

# Examining the engine of growth

## Assessing Corporate Governance's Role in the Asian Tigers' Innovation



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## **Abstract**

This study investigated the relationship between a firm's level of innovation and its performance, and how this relationship is influenced by the quality of corporate governance. This was done in the context of the Asian Tigers (Hong Kong, Singapore, South Korea, and Taiwan) which is particularly relevant given the recent shift towards knowledge-intensive strategies and policies within these economies. This study explored the direct effect of innovation on firm performance and the moderating role of corporate governance indicators by conducting a multiple regression analysis on 257 firms in the Asian Tigers. The analysis found that while firm innovation generally shows a positive impact on performance, this effect was not statistically significant within the scope of this study. Consequently, the hypothesized positive relationship between innovation and firm performance and the moderating effects of corporate governance, were rejected. Interestingly, the analysis revealed a direct positive effect of board experience on firm performance and revealed the industry context to have a significant influence on firm performance. These results imply that the quality of a firm's corporate governance does not influence the relationship between innovation and firm performance of firms in the Asian Tigers. The study highlights the direct impact of a policy regarding board experience, the importance the industry context, and offers information that is relevant for examining investment decisions. The study suggests further research should focus on refining measurement methods and further explore policy implications related to corporate governance and innovation in complex economies like the Asian Tigers.

**Keywords:** Asian Tigers, firm performance, innovative capabilities, R&D, corporate governance, board independence, board experience, board size

# Content

- 1. Introduction .....6
  - 1.1 Background .....6
  - 1.2 Problem Statement.....6
  - 1.3 Objective .....7
  - 1.4 Research Question .....7
  - 1.5 Relevance .....7
- 2. Theoretical framework.....9
  - 2.1 Context of the Asian Tigers .....9
  - 2.2 Innovation.....10
  - 2.3 Quality of corporate governance .....11
  - 2.4 Conceptual model .....15
- 3. Methodology and data collection .....16
  - 3.1 Research method.....16
  - 3.2 Data collection and sample .....16
  - 3.3 Operationalization.....17
    - 3.3.1 Dependent variable .....17
    - 3.3.2 Independent variable .....17
    - 3.3.3 Moderating variables.....18
    - 3.3.4 Control variables.....18
  - 3.4 Data analysis.....19
  - 3.5 Research ethics .....20
- 4. Analysis.....21
  - 4.1 Descriptive statistics .....21
  - 4.2 Multiple regression analysis .....23
    - 4.2.1 Model 1.....23
    - 4.2.2 Model 2.....23
    - 4.2.3 Model 3.....24
    - 4.2.4 Model 4.....24
    - 4.2.5 Model 5.....25
    - 4.2.6 Model 6.....25
    - 4.2.7 Model 7.....26
    - 4.2.8 Summary of results .....27

4.3	Robustness check.....	30
5.	Discussion .....	31
5.1	Interpretation of the results .....	31
5.1.1	Innovation and firm performance .....	31
5.1.2	Corporate governance and firm performance.....	32
5.1.3	Control variables.....	35
5.2	Theoretical Implications.....	36
5.3	Practical implications.....	37
5.4	Limitations and future research .....	38
6	Conclusion.....	40
7	References .....	41
8	Appendices .....	50
8.1	Initial descriptive statistics continuous variables .....	50
8.2	Initial P-P plots and histograms of continuous variables .....	50
8.2.1	Research and Development Expenses.....	50
8.2.2	ROA .....	51
8.2.3	Employees .....	52
8.3	P-P plots and histograms after transformation .....	53
8.3.1	RandDExpenses_log .....	53
8.3.2	FirmSize_log.....	54
8.4	Regression standardized residuals scatterplot .....	55
8.5	Breusch-Pagan test.....	55
8.6	Residuals Scatterplot with Loess line .....	56
8.7	Multicollinearity .....	56
8.8	Durbin Watson test.....	57
8.9	Regression analysis.....	57
8.9.1	Model 1.....	57
8.9.2	Model 2.....	58
8.9.3	Model 3.....	59
8.9.4	Model 4.....	60
8.9.5	Model 5.....	61
8.9.6	Model 6.....	62
8.9.7	Model 7.....	63

8.9.8 Model Comparison Test .....	64
8.10 Robustness checks .....	64
8.10.1 Without control variables.....	64
8.10.2 Different dependent variable .....	65
8.11 Assumptions.....	67
8.11.1 Normality.....	67
8.11.2 Homoscedasticity .....	67
8.11.3 Linearity.....	67
8.11.4 Multicollinearity.....	67
8.11.5 Independence of error terms .....	68
8.12 Syntax.....	68
8.13 Research integrity form.....	84
8.14 Consent form repository.....	85

# 1. Introduction

## 1.1 Background

Since the early 1960s, Asia embarked on a pursuit of global economic supremacy, marking a turning point in the economic development trajectories of numerous Southeast Asian nations (Schulte Nordholt et al., 2013). Four East Asian countries, collectively known as the “Asian Tigers,” namely Singapore, Hong Kong, South Korea, and Taiwan, experienced remarkable growth over a short time-period (Toma, 2019). These Tigers transformed from low-wage countries into relatively industrialized and affluent economies, rapidly converting to capable players in the global economy (Holzer, 2000). During this rapid growth, the Tigers achieved sustained GDP growth, averaging 6 to 7 percent annually for over three decades. Thereby outperforming nearly all other economies with comparable productivity and income levels and solidifying their status as economic models of successful development (Holzer, 2000; Toma, 2019). This extraordinary economic growth garnered global attention and interest from researchers (Holzer, 2000).

## 1.2 Problem Statement

While some say the Tigers’ growth can be traced back to their comparative advantages (Nzeh et al., 2023), others identify common factors contributing to the Tigers’ growth for which most can be attributed to the concept of the ‘developmental state’ (Milward, 1998; Toma, 2019). Here, the growth in the Tigers is not viewed as a ‘miracle’ but rather seen as the result of export-oriented industrialization, and manufacture-led government policies (Cooke, 2017; Gulati, 1992; Milward, 1998; Toma, 2019). These policies that came with the model of the developmental state were key in the growth experienced by enterprises in the Tigers (Mukhjeri, 2016; Polidano, 2001; Toma, 2019). However, the economic models of some of the Tigers appear to be shifting in favor of more knowledge-intensive strategies and policies aimed at deindustrializing (Cooke, 2017). This phenomenon of deindustrialization increases the importance of knowledge-intensive activities like R&D and innovative capabilities for firms that want to keep up, resulting in ‘catch-up’ strategies (Cooke, 2017; Tseng, 2009; Wong & Goh, 2015). Research touched upon the influence of innovation on firm performance and generally shows a positive effect between innovation and firm performance (Ehie & Olibe, 2010; Stam & Wennberg, 2009; Thornhill, 2006). However, this effect is influenced by other factors, like managerial capabilities and characteristics of a firm’s board (Cheng, 2008; Coad et al., 2020; Coles et al., 2008; Stam & Wennberg, 2009). These factors shape firm strategy

and have the potential to support or hinder firms' innovative capabilities, which makes them important to consider in investment decisions (Coad et al., 2020; Stam & Wennberg, 2009). Research regarding the interplay between them and the effect on firm performance in this specific context offers potential. Namely, the Tigers' unique development paths appear to align with aspects of both transition and developing economies (Hoskisson et al., 2000). Moreover, firms operating in the Tigers exhibit catch-up strategies aimed at developing knowledge-intensive strategies, highlighting the importance of understanding their innovation and governance dynamics (Fagerberg & Godinho, 2018; Wong & Cheong, 2014).

### 1.3 Objective

This study tests whether innovation positively influences the performance of firms in the Asian Tigers, and if this is dependent upon the quality of firms' corporate governance. Determining whether firms that have been used to success for a long time are able to catch up with today's rapidly changing business environment (Jo & Park, 2018) can be interesting.

### 1.4 Research Question

Considering these gaps in knowledge and expectations, this study will focus on the following research question:

*“How is the relationship between a firm's level of innovation and the performance of firms in the Asian Tigers (Hong Kong, Singapore, South Korea, Taiwan) influenced by the quality of the firms' corporate governance?”*

### 1.5 Relevance

The Tiger economies offer the opportunity for rich case studies (Holzer, 2000). Developments in these countries, like stagnating growth, increasing numbers of innovations, and catch-up efforts by some (Cooke, 2017; Wong & Cheong, 2014), make it relevant to examine the effects of innovation in this context. Adding to the literature is useful for firms in those countries and provides relevant information on these important knowledge-intensive business activities for scholars. Also, the findings can help managers make informed decisions regarding innovative investments. While innovation generally leads to favorable outcomes for firms, influential factors need to be considered. Namely, each firm must critically assess its capabilities and evaluate whether they are capable enough to realize optimal results (Coad et al., 2020; Strange et al., 2009). Such organizational capabilities are influenced by the quality

of firms' corporate governance. Effective corporate governance helps firms successfully allocate resources, manage risks, and provides transparency and accountability (Cheng, 2008; Michelberger, 2016; Rasheed & Nisar, 2018; Strange et al., 2009). The findings of this study could help firms critically assess their organizational capabilities and help realize the optimal effectiveness of investments. This is relevant in the current fast-changing business environment, where organizational success depends on the effectiveness in utilizing resources (Jo & Park, 2018). Effectively utilizing innovation can help firms gain a competitive advantage and contribute to sustainable growth (Helfat, 1994; Kaleka & Morgan, 2017). While examining this is relevant in any market, several companies in the Asian Tigers play a significant role in today's global economy (Cooke, 2017; Nzeh et al. 2023). The fact that the Tigers are unique types of emerging markets means this context can provide insight into how firms successfully navigate challenges and leverage opportunities in complex markets. Therefore, contributing to the existing understanding of innovation and corporate governance in this context provides insights into how firms manage their organizational capabilities and competitiveness which helps understand global economic trends and the evolution of corporate strategies in this interconnected global world.

## 2. Theoretical framework

### 2.1 Context of the Asian Tigers

Most research on the effects of innovation and corporate governance on firm performance was conducted in developed Western market economies like the UK, US, and Europe. Scholars say such research may not be applicable to other countries and point to the research potential of emerging and developing markets (Bruton et al., 2008; Michelberger, 2016; Wright et al., 2005; Young et al., 2008). Emerging economies are generally low or middle-income economies with a growth orientation and play an important role in global economic development (Bruton et al., 2008; Young et al., 2008). Emerging economies can be categorized into two groups: transition and developing countries (Hoskisson et al., 2000). Transition economies refers to countries that are transforming from more centrally planned socialist economies to more market-oriented capitalist economies, while developing economies industrialize and experience significant growth. Both have less developed financial and institutional systems compared to advanced economies (Bruton et al., 2008; Hoskisson et al., 2000; Young et al., 2008).

The Asian Tigers (Hong Kong, Singapore, South-Korea, and Taiwan) have similarities to such economies (Toma, 2019). While the reason for the extraordinary growth in these countries has been debated by scholars (Holzer, 2000), most agree their growth was characterized by an active role of the government through regulation and was focused on moving towards a more market-oriented economy (Cooke, 2017; Toma 2019; Wong & Cheong, 2014). While the Tigers aligned with the idea of the transition economies, they also fit the idea of developing economies where the government must be able to effectively implement policies. This developmental state model supports theories of growth in the Tigers (Minns, 2001; Mukhjeri, 2016; Polidano, 2001). While the industrializing and manufacturing policies that came with the economic model of the developmental state helped the Tigers grow (Mukhjeri, 2016; Polidano, 2001), there is a shift towards independence with a focus on innovation and entrepreneurial activities (Cooke, 2017; Tseng, 2009; Wong & Goh, 2015).

While the Asian Tigers could currently be seen as high-income countries (Toma, 2019), challenges like aging populations and increasing competition remain (Cooke, 2017; Nzeh et al., 2023; Selvarajah, 1997). Most importantly the countries appear to transition towards more knowledge-based industries to sustain the economic growth they experienced (Cooke, 2017; Toma, 2019; Wong & Cheong, 2014). The strategies implemented by the

Tigers show similarities with the idea of ‘catch-up’ strategies, which aim to catch up with and surpass developed and advanced economies (Fagerberg & Godhinho, 2018; Wong & Cheong, 2014). Such strategies are aimed at catching up through industrialization and the development of firms’ knowledge-intensive capabilities and therefore align with the increasing focus on developing knowledge-based competencies in the Tigers (Cooke, 2017; Fagerberg & Godhinho, 2018). The Tigers were thus transition economies at a certain point, are still not widely considered as developed, and aim to grow to be so. However, they do not fit completely with the idea of emerging markets due to their economic successes and the strong financial systems of some (Nzeh et al., 2023). Namely, each Tiger has developed a distinct economic model that is thus different from traditional Western models and has a specific focus on areas of competitive advantage (Nzeh et al., 2023; Selvarajah, 1997; Toma, 2019). Moreover, the Tigers have served as role models for other developing countries that are following in their footsteps and striving for similar economic growth (Nzeh et al., 2023; Toma, 2019). Examining whether the strategies of firms in the Tigers align with existing innovation and corporate governance knowledge can help examine the effectiveness of corporate strategies and help evaluate firms’ investment decisions. A further examination of how firms operate in these complex and interesting markets could offer interesting insights.

## 2.2 Innovation

Innovation is a process that involves the creation, adoption, and implementation of new knowledge, ideas, and processes in an organization (Johannessen et al., 2001). Generally, literature considers innovation essential for organizational success and as a tool to maintain competitive advantage and foster growth (Coad et al., 2020; Holak et al., 1991). In business studies, innovation can be studied by examining a firm’s R&D efforts (Kaleka & Morgan, 2017). R&D refers to a series of investigative activities to improve existing products and procedures or to lead to the development of new products and procedures faster and more cost-effectively than competitors (Helfat, 1994). The management of R&D processes can lead to increased precision in development lead times, improved quality of final products, and reduced development costs, thereby strengthening a company’s competitive advantage (Helfat, 1994; Kaleka & Morgan, 2017). Besides the positive influence of innovative capabilities, like R&D, on firm performance, there are also factors influencing the effectiveness of this relationship. For instance, the success of a firm’s R&D can depend on factors like social capital and knowledge sharing (Jo & Park, 2018). Meanwhile, others say

the benefits of innovative investments is influenced by external economic events and the type of industry (Ehie & Olibe; Holak et al., 1991; Stam & Wennberg, 2009).

