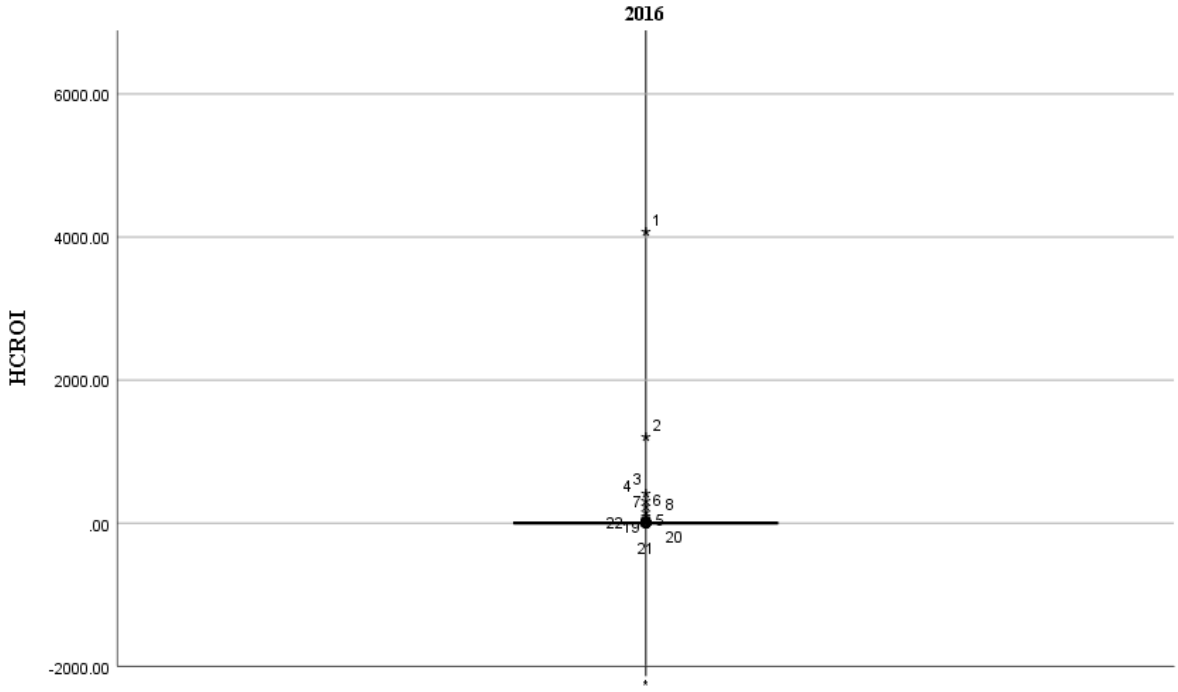


Figure 66. Boxplot depicting outliers for HCROI for 2016

Appendix K

Windzorised HCROI data

Table 24

Windsorized HCROI Data

2013	N	M	Mdn	SD	Min	Max	r	p	r_s	p
Original Data: HCROI	372	26.5926	1.6993	281.5058	3.46	4065.27	-	-	-	-
Original Data: HCROI and ROA	-	-	-	-	-	-	0.0055	0.9151	0.43	0.00
Original Data: HCROI and ROE	-	-	-	-	-	-	-0.0077	0.8816	.40	0.00
Windsorized Data: HCROI and ROA	-	-	-	-	-	-	0.3535	0.00	0.43	0.00
Windsorized Data: HCROI and ROE	-	-	-	-	-	-	0.3502	0.00	.40	0.00

Appendix L

Hedges-Vevea method Meta-Analysis

First the meta-analysis that evaluates the relationship between HCROI and ROA will be presented followed by the results from on HCROI and ROE

A meta-analysis of the relationship between HCROI and ROA using the random-effects model for the Hedges-Vevea method. The findings are presented in table 25 below. The corresponding Q-statistic was highly significant, χ^2 (9) = 44.03, $p < .001$. The effect size reported on as the r_s metric (Spearman correlation) within 95% confidence intervals are .418 (95% CI [.354, .477]). Additionally, the population effect size that has been described is significant, $z = 11.672$, $p < .001$.

The relationship between HCROI and ROE using the random-effects model for the Hedges-Vevea method is highly significant, $\chi 2$ (9) = 60.052, $p < .001$. The effect size reported on as the r_s metric (Spearman correlation) within 95% confidence intervals are .381 (95% CI [.304, .453]). Additionally, the population effect size that has been described is significant, $z = 9.023$, $p < .001$. The results suggest a moderate and positive relationship between the focal variables within acceptable confidence intervals.