Moreover, while studies point to the positive influence of innovative investments and firm performance, Coad et al. (2020) argue that the effectiveness of R&D is dependent on managerial and innovative capabilities. They say that while firms that do invest in R&D experience higher performance, those firms that did not invest in R&D would have had less growth and less relative profitability if they had done so due to lacking capabilities. Moreover, scholars (Jo & Park, 2018; Stam & Wennberg, 2009) argue that the heterogeneity in firms' innovative capabilities influences whether firms will benefit from innovative investments or not. The outcomes of R&D are thus closely tied to the firm itself and can be difficult to replicate, pointing to the firm-specific nature of the effectiveness of R&D (Helfat, 1994; Stam & Wennberg, 2009). Still, investing in R&D has been proven to lead to increased labor productivity and effectiveness in maintaining a competitive advantage (Helfat, 1994; Holak et al., 1991), both of which positively affect firm performance (Kaleka & Morgan, 2017). Overall, research has shown that firm R&D efforts are significant predictors of firm performance, with higher R&D spending leading to improved firm performance (Stam & Wennberg, 2009; Thornhill, 2006). This leads to the following hypothesis:

*H1: Firms' R&D spending positively influences the performance of firms in the Asian Tigers.*

### 2.3 Quality of corporate governance

Differences in firms' capabilities can be studied by examining firms' corporate governance. Corporate governance studies aim to enhance understanding of governance structures and mechanisms that serve organizational functioning (Michelberger, 2016). The term 'corporate governance' refers to the effectiveness of mechanisms, policies, and practices that govern the management and oversight of a firm to ensure accountability, fairness, and transparency in its relationship with stakeholders (Michelberger, 2016; Rasheed & Nisar, 2018; Strange et al., 2009). This can be evaluated by examining whether a firm's governance structure protects shareholders' interests and consequently enhances firm value (Michelberger, 2016; Strange et al., 2009). Factors like the independence of board members, the alignment of management incentives with shareholder interests, directors' qualifications, board meeting frequency, and board size can be examined (Ali et al., 2020; Jermias & Gani, 2014; Michelberger, 2016). This can be done by examining a firm's board (Ali et al. 2020; McIntyre et al., 2007; Muth & Donaldson, 1998). A board of directors is responsible for representing the interests of

shareholders through the hiring, monitoring, and replacement of management (Strange et al., 2009). Consequently, effective corporate governance can be reflected in the presence of policies regarding the ethical conduct of the board, the alignment of management's compensation with shareholder interests, and the firm's social behavior and responsibility (Khanchel, 2007; Latif et al., 2017; Siebens, 2002). The presence of such corporate governance policies is linked to better financial performance and can reduce information risk, thereby increasing the value of the firm (Latif et al., 2017). While there are many dimensions to a firm's quality of governance, most studies focus on a few of the aforementioned factors because measuring all is often not feasible (Michelberger, 2016).

One frequently examined factor is board size. Board size is a critical factor in determining the effectiveness of corporate governance because it influences the board's ability to oversee management, make strategic decisions, and fulfill its various duties (Ali et al., 2020; Michelberger, 2016). However, the optimal board size is a subject of debate, with various studies suggesting different ideal measures. Some find a positive relationship between board size and firm performance and posit that larger boards can generate more creative ideas to improve firm performance and better monitor to reduce information asymmetry (Alqatan et al., 2019; Tulung & Ramdani, 2018). However, others point to an inverse association between board size and firm value, with smaller boards leading to more favorable financial ratios while larger boards appear to negatively influence firm performance (Yermack, 1996). Research by Cheng (2008) explains that such a negative influence of board size on firm performance fits with the idea that larger boards are more easily forced to make compromises. Moreover, R&D activities can be linked to risks and accordingly, a higher board size is negatively associated with R&D activities (Cheng, 2008). The decisions of larger boards regarding innovation can thus be less extreme, meaning fewer R&D investments. Moreover, research shows that sometimes firms reduce board size in response to economic uncertainty to strengthen their corporate governance, further indicating a negative effect between firm size and firm performance (Ongsakul et al., 2020). The ideal board size thus appears to be dependent on the context, making it difficult to assess what size aligns with a good quality of corporate governance. However, there are other ways to assess this like examining the presence of policies. Namely, examining whether firms have them in place or not can be an indicator of firms' commitment to corporate governance (Siebens, 2002). As the data collected by researchers for the Datastream database states, a company with a policy regarding the size of its board strives to maintain a well-balanced board through an adequate number of board

members (LSEG, 2023). This indicates the firm has numerical boundaries set for the ideal size of the board of directors and the number of individuals on the board. While such a policy does not include the composition of this board (e.g., diverse, or not), it does show a company is conscious of the influence its board can have. Having a policy regarding board size, therefore, aligns with a better quality of corporate governance and leads to the following hypothesis:

*H2: Having a policy regarding board size strengthens the relationship between firms' R&D spending and firm performance in the Asian Tigers.*

Another frequently examined factor is board independence. This refers to the presence of directors on a company's board who are not part of the company's executive team and free of any relationships that could impair their objectivity and ability to make decisions in the best interest of shareholders (Bohorquez et al., 2018; Ortas et al., 2017; Wu & Li, 2015). Some research finds board independence to positively influence firm performance (Alqatan et al., 2019), while others say the efficacy of board independence is reflected in the stability of board governance and the control of agency costs (Pearce & Patel., 2017). However, since board independence is seen as a mechanism to reduce corporate misconduct, it is no surprise that its effectiveness varies based on the form it takes and the national context (Bohorquez et al., 2018). Particularly in civil law countries, it is suggested that independent directors are more committed to stakeholder engagement and community well-being (Ortas et al., 2017). Moreover, board independence is positively associated with voluntary disclosure in countries with high investor protection rights, highlighting the importance of the legal and institutional setting in governance research (Bohorquez et al., 2018). For instance, increased board independence in China has been associated with a reduction in negative corporate events and improved firm performance (Wu & Li, 2015). Others find that it can even mitigate the negative effects on firm performance in emerging markets (Pham & Nguyen, 2020). Overall, board independence increases firm performance in countries with stronger legal systems and enforcement (Bohorquez et al., 2018) and can diminish negative effects on firm performance in countries where this is lacking (Pham & Nguyen, 2020). Still, research by Coles et al. (2008) found that board independence was negatively correlated with firms' level of R&D. They found that while board independence is usually linked to higher performance, in cases where firm-specific knowledge is important, like R&D-intensive firms, lower board independence might be preferred. Therefore, theory indicates that what is considered a 'good'

amount of independent board members is dependent upon the context. Therefore, examining whether a company has a policy regarding this aspect can be helpful. Namely, as the data collected by researchers for Datastream states, a company with a policy regarding the independence of its board strives to maintain a well-balanced board through an adequate number of independent board members (LSEG, 2023). Here the researchers align with the idea that independent board members maintain integrity and independence in decision-making which leads to the following hypothesis:

*H3: Having a policy regarding board independence strengthens the relationship between firms' R&D spending and firm performance in the Asian Tigers.*

Moreover, other characteristics of directors are also important (Alvarado & Bravo, 2017), leading to another frequently examined aspect of which is board experience. This refers to the knowledge, skills, and expertise that individuals acquire through serving on corporate boards. This experience is considered critical for effective governance as it influences the decision-making processes and oversight functions of the board (Alvarado & Bravo, 2017; Zheng & Kouwenberg, 2019). Studies find that higher levels of experience and team tenure are correlated with better firm performance (Alvarado & Bravo, 2017; McIntyre et al., 2007). Specifically, firms where board members have diverse experiences or experiences in the relevant industry have been linked to higher firm performance and growth (Jhunjunwala, 2012; Whitley et al., 2018; Zheng & Kouwenberg, 2019). Members with more experience can provide strategic advice and facilitate access to critical information and resources, potentially also increasing board capital (Drobetz et al., 2013; Jermias & Gani, 2014). Having board members with experience in the relevant industry is beneficial when challenging situational and structural factors are present that would be more so if the board had less experience (Whitley et al., 2018). Moreover, research by Dou et al. (2019) shows that the experience of board members could reduce potential negative effects firms experience when internationalizing. Also, firms with experienced board members exhibit careful consideration of investment behaviors (Drobetz et al., 2013). Experience in the industry allows for a better understanding of the risks and opportunities associated with investment opportunities and is considered a good quality to possess (Drobetz et al., 2013; Jermias & Gani, 2014). Hence, recruiting more experienced board members can lead to more competent board members and is associated with improved board performance. Again, having a policy regarding the experience of board members is something that shows a firm is conscious of the

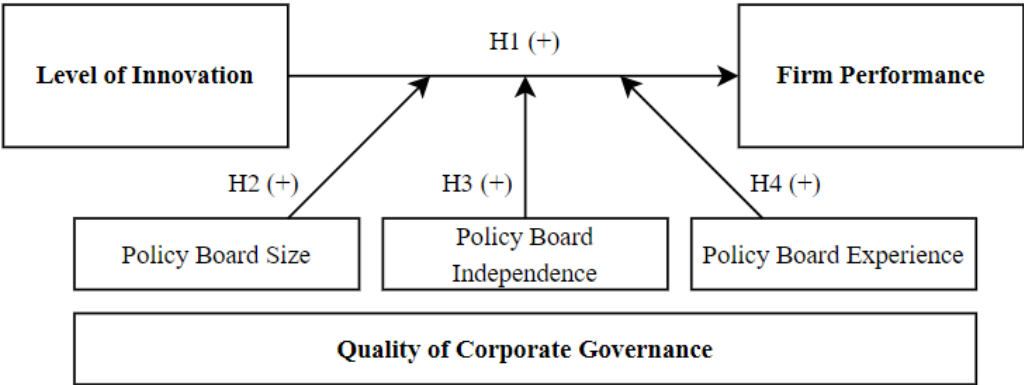
implications and the effects of board experience. Thereby, as the data collected by researchers for the Datastream states, a company with a policy regarding the adequate experience of its board strives to maintain a well-balanced board through an adequate representation of experience and expertise (LSEG, 2023). This leads to the following hypothesis:

*H4: Having a policy regarding board experience strengthens the relationship between firms' R&D spending and firm performance in the Asian Tigers.*

### 2.4 Conceptual model

These hypotheses are visualized in a conceptual model. The model shows H1, the expectation that innovation positively influences firm performance. H2 to H4 shows the expectation that the presence of policies regarding board size, board independence, and board experience positively affect this relationship.

Figure 1: Conceptual model



### 3. Methodology and data collection

#### 3.1 Research method

Quantitative research methods are used because it can estimate the strength of the relationship between variables and provide evidence to determine the validity of hypotheses or conclusions. The results of quantitative research can also be generalized to larger populations and benefit studies in the real business world (Price & Lovell, 2018). Therefore, employing quantitative methods means the results of this study can be generalized beyond only the firms included in this study which enhances the relevance and applicability of the findings to a broader business environment. Reliability and validity must be assessed to achieve scientific rigor (Price & Lovell, 2018). To ensure the reliability, all decisions are discussed and written down, making the research reproducible. To achieve internal validity, the assumptions of multiple regression are met because then any biases in the data are not big enough to influence the analysis (Hair et al., 2018). External validity is achieved by ensuring the sample is an appropriate representation of the investigated population which is done by considering multiple types of firms. Moreover, the hypotheses are based on existing research, aligning with deductive methods (Bowden, 2020). Accordingly, this study aligns with the positivistic principles of predictability, generalizability, and objectivity and aims to reflect reality through objective truths (Bowden, 2020).

#### 3.2 Data collection and sample

To measure firm performance data regarding firms' ROA is collected, in line with research by Xue et al. (2020). Moreover, in line with other international business scholars, this study collects data regarding firms' R&D expenses to measure firms' level of innovation (Edworthy & Wallis, 2009; Holak et al., 1991). Lastly, to collect data regarding firms' corporate governance, data regarding the presence of policies is collected (LSEG, 2023; Siebens, 2002). While research by Michelberger (2016) shows board size, board independence, and board experience have been examined in corporate governance research, no study has combined these three specifically. This study does so because these aspects are available for data collection, and all have theoretical substantiations. Since others have not used this specific combination of variables in the relevant countries and timeframe, there is no dataset containing all the needed information. Therefore, a new dataset is created through the LSEG Workspace (Datastream) which collects economic, financial, and business information from numerous databases and countries. Data from Datastream provides insights into economic

trends and help determine how policies affect firms within and across countries. This is suitable for studies with a global perspective like this one. Moreover, this study uses data regarding firms in Hong Kong, Singapore, South Korea, and Taiwan. Data is collected from 2018 until 2021, making the results relevant today. The dataset initially provided a sample of 843 but was narrowed down due to data availability. Thus, the sample consists of 257 companies in Hong Kong, Singapore, South Korea, and Taiwan for which data is available for the time-period 2018-2021.

### 3.3 Operationalization

#### 3.3.1 Dependent variable

##### *Firm performance*

Firm performance can refer to financial indicators like firm profitability, return on assets (ROA), return on equity (ROE). Different metrics focus on different aspects, like the company's overall financial health versus its daily operations (Xue et al., 2020). ROA and ROE reveal how efficiently firms utilize invested capital to generate profits. Data regarding both was collected because when the dataset was constructed it was unclear which was preferred since they are only slightly different in their usefulness. Namely, ROA assesses firms' profitability by showing how efficiently assets are used to generate profits, while ROE evaluates profitability relative to shareholders' equity (Xue et al., 2020). Some, like Fuji et al. (2012), use ROA to measure firm performance, while others use both ROA and ROE (Ali et al., 2020; Nguyen et al., 2021; Tang, 2023). This study uses ROA because the effect of innovative investments on firm performance is examined. This is measured as a firm's annual net income divided by its total assets. Higher ROA indicates more efficient use of assets and higher profitability. This is of ratio measurement level because there is a true zero point, and the data can be categorized or ranked and is suitable for multiple regression analysis.

#### 3.3.2 Independent variable

##### *Innovation*

To reflect such a multifaceted concept as innovation, R&D spending is used because it reflects the investment in creating new products, processes, and knowledge that can lead to competitive advantages and growth (Coad et al., 2020; Edworthy & Wallis, 2009; Holak et al., 1991). This study operationalizes innovation as a firm's R&D spending which is measured as

R&D expenses in dollars in Datastream. This is because not all examined countries use the same currency and because for all the metric is available in US dollars. This variable is also at a ratio measurement level because there is a true zero point, and the data can be categorized or ranked and is suitable for multiple regression analysis.

### 3.3.3 Moderating variables

#### *Quality of corporate governance*

This study aligns with research by Siebens (2002), and the descriptions used by Datastream by assuming the presence of policies to be an indicator of the effectiveness of corporate governance. Consequently, this study measures corporate governance through the presence of policies regarding aspects of corporate governance. Hence, the moderating variables are binary variables with yes/no options, where yes is an indicator of a higher quality of governance and no is an indicator of a lower quality of governance. Multiple variables are used because corporate governance is a multifaceted concept concerning the interests of numerous stakeholders. The variables are categorical and measured at a nominal measurement level. To incorporate these dichotomous variables into the regression analysis, dummy variables are used where a 'yes' is represented by 1 and a 'no' by 0. The following variables are collected by searching for the variable's 'Eikon code' in the database Datastream.

Firstly, the independence of the board is examined by investigating if firms have a policy regarding the independence of board members by collecting data through Datastream by searching for 'TR.PolicyBoardInd'. Secondly, board size is assessed by examining whether the firm has a policy regarding board size to assess the board's ability to oversee management and fulfill its various duties. This variable is collected through Datastream and can be found by searching for 'TR.PolicyBoardSize.' Thirdly, the board of director's qualifications are assessed by examining whether firms have a policy regarding adequate experience of its board. This variable is collected through Datastream and can be found by searching for 'TR.PolicyBoardExperience.'

### 3.3.4 Control variables

Larger firms have more resources to spend on R&D and generate higher amounts of revenue than smaller firms and will thus be controlled for (Jefferson et al., 2006; Saeed et al., 2013). Firm size can be operationalized in different ways like measuring a company's total assets in

\$ or by examining the number of employees. Studies on innovation and corporate governance have used the latter approach (Michelberger, 2016). Consequently, this study operationalizes firm size as the number of employees. This is collected for each firm by searching for 'DWEN' in Datastream. This refers to the number of employees present and, contrary to the option of total assets in \$, is not influenced by currency rates.

Moreover, the type of industry can affect what is considered a good quality of governance and controls for industry since industries have varying levels of regulatory, public, and social pressure to conform to certain types of governance (Andersen & Dejoy, 2011). Also, some industries encourage board independence while others do not (Andersen & Dejoy, 2011). Thus, this is collected by examining the industry names and codes (TRBC ECON SEC NAME/ CODE) in the LSEG Excel file which also has the ISINs of the firms in the sample. It must be dummy-coded to be included in the analysis because it is of nominal measurement level. Including dummies for all categories would result in perfect multicollinearity which is why 9 dummy variables are created while there are 10 industry sectors. The chosen reference category is 'Technology' because this category has the largest number of firms, resulting in a larger basis for comparison (Field, 2018).

### 3.4 Data analysis

Regression analysis is employed because this is appropriate for testing the relationship between an independent and dependent variable and examines the influence of moderating variables on this relationship (Field, 2018; Hair et al., 2018). The purpose of multiple regression analysis is to describe functional relationships among variables and to predict the response of one variable based on others, showcasing its dual role in explanation and prediction (Field, 2018). Thus, it helps understand the nature and strength of the relationship between variables and can test whether and how this relationship changes when moderators are added to the relationship (Hair et al., 2018). The data is examined and checked for outliers and missing values to avoid any bias effects. Also, before starting the analysis the assumptions of multiple regression must be met (Hair et al., 2018). Once these assumptions are met the analysis is performed and the hypotheses are tested. Performing the regression analysis, using the statistical software SPSS, helps assess whether hypotheses are accepted, and the reasons behind this can be discovered by going back to the theory (Field, 2018).

### 3.5 Research ethics

This study complies with the APA Ethics Code (American Psychological Association, 2017), the principles of the Netherlands' Code of Conduct for Research Integrity (Netherlands Code of Conduct for Research Integrity, 2018), and the principles of the General Data Protection Regulation (GDPR, 2024). The researcher recognizes the rules and principles these institutions advocate for and vows the gathered and analyzed data is not manipulated, fabricated, or falsified in any way. The researcher avoids any form of bias and presents the data and results as they are while remaining impartial and independent. This aim to stay objective and remain unbiased also aligns with the positivistic approach (Bowden, 2020). Moreover, this study aims to ensure transparency by keeping a collection of the steps of the entire research process, thereby also ensuring transparency.

## 4. Analysis

### 4.1 Descriptive statistics

To examine the appropriateness of the continuous variables the mean, median, standard deviation, skewness, kurtosis, histogram, and P-P plots were examined. The initial descriptive statistics can be found in Appendix 8.1. This examination showed no missing values because all data was gathered specifically for this study and filters were used to ensure data availability. Moreover, the data was checked for outliers by examining the variables' Z scores. Variables with a standard deviation above the threshold value of +/- 3.29 are examined since these could impact the analysis (Field, 2018; Hair et al., 2018). Outliers above this threshold were deleted if they were not representative of the sample (Hair et al., 2018), resulting in the deletion of 27 variables. Afterwards the descriptive statistics table still showed abnormalities regarding the normality of the variables. A violation of normality could affect the homoscedasticity and regression line (Field, 2018) and was, therefore, further investigated by creating histograms and P-P plots of the continuous variables, found in Appendix 8.2. These showed that the variables ResearchAndDevelopmentExpenses and Employees were both positively skewed and leptokurtic, indicating a logarithmic transformation was suitable to reduce the skewness (Field, 2018). Therefore, these variables were transformed into the variables RandDExpenses\_log and FirmSize\_log through logarithmic transformations. The variable ROA was already distributed normally and therefore did not need to be transformed. After these transformations, the descriptive statistics, seen in Table 1, and new plots, found in Appendix 8.3, showed the variables were now normally distributed and showed no other significant abnormalities. To examine the appropriateness of the categorical variables their frequencies were assessed. These frequencies showed no abnormal activity and can be found in Table 1.

Table 1: Descriptive Statistics after data transformation

	N	%	Min.	Max.	Mean	SD	Skewness	Kurtosis
ROA			-21.140	32.430	5.590	6.321	.091	2.500
FirmSize_log			1.360	5.480	3.831	.675	-.589	1.019
R&DExpenses_log			.000	6.650	4.744	.851	-.994	3.156
Valid N	993							
<b>PolicyBoardIndependence</b>								
No	360	36.3%						
Yes	633	63.7%						
<b>PolicyBoardSize</b>								
No	233	23.5%						
Yes	760	76.5%						
<b>PolicyBoardExperience</b>								
No	248	25.0%						
Yes	745	75.0%						
<b>Industry</b>								
Basic Materials	84	8.5%						
Consumer Cyclical	158	15.9%						
Consumer Non-	92	9.3%						
Energy	36	3.6%						
Financials	8	0.8%						
Healthcare	76	7.6%						
Industrials	163	16.3%						
Real Estate	20	2.0%						
Technology	332	33.2%						
Utilities	24	2.4%						

## 4.2 Multiple regression analysis

Before starting the analysis, the assumptions of multiple regression analysis (Hair et al., 2018) were checked. Each assumption was assessed, and data was transformed accordingly when found to be insufficient in meeting the assumptions. An in-depth examination of this process and the transformations can be found in Appendix 8.11. To test the hypothesized relationships and get an answer to the research question, multiple regression analysis was conducted. In this process, 7 models were run from which a comprehensive overview of the results can be found in Table 3.

### 4.2.1 Model 1

Model 1 tested the relationship between the dependent variable (ROA) and all control variables. This analysis showed that the effect of Firm Size on ROA is negative ( $b = -.369$ ;  $SE = .311$ ) but that this is not statistically significant. For the industry variables, for all industries the ROA is smaller than that of the Technology industry since the  $b$  values are negative. The industries ConsumerNonCyclicals, BasicMaterials, and Energy are not significant, meaning there is no difference in the ROA of companies in those industries compared to that of the reference category which is the Technology industry. Conversely, the results of the other industries are significant, meaning that in those the effect of a firm's ROA in that industry is significantly different than the ROA of firms operating in the Technology industry.

### 4.2.2 Model 2

Model 2 tested the relationship between the independent variable (R&D expenses) and the dependent variable and included all control variables. The regression analysis showed that there is a small positive effect of the independent on the dependent variable ( $b = .089$ ;  $SE = .273$ ) but that this is not statistically significant. In the models that follow this relationship continues to stay insignificant meaning Hypothesis 1 is not supported. As for the control variable Industry, the industries ConsumerNonCyclicals, BasicMaterials, and Energy are still not significant while the results of the other industries are significant. They also still all have negative values, meaning the ROA in those industries is significantly lower than that of the Technology industry. For the control variable Firm Size, there was a negative effect, but this was not significant, meaning there is no found effect of firm size on ROA.

#### 4.2.3 Model 3

Model 3 tested the relationship between the independent variable and the dependent variable, included all control variables, and tested the influence of the moderator Policy Board Size (H2). This analysis showed the influence of the independent on the dependent variable was still positive but not statistically significant. As for the moderator, this model showed a positive and statistically significant effect of PolicyBoardSize on ROA ( $b=4.862$ ;  $SE=2.425$ ). However, the inclusion of the interaction term was negative but not statistically significant which makes sense since the main relationship itself is also still not significant. Looking at the control variables showed that Firm Size was still negative but not statistically significant and that most industry variables were still negative and significant, now only except for ConsumerNonCyclicals, and BasicMaterials. This thus means that Energy did become statistically significant.

#### 4.2.4 Model 4

Model 4 tested the relationship between the independent variable and the dependent variable, included all control variables, and tested the influence of the moderator Policy Board Independence (H3). This analysis showed the influence of the independent on the dependent variable was still positive but not statistically significant. As for the moderator, this model showed a positive and statistically significant effect of PolicyBoardIndependence on ROA ( $b=5.424$ ;  $SE=2.329$ ). Moreover, the inclusion of the interaction term was negative and statistically significant. This is noteworthy because this says that there is an interaction between having a policy on board independence and the relationship between R&D expenses and ROA but it also says that this main relationship itself does not exist. To investigate if this was caused by a confounding effect another regression was run in which the effect of PolicyBoardIndependence on R&D expenses was run, found in Appendix 8.9.4. This analysis showed a small positive effect of PolicyBoardIndependence on R&D expenses but this effect was not statistically significant, thereby ruling out the possibility of a confounding effect. A potential explanation for this significant effect could be that the effects of other moderating variables, which are not included in this model, are not wrongly attributed to PolicyBoardIndependence. This is supported by the fact that in Model 6, in which all interaction terms are included at once, the significant effect found in Model 4 disappears, thereby supporting this methodological explanation. Looking at the control variables showed that Firm Size was still negative but not statistically significant and that most industry

variables were still negative and significant, apart from Energy, ConsumerNonCyclicals, and BasicMaterials.

#### 4.2.5 Model 5

Model 4 tested the relationship between the independent variable and the dependent variable, included all control variables, and tested the influence of the moderator Policy Board Experience (H4). This analysis showed the influence of the independent on the dependent variable was still positive but not statistically significant. As for the moderator, this model showed a positive and statistically significant effect of PolicyBoardExperience on ROA ( $b=5.887$ ;  $SE=2.337$ ). Moreover, the inclusion of the interaction term was negative and statistically significant. To investigate if this was caused by a confounding effect another regression was run in which the effect of PolicyBoardExperience on R&D expenses was run, found in Appendix 8.9.5. This analysis showed a positive and statistically significant effect of PolicyBoardExperience on R&D expenses, meaning there is at least a partial confounding effect. This means that having a policy regarding board experience has a positive and significant effect on both the independent and dependent variables, but a negative one on the relationship between the two. However, like the effect found in Model 4, this effect also still disappears in Model 6. Therefore, the negative and significant effect of the interaction term is also likely caused by the fact that in this model the variables are not controlled for by the other moderating variables. Thus, indicating that this significant interaction effect is likely false. Looking at the control variables showed that Firm Size was still negative but not statistically significant and that most industry variables were still negative and significant, except for ConsumerNonCyclicals, and BasicMaterials. This thus means that Energy did become statistically significant.

#### 4.2.6 Model 6

In Model 6 the relationship between the independent and dependent variables was again tested with the inclusion of control variables, moderators, and interaction terms. This model was created to check the effects of all variables that were previously measured separately and check them. These interaction terms were calculated by multiplying each moderator with the independent variable respectively and were then added to the model. Running this model shows the interaction terms are all negative and not significant. This means they each do not affect the relationship between the independent and dependent variables meaning H2, H3, and H4 are also rejected. Interestingly, while the effect of the independent on the dependent

variable is still not significant, adding the interaction terms to the model did increase the b from an initial value of .089 to a value of .874 and a significance level of first .745, then .948 and now 0.064. Thus, while it is still not significant it is coming much closer to the significance level of .05. This model thus shows that the moment all separate effects are controlled for each other, the previously found effects of the moderators disappear. This might be a confounding effect because in the previous models, the effects of the moderators that were not included in the models were wrongly attributed to the one that was measured. This could indicate that the moderators might not have been measured in the most efficient manner. This possibility will be further examined in the discussion.