Table 25

Results of Hedges-Vevea Random-Effects Meta-Analyses Measuring HCROI Relationships Across 10 Years [s8]

Variables	K	Q (df)	*p*	Mean	95% confidence interval for mean *r*		*z*
					Lower Limit	Upper Limit	
ROA	10	44.034 (9)	.000**	.418	.354	.477	11.672
ROE	10	60.052 (9)	.000**	.381	.304	.453	9.023

Appendix M

Meta-Analysis SPSS output

The SPSS version 26 (IBM Corp, 2012) output for meta-analysis on HCROI and ROA are presented below.

```
Run MATRIX procedure:

**********   META-ANALYSIS OF CORRELATION COEFFICIENTS:  r   **********

NUMBER OF STUDIES
         k
        10

**********   FIXED-EFFECTS MODEL   **********

MEAN EFFECT SIZE, LOWER & UPPER 95% CONFIDENCE BOUNDS, AND Z-TEST
    Mean r   Lower r   Upper r         z         p         k
      ,416      ,387      ,443    25,708      ,000    10,000

HOMOGENEITY TEST:  Q STATISTIC (Goodness of Fit)
      Chi2        df         p
    44,034     9,000      ,000

**********   HEDGES-VEVEA RANDOM-EFFECTS MODEL   **********

MEAN EFFECT SIZE, LOWER & UPPER 95% CONFIDENCE BOUNDS, AND Z-TEST
    Mean r   Lower r   Upper r         z         p         k
      ,418      ,354      ,477    11,672      ,000    10,000

Estimated Variance in Population (Fisher-Transformed) Correlations
       Tau
     ,0115

HOMOGENEITY TEST:  Q STATISTIC (Goodness of Fit)
      Chi2        df         p
     9,262     9,000      ,413

**********   HUNTER-SCHMIDT RANDOM-EFFECTS MODEL   **********

MEAN EFFECT SIZE, LOWER & UPPER 95% CREDIBILITY BOUNDS, AND CHI-SQUARE TEST
    Mean r   Lower r   Upper r      Chi2         p        df
      ,411      ,258      ,563    39,830      ,000     9,000

Sample Correlation Variance
     ,0081

Sampling Error Variance
     ,0020

Estimated Variance in Population Correlations
     ,0061

**********   PUBLICATION BIAS DIAGNOSTIC INDICATORS   **********
```

```
Rosenthal Fail-Safe N
      2443

------ END MATRIX -----
```

Figure 67. SPSS version 26 (IBM Corp, 2012) output: meta-analysis for the relationship between HCROI and ROA for the study period (2007 - 2016)

The SPSS version 26 (IBM Corp, 2012) output for meta-analysis on HCROI and ROE are presented below

```
Run MATRIX procedure:

**********   META-ANALYSIS OF CORRELATION COEFFICIENTS:  r   **********

NUMBER OF STUDIES
         k
        10

**********   FIXED-EFFECTS MODEL   **********

MEAN EFFECT SIZE, LOWER & UPPER 95% CONFIDENCE BOUNDS, AND Z-TEST
    Mean r   Lower r   Upper r         z         p         k
      ,380      ,351      ,409    23,258      ,000    10,000

HOMOGENEITY TEST:  Q STATISTIC (Goodness of Fit)
      Chi2        df         p
    60,052     9,000      ,000

**********   HEDGES-VEVEA RANDOM-EFFECTS MODEL   **********

MEAN EFFECT SIZE, LOWER & UPPER 95% CONFIDENCE BOUNDS, AND Z-TEST
    Mean r   Lower r   Upper r         z         p         k
      ,381      ,304      ,453     9,023      ,000    10,000

Estimated Variance in Population (Fisher-Transformed) Correlations
       Tau
     ,0168

HOMOGENEITY TEST:  Q STATISTIC (Goodness of Fit)
      Chi2        df         p
     9,564     9,000      ,387

**********   HUNTER-SCHMIDT RANDOM-EFFECTS MODEL   **********

MEAN EFFECT SIZE, LOWER & UPPER 95% CREDIBILITY BOUNDS, AND CHI-SQUARE TEST
    Mean r   Lower r   Upper r       Chi2         p        df
      ,374      ,187      ,561    51,694      ,000     9,000

Sample Correlation Variance
     ,0113

Sampling Error Variance
     ,0022

Estimated Variance in Population Correlations
     ,0091

**********   PUBLICATION BIAS DIAGNOSTIC INDICATORS   **********

Rosenthal Fail-Safe N
      1992

------ END MATRIX -----
```

Figure 68. SPSS version 26 (IBM Corp, 2012) output: meta-analysis for the relationship between HCROI and ROE over the study period (2007 - 2016)

APPENDIX N

Panel Data Analysis Output

The raw output of the panel data analysis is available below. This is not a primary technique in HRM or Industrial / Organisational Psychology therefore this output[9] was not subject to detailed analysis that would be expected in accounting disciplines.