#### 4.2.7 Model 7

In Model 7 the relationship between the independent and dependent variables was tested with control variables, and the moderators were added. Here the influence of the independent on the dependent variable was, as mentioned, still not significant. As for the moderators, this model showed a small positive effect of PolicyBoardSize on ROA ( $b=.037$ ;  $SE=.551$ ) but this was not statistically significant. Also, it showed a small positive effect of PolicyBoardIndependence on ROA ( $b=.154$ ;  $SE=.481$ ) which was also not statistically significant. This means that there is no statistical relationship between these two moderating variables and the dependent variable. However, the model also showed a positive effect of PolicyBoardExperience on ROA ( $b= 1.284$ ;  $SE= .539$ ) which was statistically significant. Thus, this showed that while policies regarding board size and board independence do not have a direct effect on the ROA, a policy regarding board experience does have a direct effect on the ROA of firms in the Asian Tigers.

After this the  $\beta$ 's had to be examined but beforehand a sheaf variable had to be created to get a  $\beta$  for the control variable Industry since this cannot be interpreted for the industry dummies separately. This sheaf variable was created by multiplying each b coefficient with its respective dummy and adding all of these together. Then, after running the analysis again without all separate dummies and with the sheaf included, the  $\beta$ 's were examined. This showed Industry had the highest  $\beta$  value (.188), meaning this had the strongest effect on ROA. This highest value is followed by PolicyBoardExperience with a  $\beta$  value of .088, which is much higher than the values of the other moderators and the only significant moderator. Because it was noteworthy that industry had the highest  $\beta$ , this was further investigated by conducting a Model Comparison Test. To do this another model, found in Appendix 8.9.8 was

created. Conducting this test showed that adding the dummies that were created to measure the control variable of industry significantly increased the  $R^2$  of the model. This means that industry, as a concept, thus contributes to the overall explanatory power of the model and has a significant direct effect on ROA.

#### 4.2.8 Summary of results

Table 3 shows an overview of the results of running the different models while Table 2 shows an overview of the implications these results have for the hypotheses. These results show that all hypotheses are insignificant and therefore rejected but do show a direct effect of both the moderator variable Policy Board Experience on ROA and the control variable Industry on ROA.

*Table 2: Results of hypotheses*

<b>Hypotheses</b>	<b>Results</b>
H1: Firms' R&D spending positively influences the performance of firms in the Asian Tigers.	Rejected
H2: Having a policy regarding board size strengthens the relationship between firms' R&D spending and firm performance in the Asian Tigers.	Rejected
H3: Having a policy regarding board independence strengthens the relationship between firms' R&D spending and firm performance in the Asian Tigers.	Rejected
H4: Having a policy regarding board experience strengthens the relationship between firms' R&D spending and firm performance in the Asian Tigers.	Rejected

Table 3: Regression Analysis

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	$\beta$
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	
(Constant)	8.173*** (1.314)	7.870*** (1.610)	4.850** (2.269)	5.012** (2.055)	5.168** (2.185)	3.934 (2.465)	8.048*** (1.619)	
RandDExpenses_log		.089 (.273)	.680 (.428)	.652* (.387)	.611 (.404)	.874* (.471)	.018 (.274)	.002
PolicyBoardSize			4.862** (2.425)			.928 (3.326)	.037 (.551)	.002
PolicyBoardInd				5.424** (2.329)		2.705 (3.254)	.154 (.481)	.012
PolicyBoardExperience					5.887** (2.337)	4.394* (2.624)	1.284** (.539)	.088**
FirmSize_log	-.369 (.311)	-.407 (.333)	-.399 (.344)	-.417 (.335)	-.550 (.346)	-.524 (.352)	-.653* (.347)	- 1.955*
ConsumerCyclicals	-1.414** (.608)	-1.357** (.633)	-1.374** (.634)	-1.285** (.635)	-1.337** (.630)	-1.332** (.636)	-1.289** (.635)	
Industrials	-2.469*** (.606)	-2.430*** (.618)	-2.571*** (.628)	-2.571*** (.628)	-2.575*** (.618)	-2.679*** (.632)	-2.433*** (.621)	
Healthcare	-1.973** (.826)	-1.965** (.827)	-2.023** (.829)	-1.965** (.832)	-2.058** (.824)	-2.097** (.833)	-1.981** (.832)	
Utilities	-3.717*** (1.326)	-3.686*** (1.330)	-3.815*** (1.330)	-3.657*** (1.329)	-3.986*** (1.326)	-3.974*** (1.334)	-3.864*** (1.333)	
RealEstate	-3.469** (1.442)	-3.430** (1.447)	-3.393** (1.450)	-3.567** (1.474)	-3.517** (1.442)	-3.700** (1.487)	-3.506** (1.469)	

Financials	-5.148** (2.237)	-5.181** (2.240)	-5.038** (2.240)	-5.192** (2.242)	-5.007** (2.234)	-4.974** (2.251)	-4.821** (2.244)	
Energy	-2.163* (1.104)	-2.151* (1.105)	-2.283** (1.107)	-2.077* (1.104)	-2.451** (1.105)	-2.404** (1.115)	-2.424** (1.115)	
ConsumerNonCyclicals	-.063 (.742)	.009 (.775)	.186 (.786)	.226 (.788)	.290 (.775)	.300 (.793)	.239 (.792)	
BasicMaterials	-1.224 (.780)	-1.176 (.794)	-1.217 (.798)	-1.206 (.794)	-1.267 (.791)	-1.326* (.800)	-1.253 (.798)	
Sheaf_Industry								.188** *
Interaction_BoardSize			-.951* (.523)			-.224 (.699)		
Interaction_BoardIndependence				-1.046** (.492)		-.544 (.675)		
Interaction_BoardExperience					-.994** (.501)	-.688 (.558)		

Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

Note 1: Standard errors in parentheses

### 4.3 Robustness check

After conducting the analyses, additional analyses were performed as robustness checks. This refers to a check whereby slight changes are made to the model and then comparing those results with the results of the initial standard regression. This is done to increase the validity and reliability of the research (Lu & White, 2014). An in-depth overview of the process and results of these robustness checks can be found in Appendix 8.10.

## 5. Discussion

This study investigated how the relationship between firms' levels of innovation and performance is influenced by the quality of corporate governance of firms in the Asian Tigers. The findings provide insights into the interaction between innovation, corporate governance, and firm performance in the context of these dynamic and complex economies. Therefore, this study aimed to find an answer to the following research question:

*“How is the relationship between a firm's level of innovation and the performance of firms in the Asian Tigers (Hong Kong, Singapore, South Korea, Taiwan) influenced by the quality of the firms' corporate governance?”*

### 5.1 Interpretation of the results

#### 5.1.1 Innovation and firm performance

The relationship between a firm's level of innovation and firm performance of firms in the Asian Tigers was examined. The analysis resulted in a positive effect of firm innovation on firm performance. However, this effect was not statistically significant ( $p > .05$ ) in each model, meaning it cannot be concluded that firm innovation positively influences firm performance in the scope of this study. Thereby H1 is rejected. This was unexpected because research points to a relationship between the two (Coad et al., 2020; Helfat, 1994; Kaleka & Morgan, 2017; Thornhill, 2006). Literature also points to the effectiveness of the innovation efforts of firms in the Asian Tigers because of their sustained economic growth (Cooke, 2017; Fagerberg & Godinho, 2018; Wong & Cheong, 2014). However, the measurement methods of such studies differ from those of this study, which could explain the contrasting findings. For example, Ehie & Olibe (2010) measured firm performance through market capitalization, Thornhill (2006) measured it through Return on Investment (ROI), and Jefferson et al. (2006) used profitability and productivity. Similarly, others measured firm innovation through R&D intensity (R&D expenditure / total sales) instead of the absolute R&D expenditure (Ehie & Olibe, 2010; Jefferson et al., 2006; Thornhill, 2006). However, researchers using more similar measures, like Sher & Yang (2005), also find firm innovation to influence firm performance. Regardless, the fact that, while insignificant, the measured effect is positive means the results at least do not contradict existing research. However, the results in Model 6 show that while the main relationship remained insignificant the values did get closer to significant by including the terms. This could point to a confounding effect since it is possible that the effects found in the separate models were overestimated because effects belonging to other

factors were wrongly attributed to the one being measured. This points to the possibility of a different factor, not included in this analysis, which affected the results and should have been controlled for. Further examining the literature on firm innovation and firm performance shows some factors that might have had such influence. For instance, firms' exporting activities (Coad et al., 2020; Kaleka & Morgan, 2017; Wong & Cheong, 2014) and ownership structures (Coad et al., 2020; Jefferson et al., 2006) could have influenced firm performance, while firm age could have affected firm innovation (Coad et al., 2020; Thornhill, 2006). Thus, the fact that these potentially influential factors were not controlled for might have influenced the results. Furthermore, a robustness check showed that with ROE as a dependent variable the relationship between innovation and firm performance was positive and significant. This points to a suboptimal operationalization of firm performance in this study, which could be another reason for the insignificance. Thus, while this study did find a positive effect of firm innovation on firm performance, in line with research, the insignificance of this effect means it cannot be concluded that the effect exists in the scope of this study.

#### 5.1.2 Corporate governance and firm performance

Interaction terms regarding the influence of the presence of policies regarding board size, independence, and experience were created to test if, and how the presence of such policies affected the relationship between firms' innovation levels and firm performance. The analysis resulted in a rejection of H2-H4. While for most this was to be expected since the main relationship remained insignificant in each model, some models showed interesting variations. The results of each moderating variable and the possible reasons behind them are discussed in the following section.

##### *Policy on board size*

Model 3 showed a negative and statistically insignificant interaction effect on the relationship between firm innovation and performance. Consequently, in the scope of this study it cannot be concluded that having a policy regarding board size has any influence on the main relationship. This insignificant effect was expected because the main relationship remained statistically insignificant. This goes against existing literature since scholars (Coad et al., 2020; Helfat, 1994; Jo & Park, 2018; Stam & Wennberg, 2009) say that whether firms will benefit from innovative investments is dependent on the firms' characteristics. It is therefore

likely that, although board size could be an influential firm characteristic, having a policy regarding board size is not.

Moreover, the analysis in Model 3 showed a positive and statistically significant direct effect on ROA. This, in line with existing research (Khanchel, 2007; Latif et al., 2017; LSEG, 2023; Siebens, 2002), suggests that having a policy regarding board size positively affects firm performance. For instance, the literature review by Michelberger (2016) found that board size was one such firm-specific characteristic with a significant effect on firm performance. However, once the effect was controlled for by adding the other moderating variables to the model this direct effect disappeared. Thus, these findings further indicate that having a policy regarding board size does not influence the effectiveness of firm innovation on performance. Thus, this might not be a relevant corporate governance measure in the context of this study. Further examining the literature shows different measures that might have been more relevant. For example, it is possible that examining board size in absolute numbers and distinguishing between either 'high' or 'low' board size could have led to a more nuanced examination of the effect of this indicator (Alqatan et al., 2019; Cheng, 2008; Tulung & Ramdani, 2018).

#### *Policy on board independence*

Model 4 showed a negative and statistically significant interaction effect on the relationship between firm innovation and performance. This suggests that having a policy regarding board independence negatively influences the positive effect of innovation on firm performance. However, concrete conclusions regarding this effect cannot be made because the main relationship remains statistically insignificant in this model. Still, therefore potential reasons for this significant interaction effect were explored. Theory suggests that being aware of the influence of the independence of the board is an indicator of higher corporate governance (Ali et al., 2020; LSEG, 2023) which leads one to expect a positive interaction effect of having such a policy in place (Latif et al., 2017; LSEG, 2023; Siebens, 2002).

While the analysis showed a negative effect on this relationship, Model 4 did show a direct positive effect on ROA which aligns with existing theory pointing to the positive effect of the presence of such a policy on firm performance. Moreover, the confounding effect test showed that such a policy did not affect firm innovation, suggesting it does not influence the willingness to innovate. Thus, the policy has a positive influence on firm performance and does not influence innovation levels, meaning this negative interaction effect must come from

something else. An explanation could be that firms with such a policy might make less efficient choices regarding innovation. Still, looking into existing studies does not offer a strong substantiation for this explanation since it widely regards board independence as something that does influence this relationship (Coles et al., 2008; Pham & Nguyen, 2020). For example, Wu et al. (2020) found that director's ownership positively influenced the efficiency of R&D investments and had a positive effect on firm performance. However, this difference in findings is not entirely surprising since an examination of a policy regarding ownership and an examination of multiple facets of ownership structures are different.

However, a methodological explanation for this finding might be more relevant. Namely, these effects disappear when the analysis controls for the other moderating variables. This can be seen in Model 6 where the interaction effect and the direct effect of the policy on firm performance both disappear. The methodological explanation for these disappearances can be that the significance found in the previous model was supposed to be attributed to a different variable which was then not included. Controlling for all variables therefore distributed the effects more accurately. While a negative interaction effect and positive direct effect on ROA are still seen in this more controlled model, they are not statistically significant anymore, meaning strong conclusions cannot be made.

#### *Policy on board experience*

Model 5 showed a negative and statistically significant interaction effect on the relationship between firm innovation and performance. This indicates that having a policy regarding board experience negatively influences the positive impact of innovation on firm performance. However, the relationship between innovation and firm performance remains positive and statistically insignificant, meaning concrete conclusions regarding the effect cannot be made. Still, potential reasons for this significant interaction effect were explored. Theory suggests that being aware of the influence of board experience can be an indicator of higher corporate governance, leading one to expect a positive effect on the main relationship (LSEG, 2023; Siebens, 2002). Model 5 showed a direct positive effect of having a policy regarding board experience on firm performance, aligning with studies suggesting a positive effect of such a policy on firm performance (Drobotz et al., 2013; LSEG, 2023; Siebens, 2002). Also, the confounding effect test showed that such a policy did have a positive effect on firm innovation itself, suggesting a board that is aware of the influence of experienced members encourages innovation. Thus, the policy has a positive influence on both firm performance

and the amount of innovation, implying this negative effect must be caused by something else. Like the discussion on policy board independence, the effect could be explained by the idea that firms with such a policy in place make less efficient choices regarding innovation. Nevertheless, existing research finds companies that are aware of the importance of experienced board members to have better judgment regarding investment decisions (Drobetz et al., 2013; LSEG, 2023; Jermias & Gani, 2014) and therefore, again, does not offer a strong substantiation for this explanation.

Again, a methodological explanation for this finding is more relevant because the interaction effect disappears when the analysis controls for other moderating variables. The methodological explanation for this disappearance can be that the significance found in the previous model had to be attributed to a different not-included variable. Controlling for all variables therefore distributed the effects more statistically accurately. While Model 6 still shows a negative interaction effect, it is not statistically significant, insinuating strong conclusions cannot be made. However, while the interaction effect disappeared just as it did for policy board independence, the direct effect of policy board experience on firm performance did persist. Therefore, it can be concluded that having a policy regarding board experience positively affects firm performance. This aligns with other studies that find the presence of board members with relevant experience associated with higher firm performance (Jhunjunwala, 2012; Zheng & Kouwenberg, 2019). Thus, while a policy regarding board experience might not be the most appropriate measure in examining the effectiveness of innovation, it does offer insights into firm performance.

### 5.1.3 Control variables

This study controlled for industry and firm size because these could have created biased results and had the potential to influence the accuracy of the analysis. Firm size was measured as the number of employees and was not found to be very influential on the results. Still, it is beneficial that the study controlled for firm size because it could have influenced the results because bigger firms can have higher revenue which could influence the results regarding firm performance (Jefferson et al., 2006; Saeed et al., 2013). Also, the robustness check conducted in Chapter 4.4.1 showed that the explanatory power of the model was increased by controlling for these variables, supporting the relevance of this inclusion.

Interestingly, while firm size was not particularly influential on the results, industry was. This study controlled for industry because different industries could have different effects on what is and is not considered good corporate governance (Andersen & Dejoy, 2011). This study found that the effect of industry was the strongest in the entire analysis. Specifically, for all industries the firm performance was lower than that of the technology industry. Only industries regarding consumer-non-cyclicals, basic materials, and energy were not always significant, showing that firm performance in these industries is not significantly different from that in the technology industry. All other industries, however, were consistently found to be significant which shows that for those, firm performance is consistently lower than in the technology industry. This suggests that the industry a firm operates in has a strong influence in the scope of this study, aligning with existing research. Namely, a reason for the recent sustained economic growth is the focus on knowledge-intensive labor in the Asian Tigers (Cooke, 2017; Fagerberg & Godinho, 2018; Toma, 2019; Wong & Cheong, 2014). Many financially successful firms in the Asian Tigers also appear to be firms operating in the technology sector (Cooke, 2017; Jefferson et al., 2006; Selvarajah, 1997; Tseng, 2009), which supports this idea that firms in most other industries have relatively lower firm performance compared to this sector. This is further supported by research by Thornhill (2006), who found that innovation is more common in dynamic industries like the technology industry. Similarly, this study finds that while the effect on firm performance is higher in such industries, the influence of firm innovation on performance is positive regardless of the type of industry. This could explain this big difference if innovation was found to have a significant positive influence on firm performance which was not the case and can therefore not be concluded. Thus, it is relevant that this study controlled for industry because the robustness check in Chapter 4.4.1 showed an increased explanatory power of the model with its inclusion, and the results show a strong influence of this control variable.

## 5.2 Theoretical Implications

The findings of this study lead to several theoretical implications. Like others, this study acknowledges that corporate governance is a multifaceted concept that is difficult to diminish into only a few aspects. The results indicate that the used measurements might not be the most appropriate since effects disappeared when controlled for the other variables, and the fact that theory offers little substantiated explanations. This might point to the need for a more comprehensive approach that incorporates more control variables and more factors associated with corporate governance at once to avoid overestimating the effects of individual factors.

Moreover, this study used the presence of policies as indicators of corporate governance which is an approach that had not been used for this specific set of aspects before. While similar approaches have been used by some (Khanchel, 2007; Latif et al., 2017; Siebens, 2002), few have examined corporate governance in the same way as this study. Therefore, the finding that shows a policy regarding board experience affects firm performance is interesting and could be kept in mind for further research.

Moreover, perhaps the most interesting finding in this study is the fact that while most previous studies suggest a clear positive relationship between firm innovation and firm performance (Coad et al., 2020; Ehie & Olibe, 2010; Jo & Park, 2018; Stam & Wennberg, 2009), this study's lack of statistical significance suggests that this positive effect is not definitive in the scope of this study. This could implicate that in the context of the Asian Tigers, this positive effect of innovation on firm performance might not be as prevalent as is thought. This could be caused by several factors, like the industry-specific differences or the dynamic nature of this context. Namely, the findings regarding the type of industry point to the idea that this factor might be of greater influence in this specific context than was initially thought. However, due to the methodological uncertainty of this study, it is difficult to make substantial theoretical conclusions.

### 5.3 Practical implications

These results indicate that the impact of innovation on firm performance might not be as significant as assumed in the context of the Asian Tigers. Considering this finding, managers in the Asian Tigers might want to consider a broader set of performance indicators. They would benefit from carefully examining the long-term benefits of innovation before making important investment decisions. Moreover, a positive effect of having a policy regarding board experience on firm performance is found. Consequently, firms in the Asian Tigers might want to consider implementing such policies to increase firm performance. Conversely, the findings suggest that having a policy regarding board independence and board size does not affect firm performance or the relationship between innovation and firm performance in the Asian Tigers. Therefore, firms that are thinking about implementing such policies might want to consider this information and opt to choose to implement different policies. Namely, implementing policies is a process that takes money and time (Broadstock et al., 2020). Investing this in something irrelevant can therefore be viewed as a waste. Thus, organizations operating in the Asian Tigers could use this information to critically assess their investment

decisions based on firm-specific characteristics like the policies they have in place. Effectively utilizing their investment opportunities would further help such companies strengthen their competitive advantage and allow them to keep navigating the complex global landscape in which they operate (Jo & Park, 2018).

#### 5.4 Limitations and future research

The effect of innovation on firm performance was statistically insignificant which could have different explanations. There could be because this study left out a relevant variable that is now affecting the analysis and going unnoticed. Therefore, further research could conduct a similar study but control for more factors that could have interfered with the results. By doing this the effect could become significant, and the validity of the model and its results would be higher. Future research should include a wider range of control variables to avoid the pitfalls of oversimplified analyses. Potential influential variables in this context could be firm age, ownership structure, and export activities (Coad et al., 2020; Kaleka & Morgan, 2017; Thornhill, 2006; Wong & Cheong, 2014). The statistical insignificance could be caused by the sample itself. Namely, the dataset was constructed specifically for this study and could have filtered out relevant firms, thereby diminishing the sample size, potentially negatively influencing the results since a higher sample size increases the power to detect significant effects (Hair et al. 2018). This could have unintentionally created a biased data set in which only firms that disclose the relevant data were examined.

Also, a suboptimal operationalization of firm performance and innovation could have affected the results. Therefore, future research might benefit from choosing a different measure for firm performance than ROA. For example, ROE could be relevant because the robustness checks proved this measure to increase the statistical significance of the main relationship. Besides, others have used both ROA and ROE in their studies (Ali et al., 2020; Nguyen et al., 2021; Tang, 2023) which also increases reliability and should be considered by future researchers. Moreover, further research could consider operationalizing firm innovation in terms of R&D intensity rather than R&D expenditure since such a ratio offers more complexity and nuance to the analysis (Coad et al., 2020; Ehie & Olibe, 2010; Jefferson et al., 2006). Namely, the fact that none of the interactions in this study are significant is not surprising because the relationship between innovation and firm performance is insignificant. If this was due to suboptimal operationalization, future research should re-examine if the interactions hold up in case there is a significant main relationship.

Furthermore, the fact that this study used policies as indicators for corporate governance might not have been the best approach since it could lack some nuance. Different measures should be considered because all interaction terms were insignificant, meaning either the chosen corporate governance measures do not have any influence, or the operationalization was suboptimal. Future research should explore this, ideally with a larger sample and a significant main effect to obtain valid results. For instance, the findings suggested that a policy regarding board experience has a positive effect on the performance of firms in the Asian Tigers. However, an in-depth examination was not possible because of the limited scope of this study, offering research potential for future researchers to examine more substantially. Examining board size, independence, and experience with different metrics could have given more depth to the results and should be considered. Examples of different metrics include using absolute numbers to measure the amount of independent and experienced board members or to classify board size into high or low (Cheng, 2008; Drobetz et al., 2013; Tulung & Ramdani, 2018; Whitley et al., 2018). Moreover, board independence and experience could be measured in the percentage of independent or experienced board members (Alvarado & Bravo, 2017; Alqatan et al., 2019; Wu & Li, 2015).

Lastly, the strongest effect was from the industry variable. That industry was found to have such differences offers potential for future research. For example, conducting a study with firms in only the strongest industry, technology, might lead to less significant differences between firms and allow for more valid research results. Furthermore, while the significant effects of the policies regarding board independence and experience were likely caused by methodological reasons, future research might want to further examine this. Namely, while improbable, examining whether firms with a policy regarding independence and experience make less or more efficient choices regarding innovation could be interesting. For example, future research could explore a question like ‘How do policies regarding board independence and experience affect the long-term firm performance of firms in the technology industry?’

## 6 Conclusion

The analysis confirmed that firm innovation generally positively affects firm performance. However, this effect was not statistically significant and can therefore not be assumed, leading to the rejection of H1. In contrast to research on the subject, this relationship was non-significant and therefore non-existent in the scope of this study. Accordingly, the moderating effects were also non-significant and therefore non-existent in the scope of this study, thereby rejecting H2-H4. However, board experience was found to have a direct effect on firm performance. Also, the control variable Industry was found to be influential, highlighting the importance of industry context in understanding firm performance in the Asian Tigers.

Considering these results, the answer to the research question would be that the relationship between a firm's level of innovation and the performance of firms in the Asian Tigers is not influenced by the quality of these firms' corporate governance. However, further research should consider different measurement methods and further explore the effect of policies regarding board experience and the types of industries in this context.

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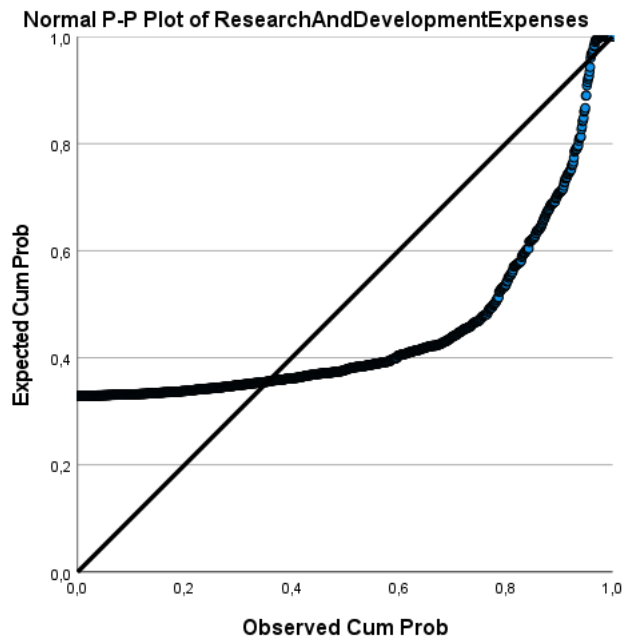
## 8 Appendices

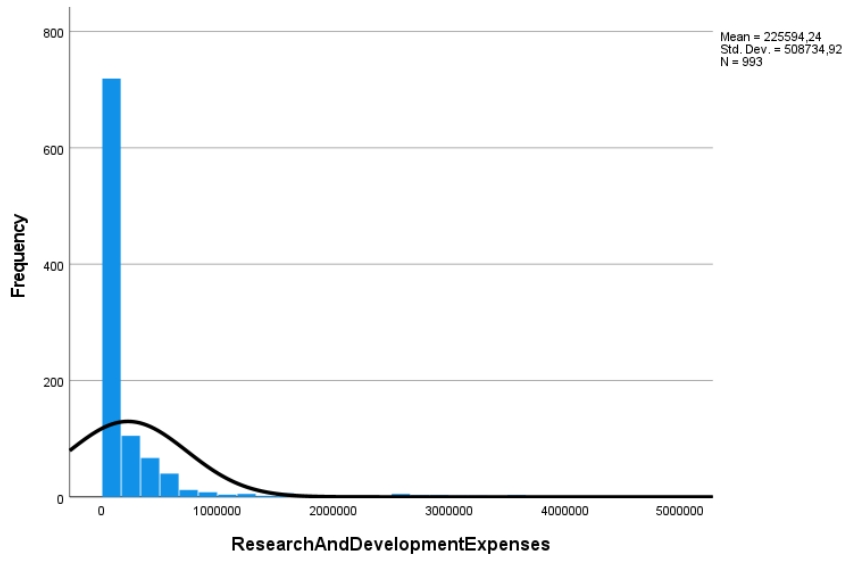
### 8.1 Initial descriptive statistics continuous variables

	N	Min.	Max.	Mean	SD	Skewness	Kurtosis
ROA		-115.340	65.530	5.517	8.164	-2.778	51.622
R&D expenses		1	19765938	321049.64	1274791.841	11.360	151.553
Employees		23	1290000	25115.57	88277.856	11.980	164.823
Valid N	1020						