Dependent Variable: ROA

Method: Panel Least Squares

Date: 01/31/18 Time: 07:30

Sample: 2007 2016

Periods included: 10

Cross-sections included: 119

Total panel (balanced) observations: 1190

White cross-section standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.084774	0.702852	0.120614	0.9040
HCROI	0.513010	0.201895	2.540970	0.0112
CONSUMER_DISCRETIONARY	4.449845	0.439176	10.13225	0.0000
CONSUMER_STAPLES	5.466349	0.389776	14.02435	0.0000
ENERGY	2.045864	0.556098	3.678959	0.0002
FINANCIALS	1.848043	0.956134	1.932830	0.0535
HEALTH_CARE	3.470646	0.707206	4.907547	0.0000
INDUSTRIALS	1.276008	0.222603	5.732204	0.0000
INFORMATION_TECHNOLOGY	4.005820	0.516448	7.756478	0.0000
MATERIALS	2.855948	0.647212	4.412694	0.0000
REAL_ESTATE	0.458066	0.315116	1.453644	0.1463
TELECOMMUNICATION_SERVIC	4.577536	0.160461	28.52736	0.0000

[9] The data is available to researchers who are interested in conducting detailed interpretations of the output or to replicate analyses.

R-squared	0.141794	Mean dependent var	4.233001
Adjusted R-squared	0.133780	S.D. dependent var	5.242463
S.E. of regression	4.879209	Akaike info criterion	6.017876
Sum squared resid	28044.26	Schwarz criterion	6.069120
Log likelihood	-3568.636	Hannan-Quinn criter.	6.037187
F-statistic	17.69375	Durbin-Watson stat	0.609954
Prob(F-statistic)	0.000000		

Dependent Variable: ROA
Method: Panel Least Squares
Date: 01/31/18 Time: 07:34
Sample: 2007 2016
Periods included: 10
Cross-sections included: 119
Total panel (balanced) observations: 1190
White cross-section standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.040454	0.266440	11.41138	0.0000
HCROI	0.531705	0.118794	4.475851	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.643703	Mean dependent var	4.233001
Adjusted R-squared	0.600719	S.D. dependent var	5.242463
S.E. of regression	3.312643	Akaike info criterion	5.335435
Sum squared resid	11642.99	Schwarz criterion	5.886309
Log likelihood	-3045.584	Hannan-Quinn criter.	5.543031
F-statistic	14.97542	Durbin-Watson stat	1.361961
Prob(F-statistic)	0.000000		

Dependent Variable: ROA
Method: Panel EGLS (Cross-section weights)
Date: 01/31/18 Time: 07:34
Sample: 2007 2016
Periods included: 10
Cross-sections included: 119
Total panel (balanced) observations: 1190
Linear estimation after one-step weighting matrix
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.342692	0.212474	11.02579	0.0000
HCROI	0.842807	0.075630	11.14376	0.0000

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.873554	Mean dependent var	8.825669
Adjusted R-squared	0.859492	S.D. dependent var	9.703432
S.E. of regression	3.365147	Sum squared resid	12116.91
F-statistic	62.11869	Durbin-Watson stat	1.425277
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.607942	Mean dependent var	4.233001
Sum squared resid	12811.57	Durbin-Watson stat	1.344690

Dependent Variable: ROA
Method: Panel EGLS (Cross-section weights)
Date: 01/31/18 Time: 07:40
Sample (adjusted): 2008 2016
Periods included: 9
Cross-sections included: 119
Total panel (balanced) observations: 1071
Linear estimation after one-step weighting matrix
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.651499	0.304002	5.432532	0.0000
HCROI	0.707180	0.094160	7.510389	0.0000
ROA(-1)	0.180246	0.048153	3.743202	0.0002