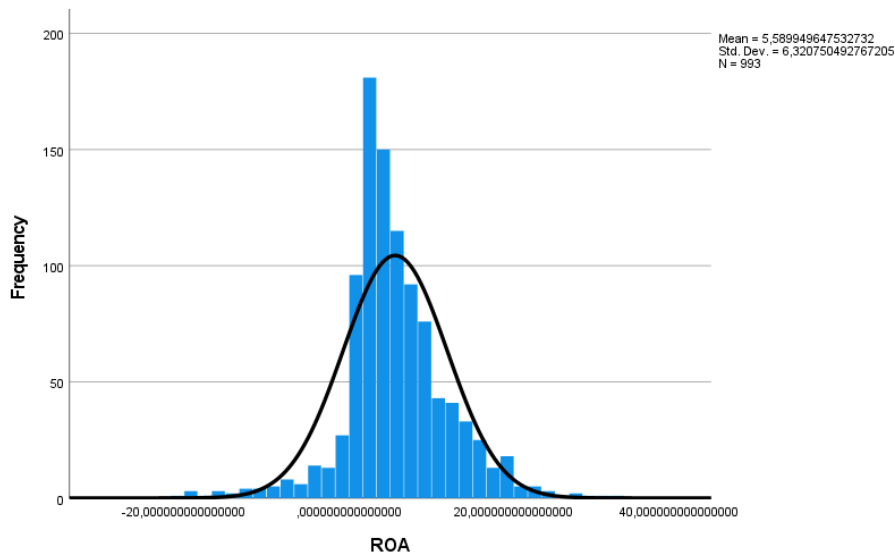
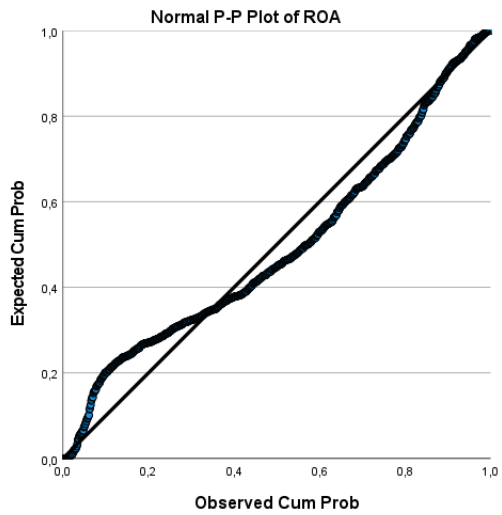
### 8.2 Initial P-P plots and histograms of continuous variables

#### 8.2.1 Research and Development Expenses

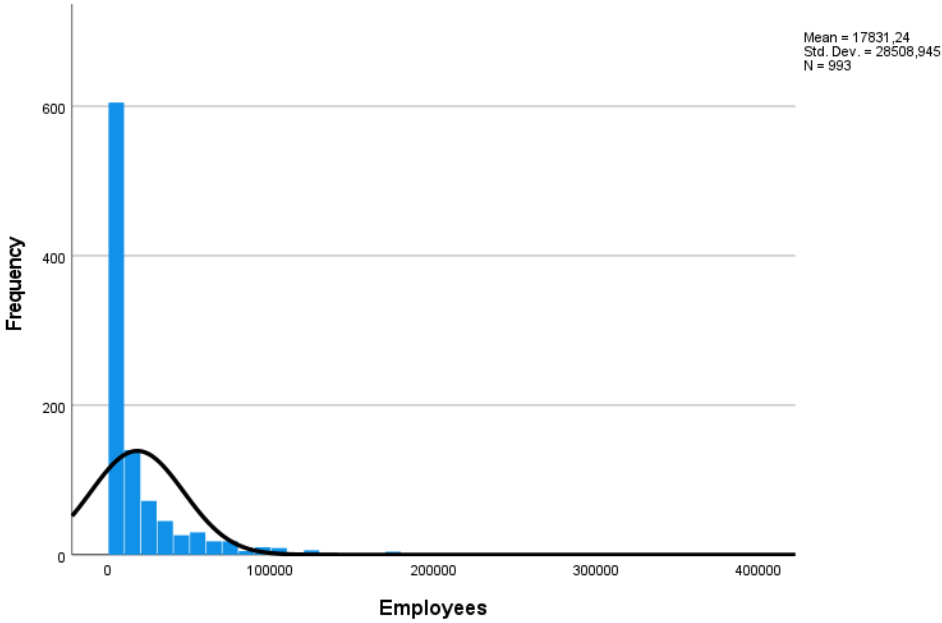
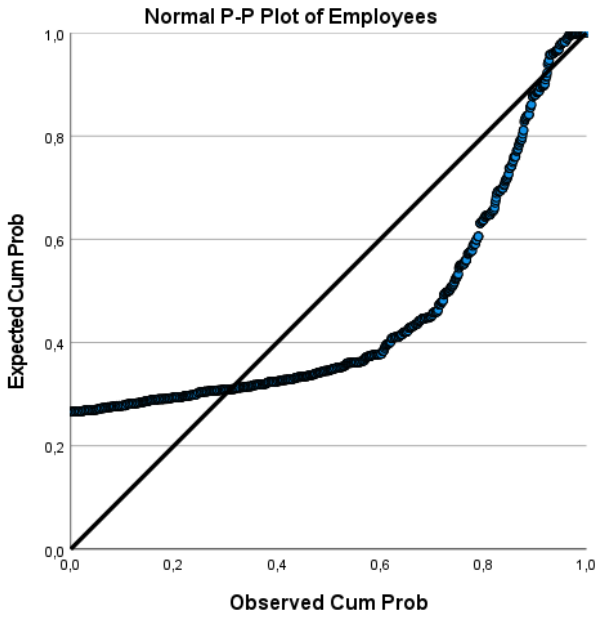




### 8.2.2 ROA

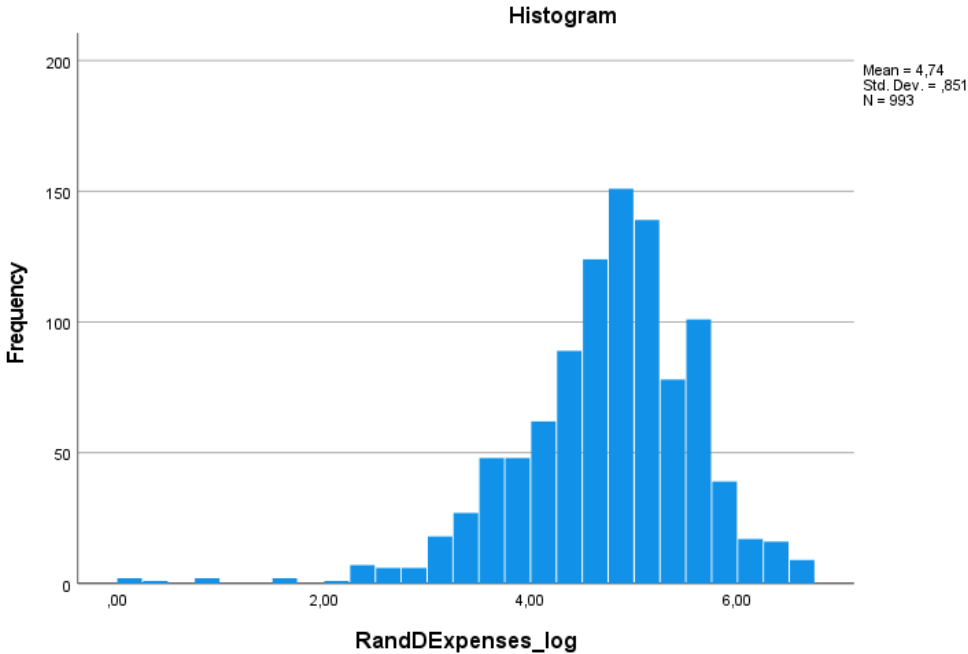
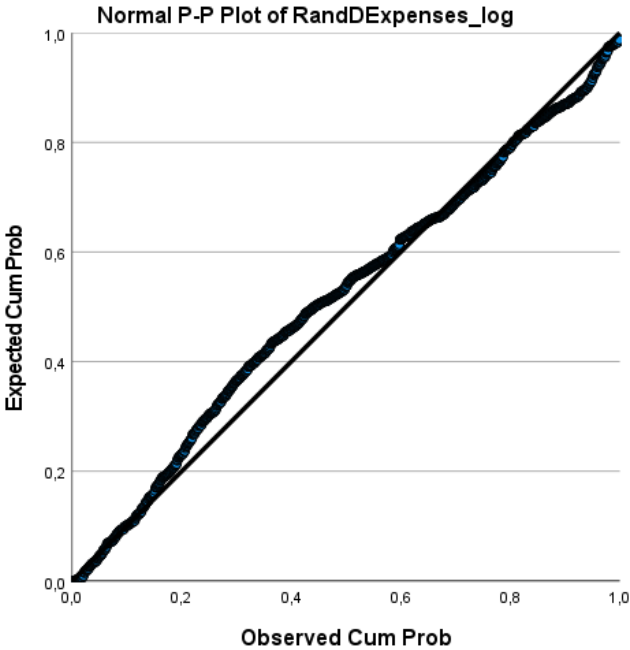


8.2.3 Employees

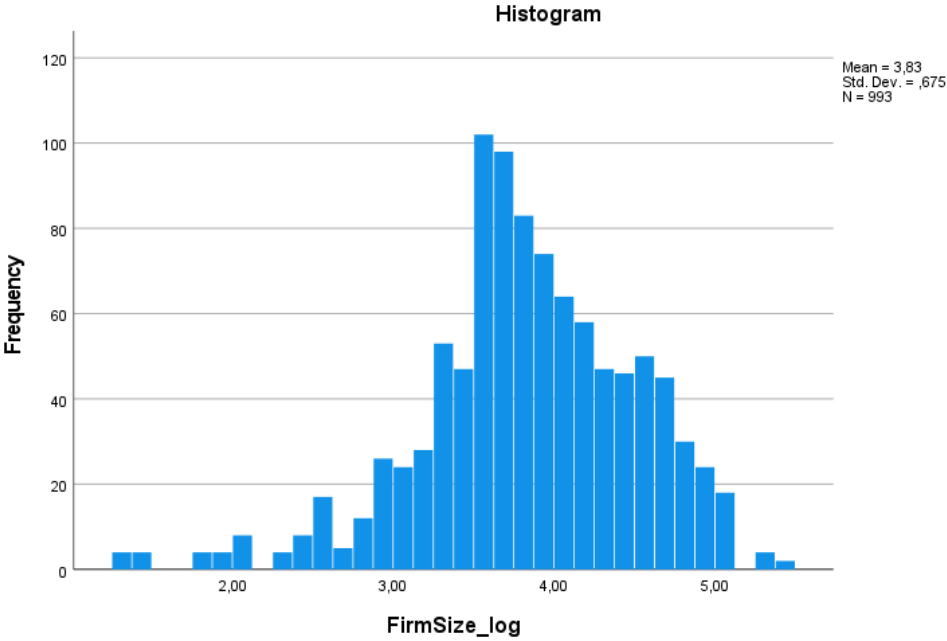
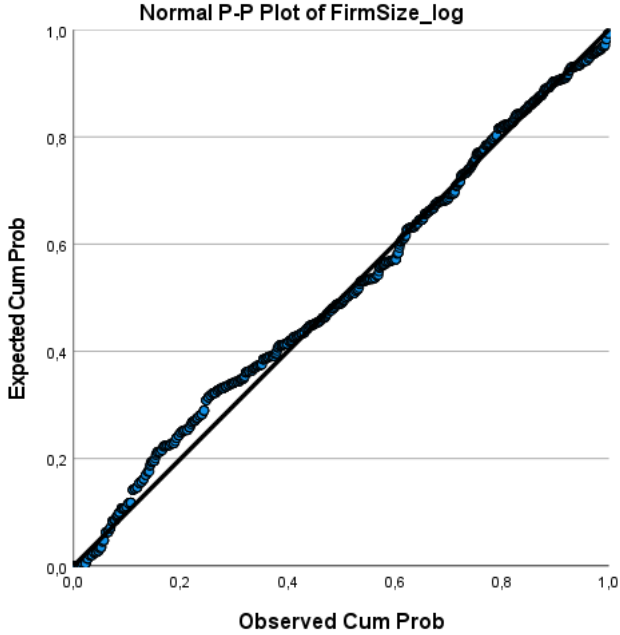


8.3 P-P plots and histograms after transformation

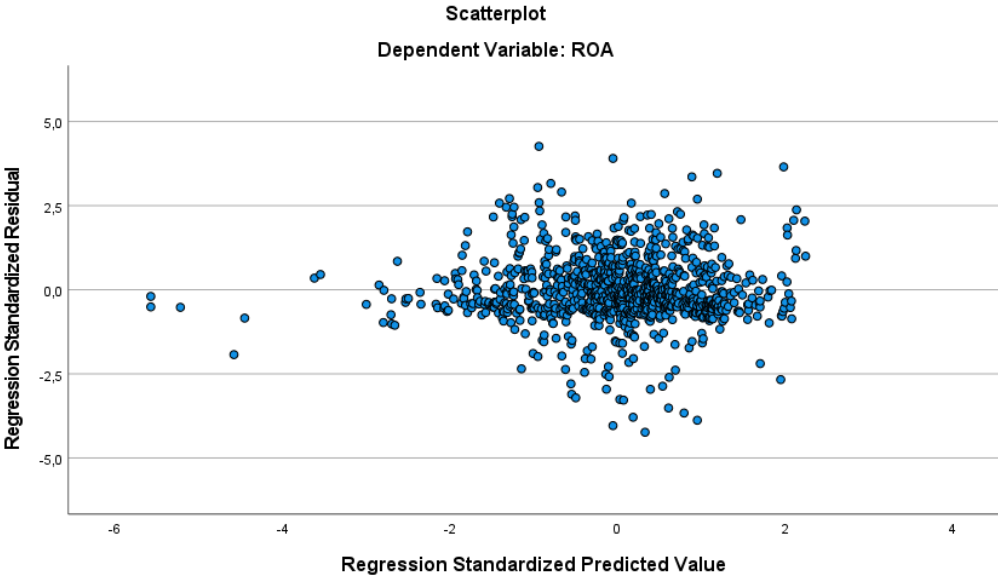
8.3.1 RandDExpenses\_log



8.3.2 FirmSize\_log



### 8.4 Regression standardized residuals scatterplot

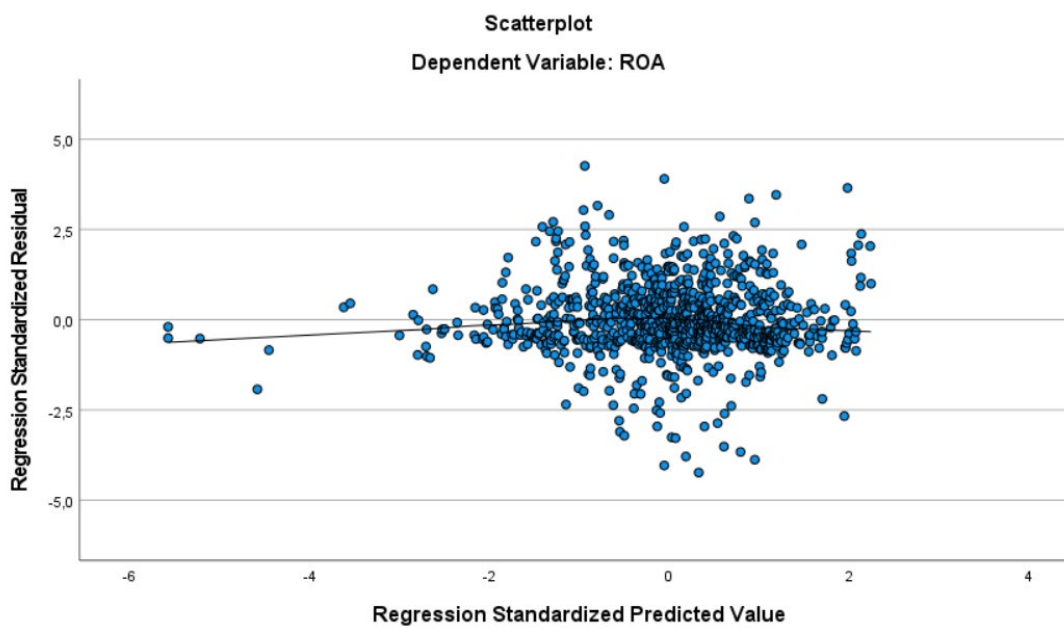


### 8.5 Breusch-Pagan test

Breusch Pagan test: ANOVA

	Sum of Squares	Df	Mean square	F	Sig.
Regression	2281.067	1	2281.067	.319	.573b
Residual	7096379.420	991	7160.827		
Total	7098660.487	992			

## 8.6 Residuals Scatterplot with Loess line



## 8.7 Multicollinearity

### Multicollinearity

	b	SE	Collinearity statistics	
			Tolerance	VIF
(Constant)	8.048***	1.619		
RandDExpenses_log	.018	.274	.720	1.389
PolicyBoardSize	.037	.551	.719	1.391
PolicyBoardInd	.154	.481	.734	1.363
PolicyBoardExperience	1.284**	.539	.720	1.388
FirmSize_log	-.653*	.347	.717	1.394
ConsumerCyclicals	-1.289*	.635	.726	1.377
Industrials	-2.433***	.621	.739	1.352
Healthcare	-1.981**	.832	.801	1.248
Utilities	-3.864***	1.333	.935	1.070
RealEstate	-3.506**	1.469	.920	1.087
Financials	-4.821**	2.244	.974	1.027
Energy	-2.424**	1.115	.902	1.109
ConsumerNonCyclicals	.239	.792	.742	1.347
BasicMaterials	-1.253	.798	.794	1.259

Legend: \* $p < 0,05$ , \*\* $p < 0,01$ , \*\*\* $p <$

## 8.8 Durbin Watson test

Durbin Watson test

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Durbin-Watson
1	.204a	.042	.028	1.992

- a. Predictors: (Constant), BasicMaterials, PolicyBoardExperience, Financials, RealEstate, Utilities, Energy, R&D, Healthcare, ConsumerCyclicals, ConsumerNonCyclicals, PolicyBoardSize, PolicyBoardIndependence, FirmSize\_log
- b. Dependent variable: ROA

## 8.9 Regression analysis

### 8.9.1 Model 1

Variables	b	SE
(Constant)	8.173***	1.314
FirmSize_log	-.369	.311
ConsumerCyclicals	-1.414**	.608
Industrials	-2.469***	.606
Healthcare	-1.973**	.826
Utilities	-3.717***	1.326
RealEstate	-3.469**	1.442
Financials	-5.148**	2.237
Energy	-2.163*	1.104
ConsumerNonCyclicals	-.063	.742
BasicMaterials	-1.224	.780

Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

## 8.9.2 Model 2

Variables	b	SE
(Constant)	7.870***	1.610
RandDExpenses_log	.089	.273
FirmSize_log	-.407	.333
ConsumerCyclicals	-1.357**	.633
Industrials	-2.430***	.618
Healthcare	-1.965**	.827
Utilities	-3.686***	1.330
RealEstate	-3.430**	.018
Financials	-5.181**	2.240
Energy	-2.151*	1.105
ConsumerNonCyclicals	.009	.775
BasicMaterials	-1.176	.794

*Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$*

### 8.9.3 Model 3

Variables	b	SE
(Constant)	4.850**	2.269
RandDExpenses_log	.680	.428
PolicyBoardSize	4.862**	2.425
Interaction_BoardSize	-.951*	.523
FirmSize_log	-.399	.344
ConsumerCyclicals	-1.374**	.634
Industrials	-2.571***	.628
Healthcare	-2.023**	.829
Utilities	-3.815***	1.330
RealEstate	-3.393**	1.450
Financials	-5.038**	2.240
Energy	-2.283**	1.107
ConsumerNonCyclicals	.186	.786
BasicMaterials	-1.217	.798

*Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$*

*R<sup>2</sup>: .037*

*Adjusted R<sup>2</sup>: .024*

## 8.9.4 Model 4

### Regression Model 4

Variables	b	SE
(Constant)	5.012**	2.055
RandDExpenses_log	.652*	.387
PolicyBoardInd	5.424**	2.329
Interaction_BoardIndependence	-1.046**	.492
FirmSize_log	-.417	.335
ConsumerCyclicals	-1.285**	.635
Industrials	-2.571***	.628
Healthcare	-1.965**	.832
Utilities	-3.657***	1.329
RealEstate	-3.567**	1.474
Financials	-5.192**	2.242
Energy	-2.077*	1.104
ConsumerNonCyclicals	.226	.788
BasicMaterials	-1.206	.794

Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

$R^2$ : .039

Adjusted  $R^2$ : .026

### Confounding Effect Test

Variables	b	SE
(Constant)	3.365***	.154
PolicyBoardIndependence	.086*	.051
FirmSize_log	.426***	.037
ConsumerCyclicals	-.627***	.071
Industrials	-.426***	.071
Healthcare	-.070	.097
Utilities	-.333**	.155
RealEstate	-.388**	.170
Financials	.392	.261
Energy	-.117	.129
ConsumerNonCyclicals	-.775***	.089
BasicMaterials	-.524	.091

Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

## 8.9.5 Model 5

Variables	b	SE
(Constant)	5.168**	2.185
RandDExpenses_log	.611	.404
PolicyBoardExperience	5.887**	2.337
Interaction_BoardExperience	-.994**	.501
FirmSize_log	-.550	.346
ConsumerCyclicals	-1.337**	.630
Industrials	-2.575***	.618
Healthcare	-2.058**	.824
Utilities	-3.986***	1.326
RealEstate	-3.517**	1.442
Financials	-5.007**	2.234
Energy	-2.451**	1.105
ConsumerNonCyclicals	.290	.775
BasicMaterials	-1.267	.791

Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

$R^2$ : .044

Adjusted  $R^2$ : .031

## Confounding Effect Test

Variables	b	SE
(Constant)	3.397***	.153
PolicyBoardExperience	.162***	.057
FirmSize_log	.403***	.038
ConsumerCyclicals	-.631***	.071
Industrials	-.439***	.070
Healthcare	-.093	.096
Utilities	-.370**	.154
RealEstate	-.449***	.168
Financials	.401	.260
Energy	-.165	.129
ConsumerNonCyclicals	-.779***	.087
BasicMaterials	-.540	.091

Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

### 8.9.6 Model 6

Variables	b	SE
(Constant)	3.934	2.465
RandDExpenses_log	.874*	.471
PolicyBoardSize	.928	3.326
PolicyBoardInd	2.705	3.254
PolicyBoardExperience	4.394*	2.624
FirmSize_log	-.524	.352
ConsumerCyclicals	-1.332**	.636
Industrials	-2.679***	.632
Healthcare	-2.097**	.833
Utilities	-3.974***	1.334
RealEstate	-3.700**	1.487
Financials	-4.974**	2.251
Energy	-2.404**	1.115
ConsumerNonCyclicals	.300	.793
BasicMaterials	-1.326*	.800
Interaction_BoardSize	-.224	.699
Interaction_BoardIndependence	-.544	.675
Interaction_BoardExperience	-.688	.558

*Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$*

*R<sup>2</sup>: .050*

*Adjusted R<sup>2</sup>: .033*

### 8.9.7 Model 7

Without sheaf:

Variables	b	SE
(Constant)	8.048***	1.619
RandDExpenses_log	.018	.274
PolicyBoardSize	.037	.551
PolicyBoardInd	.154	.481
PolicyBoardExperience	1.284**	.539
FirmSize_log	-.653*	.347
ConsumerCyclicals	-1.289**	.635
Industrials	-2.433***	.621
Healthcare	-1.981**	.832
Utilities	-3.864***	1.333
RealEstate	-3.506**	1.469
Financials	-4.821**	2.244
Energy	-2.424**	1.115
ConsumerNonCyclicals	.239	.792
BasicMaterials	-1.253	.798

Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

With sheaf:

Variables	b	SE
(Constant)	8.049***	1.417
RandDExpenses_log	.018	.255
PolicyBoardSize	.037	.540
PolicyBoardInd	.154	.471
PolicyBoardExperience	1.284**	.531
FirmSize_log	-.653*	.334
Sheaf_Industry	1.000***	.171

Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

8.9.8 Model Comparison Test

Model Comparison Test

	R <sup>2</sup>	F Change	Sig.
Model 1	.003		
Model 2	.034		
Model Comparison Test		3.114	.001

8.10 Robustness checks

8.10.1 Without control variables

To check whether the control variables that were added to the analysis were relevant to this study. This is done to assess the impact of the used control variables on the findings. Comparing the model with and without helps solidify the consistency of the significance and coefficients, and comparing the R<sup>2</sup> gives more insight into the explanatory power of the models (Lu & White, 2014). The analysis in Model 3 was run again but this time without the inclusion of firm size and industry. Comparing the results of this analysis with that of the initial regression confirmed that adding the control variables to the model was beneficial to the results. Namely, the model without the control variables has an R<sup>2</sup> of .012 while the one with has an R<sup>2</sup> of .050. For example, in the model without control variables, the effect of experience is not significant while in the model where they are included it is significant. This thus shows that without adding the control variables the model’s explanatory power is only 1.2% while adding control variables increased this explanatory power to 5%, thereby allowing for more accurate results.

Variables	b	SE
(Constant)	1.632	2.027
RandDExpenses_log	.670	.452
PolicyBoardSize	.612	3.230
PolicyBoardInd	1.885	3.153
PolicyBoardExperience	4.194	2.570
Interaction_BoardSize	-.147	.676
Interaction_BoardIndependence	-.301	.652
Interaction_BoardExperience	-.701	.544

*Legend: \*  $p < .1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$*

*R<sup>2</sup>: .012*

*Adjusted R<sup>2</sup>: .005*

### 8.10.2 Different dependent variable

A way to check whether the results of this analysis were not dependent on the choice of dependent variable is by running the analysis again with an alternative proxy for firm performance (Lu & White, 2014). While this study made the choice to use the ROA to measure firm performance, ROE is only slightly different in its practicality (Xue et al., 2020). Therefore, the choice was made to run the analysis again and use the ROE as a proxy to check the robustness of the model. Doing this gives insight into whether the results of this analysis are coincidental or might be influenced by a specific choice of variable (Lu & White, 2014). Before running the analysis again, the assumptions of multiple regression were checked for this ROE variable. After deleting outliers all assumptions were met and the model was run again. Running this model showed that with ROE as a dependent variable the relationship between R&D spending and firm performance was positive and significant while it was not in the initial regression. Moreover, there was a change in the significance levels of the industries. Namely, the basic materials sector was now also significant while the real estate and financial sectors weren't significant anymore. Thus, now the real estate and financial sectors did not show a difference in ROE in comparison to technology while they did for ROA. Conversely, the basic materials sector now does show a significant difference in ROE compared to the technology sector while it did not for ROA. Despite these changes, the moderators were still not significant meaning they still do not influence the relationship between R&D spending

and firm performance. Thus, using ROE as a proxy does make the relationship between R&D spending and firm performance significant, indicating that R&D could have an effect on firm performance. However, this relationship is still not influenced by the moderating variables still only board experience has a direct effect on performance. Therefore, since most results stayed the same this check showed that the results were not only a coincidence caused by the choice of dependent variable but does suggest using ROE might be more beneficial for further research on R&D spending and firm performance.

Variables	b	SE
(Constant)	1.315	4.555
RandDExpenses_log	2.022**	.870
PolicyBoardSize	8.202	6.138
PolicyBoardInd	-3.153	6.008
PolicyBoardExperience	9.575**	4.844
FirmSize_log	-.146	.651
ConsumerCyclicals	-2.372**	1.180
Industrials	-5.139***	1.168
Healthcare	-5.615***	1.549
Utilities	-6.603***	2.461
RealEstate	-1.325	2.745
Financials	-2.903	4.154
Energy	-6.191***	2.059
ConsumerNonCyclicals	.093	1.467
BasicMaterials	-3.403**	.021
Interaction_BoardSize	-1.632	1.289
Interaction_BoardIndependence	.616	1.245
Interaction_BoardExperience	-1.539	1.031

*Legend: \* p < .1; \*\* p < 0.05; \*\*\* p < 0.01*

## 8.11 Assumptions

### 8.11.1 Normality

To conduct regression analysis the variables must be normally distributed which can be examined by looking at the distribution, skewness, and kurtosis of the variables (Hair et al., 2018). The steps taken in chapter 4.1 already showed a violation of normality and combatted this by creating the logarithmic functions `RandDExpenses_log` and `FirmSize_log`. Therefore, to make sure that the regression analysis complies with the assumption of normality, these newly created log variables are included in the analysis.