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.879113	Mean dependent var	7.458653
Adjusted R-squared	0.863843	S.D. dependent var	8.333408
S.E. of regression	2.700943	Sum squared resid	6930.341
F-statistic	57.57138	Durbin-Watson stat	1.691231
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.716348	Mean dependent var	3.972752
Sum squared resid	7266.667	Durbin-Watson stat	1.573963

Dependent Variable: ROE
Method: Panel Least Squares
Date: 01/31/18 Time: 07:32
Sample: 2007 2016
Periods included: 10
Cross-sections included: 119
Total panel (balanced) observations: 1190
White cross-section standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.195363	2.258663	0.971975	0.3313
HCROI	1.303336	0.496201	2.626628	0.0087
CONSUMER_DISCRETIONARY	6.867034	2.339819	2.934857	0.0034
CONSUMER_STAPLES	13.68898	1.621657	8.441357	0.0000
ENERGY	1.689059	1.927608	0.876246	0.3811
FINANCIALS	12.09358	3.195740	3.784283	0.0002
HEALTH_CARE	6.273700	1.488676	4.214281	0.0000
INDUSTRIALS	3.055634	1.171147	2.609096	0.0092
INFORMATION_TECHNOLOGY	8.105008	1.630272	4.971569	0.0000
MATERIALS	3.845021	1.542017	2.493501	0.0128
REAL_ESTATE	0.384901	1.556498	0.247286	0.8047
TELECOMMUNICATION_SERVIC	11.17605	1.178140	9.486179	0.0000

R-squared	0.099121	Mean dependent var	10.95431
Adjusted R-squared	0.090709	S.D. dependent var	14.88883
S.E. of regression	14.19751	Akaike info criterion	8.154043
Sum squared resid	237448.5	Schwarz criterion	8.205287
Log likelihood	-4839.655	Hannan-Quinn criter.	8.173354
F-statistic	11.78288	Durbin-Watson stat	0.959914
Prob(F-statistic)	0.000000		

Dependent Variable: ROE
Method: Panel Least Squares
Date: 01/31/18 Time: 07:33

Sample: 2007 2016
Periods included: 10
Cross-sections included: 119
Total panel (balanced) observations: 1190
White cross-section standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.893387	0.752885	10.48419	0.0000
HCROI	1.364731	0.335679	4.065589	0.0001

Effects Specification
Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.440979	Mean dependent var	10.95431
Adjusted R-squared	0.373538	S.D. dependent var	14.88883
S.E. of regression	11.78441	Akaike info criterion	7.873497
Sum squared resid	147343.5	Schwarz criterion	8.424371
Log likelihood	-4555.731	Hannan-Quinn criter.	8.081093
F-statistic	6.538759	Durbin-Watson stat	1.432303
Prob(F-statistic)	0.000000		

Dependent Variable: ROE
Method: Panel EGLS (Cross-section weights)
Date: 01/31/18 Time: 07:35
Sample: 2007 2016
Periods included: 10
Cross-sections included: 119
Total panel (balanced) observations: 1190
Linear estimation after one-step weighting matrix
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.175835	0.660481	7.836459	0.0000
HCROI	2.576369	0.247423	10.41282	0.0000

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.814524	Mean dependent var	30.38737
Adjusted R-squared	0.793896	S.D. dependent var	31.32870
S.E. of regression	11.82667	Sum squared resid	149661.1

F-statistic	39.48685	Durbin-Watson stat	1.439625
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.388336	Mean dependent var	10.95431
Sum squared resid	161219.0	Durbin-Watson stat	1.421229

Dependent Variable: ROE
Method: Panel EGLS (Cross-section weights)
Date: 01/31/18 Time: 07:38
Sample (adjusted): 2008 2016
Periods included: 9
Cross-sections included: 119
Total panel (balanced) observations: 1071
Linear estimation after one-step weighting matrix
White cross-section standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.215075	0.610940	5.262506	0.0000
HCROI	2.291541	0.289445	7.917014	0.0000
ROE(-1)	0.179911	0.037000	4.862424	0.0000

Effects Specification
Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.835503	Mean dependent var	29.86102
Adjusted R-squared	0.814724	S.D. dependent var	31.10345
S.E. of regression	11.02794	Sum squared resid	115534.6
F-statistic	40.20983	Durbin-Watson stat	1.725116
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.455776	Mean dependent var	10.21544
Sum squared resid	124160.7	Durbin-Watson stat	1.632157

Figure 69. Output for panel data analysis of confounding effects, on the hypothesised relationships, such as country, size and industry.