### 8.11.2 Homoscedasticity

Homoscedasticity refers to the fact that in regression analyses the error variance must be equally distributed (Field, 2018). To examine whether this assumption is met a scatterplot of the distribution of residuals was examined. While interpreting the scatterplot, found in Appendix 8.4, indicated homoscedasticity, additional testing was done to further ensure the assumption was met. Namely, the Breusch-Pagan test was conducted which tests the null hypothesis of homoscedasticity. This test, found in Appendix 8.5, resulted in a significance level of .573, meaning the assumption of homoscedasticity is met since a value of  $> 0.05$  means the hypothesis stating that there is homoscedasticity is accepted.

### 8.11.3 Linearity

This assumption of regression analysis is about the linearity between all the different variables and can be assessed through an analysis of residuals and partial regression plots (Hair et al., 2018). Therefore, residual plots, found in Appendix 8.4, were examined. An examination of these plots shows the residuals are evenly distributed around 0 and therefore indicates the assumption of linearity is met. To double check a Loess line was also added to the scatterplot which indeed showed linearity and can be found in Appendix 8.6.

### 8.11.4 Multicollinearity

The assumption of multicollinearity refers to the fact that each predicted value must be independent and not related to a different predictor in the model (Hair et al., 2018). Before, only the independent variable was examined but now the moderators and control variables will also be tested. To test for multicollinearity a regression was run and the resulting VIF values were examined. All VIF values, found in Appendix 8.7, were found to be  $< 5$  meaning

the assumption of multicollinearity is met will not decrease the total variance explained (Hair et al., 2018).

#### 8.11.5 Independence of error terms

The independence of error terms refers to the assumption that all observations must be uncorrelated with each other and can be tested through a Durbin-Watson test (Field, 2018). To have uncorrelated residuals the value of this test should be around 2 (Field, 2018; Hair et al., 2018). The test, found in Appendix 8.8, shows a value of 1.992 meaning that the assumption is met.

#### 8.12 Syntax

```
DATASET ACTIVATE DataSet1.
```

```
*Dummy coding*
```

```
RECODE SIC2numbers (53=1) (ELSE=0) INTO ConsumerCyclicals.
```

```
VARIABLE LABELS ConsumerCyclicals ' ConsumerCyclicals '.
```

```
RECODE SIC2numbers (52=1) (ELSE=0) INTO Industrials.
```

```
VARIABLE LABELS Industrials ' Industrials '.
```

```
RECODE SIC2numbers (56=1) (ELSE=0) INTO Healthcare.
```

```
VARIABLE LABELS Healthcare ' Healthcare '.
```

```
RECODE SIC2numbers (59=1) (ELSE=0) INTO Utilities.
```

```
VARIABLE LABELS Utilities ' Utilities '.
```

```
RECODE SIC2numbers (60=1) (ELSE=0) INTO RealEstate.
```

```
VARIABLE LABELS RealEstate ' RealEstate '.
```

```
RECODE SIC2numbers (55=1) (ELSE=0) INTO Financials.
```

```
VARIABLE LABELS Financials ' Financials '.
```

```
RECODE SIC2numbers (50=1) (ELSE=0) INTO Energy.
```

```
VARIABLE LABELS Energy ' Energy '.
```

```
RECODE SIC2numbers (54=1) (ELSE=0) INTO ConsumerNonCyclicals.
```

```

VARIABLE LABELS ConsumerNonCyclicals ' ConsumerNonCyclicals '.
RECODE SIC2numbers (51=1) (ELSE=0) INTO BasicMaterials.
VARIABLE LABELS BasicMaterials ' BasicMaterials '.
RECODE SIC2numbers (57=1) (ELSE=0) INTO Technology.
VARIABLE LABELS Technology ' Technology '.
RECODE PolicyBoardIndependence (Y=1) (ELSE=0) INTO PolicyBoardIndependence.
VARIABLE LABELS PolicyBoardIndependence ' PolicyBoardIndependence '.
RECODE PolicyBoardSize (Y=1) (ELSE=0) INTO PolicyBoardSize.
VARIABLE LABELS PolicyBoardSize ' PolicyBoardSize '.
RECODE PolicyBoardExperience (Y=1) (ELSE=0) INTO PolicyBoardExperience.
VARIABLE LABELS PolicyBoardExperience ' PolicyBoardExperience '.
*descriptives en outliers*.
DESCRIPTIVES VARIABLES=ROA ResearchAndDevelopmentExpenses Employees
  /STATISTICS=MEAN STDDEV MIN MAX KURTOSIS SKEWNESS.

FREQUENCIES VARIABLES=PolicyBoardInd PolicyBoardSize PolicyBoardExperience
Sector
  ResearchAndDevelopmentExpenses ROA Employees
  /ORDER=ANALYSIS.

* Custom Tables.
CTABLES
  /VLABELS VARIABLES=PolicyBoardInd PolicyBoardSize PolicyBoardExperience Sector
  DISPLAY=LABEL

```

```

/TABLE PolicyBoardInd [COUNT F40.0, COLPCT.COUNT PCT40.1] + PolicyBoardSize
[COUNT F40.0,

    COLPCT.COUNT PCT40.1] + PolicyBoardExperience [COUNT F40.0, COLPCT.COUNT
PCT40.1] + Sector [COUNT

    F40.0, COLPCT.COUNT PCT40.1]

/CATEGORIES VARIABLES=PolicyBoardInd PolicyBoardSize PolicyBoardExperience
Sector ORDER=A

KEY=VALUE EMPTY=EXCLUDE

/CRITERIA CILEVEL=95.

SELECT IF ZResearchAndDevelopmentExpenses < 3.3.

SELECT IF ZROA < 3.3.

SELECT IF ZEmployees < 3.3.

DATASET ACTIVATE DataSet2.

DESCRIPTIVES VARIABLES=ZResearchAndDevelopmentExpenses ZROA ZEmployees

/STATISTICS=MEAN MIN MAX.

SELECT IF ZResearchAndDevelopmentExpenses > -3.3.

SELECT IF ZROA > -3.3.

SELECT IF ZEmployees > -3.3.

DESCRIPTIVES VARIABLES=ResearchAndDevelopmentExpenses ROA Employees

/STATISTICS=MEAN MIN MAX KURTOSIS SKEWNESS.

PPLOT

```

```
/VARIABLES=ResearchAndDevelopmentExpenses ROA Employees
```

```
/NOLOG
```

```
/NOSTANDARDIZE
```

```
/TYPE=P-P
```

```
/FRACTION=BLOM
```

```
/TIES=MEAN
```

```
/DIST=NORMAL.
```

```
GRAPH
```

```
/HISTOGRAM(NORMAL)=ResearchAndDevelopmentExpenses.
```

```
GRAPH
```

```
/HISTOGRAM(NORMAL)=ROA.
```

```
GRAPH
```

```
/HISTOGRAM(NORMAL)=Employees.
```

```
COMPUTE RandDExpenses_log=LG10(ResearchAndDevelopmentExpenses).
```

```
EXECUTE.
```

```
EXAMINE VARIABLES=RandDExpenses_log
```

```
/PLOT BOXPLOT STEMLEAF HISTOGRAM NPLOT
```

```
/COMPARE GROUPS
```

```
/STATISTICS DESCRIPTIVES
```

/CINTERVAL 95

/MISSING LISTWISE

/NOTOTAL.

PLOT

/VARIABLES=RandDExpenses\_log

/NOLOG

/NOSTANDARDIZE

/TYPE=P-P

/FRACTION=BLOM

/TIES=MEAN

/DIST=NORMAL.

COMPUTE FirmSize\_log=LG10(Employees).

EXECUTE.

EXAMINE VARIABLES=FirmSize\_log

/PLOT BOXPLOT STEMLEAF HISTOGRAM NPLOT

/COMPARE GROUPS

/STATISTICS DESCRIPTIVES

/CINTERVAL 95

/MISSING LISTWISE

/NOTOTAL.

## PLOT

/VARIABLES=FirmSize\_log

/NOLOG

/NOSTANDARDIZE

/TYPE=P-P

/FRACTION=BLOM

/TIES=MEAN

/DIST=NORMAL.

DESCRIPTIVES VARIABLES=ResearchAndDevelopmentExpenses ROA Employees

/STATISTICS=MEAN MIN MAX KURTOSIS SKEWNESS.

DESCRIPTIVES VARIABLES=ROA FirmSize\_log RandDExpenses\_log

/STATISTICS=MEAN MIN MAX KURTOSIS SKEWNESS.

## REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log

/SCATTERPLOT=(\*ZRESID ,\*ZPRED)

/SAVE PRED RESID.

```
COMPUTE SquaredResiduals=RES_1*RES_1.
```

```
EXECUTE.
```

```
REGRESSION
```

```
/MISSING LISTWISE
```

```
/STATISTICS COEFF OUTS R ANOVA
```

```
/CRITERIA=PIN(.05) POUT(.10)
```

```
/NOORIGIN
```

```
/DEPENDENT SquaredResiduals
```

```
/METHOD=ENTER RandDExpenses_log
```

```
/SCATTERPLOT=(*ZRESID ,*ZPRED).
```

```
REGRESSION
```

```
/MISSING LISTWISE
```

```
/STATISTICS COEFF OUTS R ANOVA COLLIN TOL CHANGE
```

```
/CRITERIA=PIN(.05) POUT(.10)
```

```
/NOORIGIN
```

```
/DEPENDENT ROA
```

```
/METHOD=ENTER RandDExpenses_log PolicyBoardInd PolicyBoardSize  
PolicyBoardExperience FirmSize_log
```

```
BasicMaterials ConsumerNonCyclicals Energy Financials RealEstate Utilities Healthcare  
Industrials
```

```
ConsumerCyclicals
```

```
/SCATTERPLOT=(*ZRESID ,*ZPRED).
```

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA COLLIN TOL CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log PolicyBoardInd PolicyBoardSize  
PolicyBoardExperience FirmSize\_log

BasicMaterials ConsumerNonCyclicals Energy Financials RealEstate Utilities Healthcare  
Industrials

ConsumerCyclicals

/RESIDUALS= Durbin-Watson.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log PolicyBoardInd PolicyBoardSize  
PolicyBoardExperience

FirmSize\_log ConsumerCyclicals Industrials Healthcare Utilities RealEstate Financials  
Energy

ConsumerNonCyclicals BasicMaterials

/RESIDUALS DURBIN.

\*regressie echt uitvoeren hierna\*.

DATASET ACTIVATE DataSet1.

\*dit is nieuw model 1\*.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER FirmSize\_log ConsumerCyclicals Industrials

Healthcare Utilities RealEstate Financials Energy ConsumerNonCyclicals BasicMaterials.

\*dit is oud model 1 nieuw model 2\*.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log FirmSize\_log ConsumerCyclicals Industrials

Healthcare Utilities RealEstate Financials Energy ConsumerNonCyclicals BasicMaterials.

\*dit is nieuw model 3 test board size\*.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log PolicyBoardSize

FirmSize\_log ConsumerCyclicals Industrials Healthcare Utilities RealEstate Financials  
Energy

ConsumerNonCyclicals BasicMaterials.

\*model 3 met interactie\*.

COMPUTE Interaction\_BoardSize = PolicyBoardSize \* RandDExpenses\_log.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log PolicyBoardSize Interaction\_BoardSize

FirmSize\_log ConsumerCyclicals Industrials Healthcare Utilities RealEstate Financials  
Energy

ConsumerNonCyclicals BasicMaterials.

\*model 4 met interactie H3\*.

COMPUTE Interaction\_BoardIndependence = PolicyBoardInd \* RandDExpenses\_log.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log PolicyBoardInd Interaction\_BoardIndependence

FirmSize\_log ConsumerCyclicals Industrials Healthcare Utilities RealEstate Financials  
Energy

ConsumerNonCyclicals BasicMaterials.

\*model 5 met interactie H4\*.

COMPUTE Interaction\_BoardExperience = PolicyBoardExperience \* RandDExpenses\_log.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log PolicyBoardExperience  
Interaction\_BoardExperience

FirmSize\_log ConsumerCyclicals Industrials Healthcare Utilities RealEstate Financials  
Energy

ConsumerNonCyclicals BasicMaterials.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log PolicyBoardSize PolicyBoardInd  
PolicyBoardExperience

FirmSize\_log ConsumerCyclicals Industrials Healthcare Utilities RealEstate Financials  
Energy

ConsumerNonCyclicals BasicMaterials.

COMPUTE Sheaf\_Industry = (-1.289 \* ConsumerCyclicals) + (-2.433 \* Industrials) +

(-1.981 \* Healthcare) + (-3.864 \* Utilities) + (-3.506 \* RealEstate) + (-4.821 \* Financials)  
+ (-2.424 \* Energy) + (.239 \* ConsumerNonCyclicals) + (-1.253 \* BasicMaterials).

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log PolicyBoardSize PolicyBoardInd  
PolicyBoardExperience

FirmSize\_log Sheaf\_Industry.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA CHANGE

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER ResearchAndDevelopmentExpenses FirmSize\_log

/METHOD=ENTER RandDExpenses\_log FirmSize\_log ConsumerCyclicals Industrials  
Healthcare Utilities

RealEstate Financials Energy ConsumerNonCyclicals BasicMaterials.

COMPUTE Interaction\_BoardSize = PolicyBoardSize \* RandDExpenses\_log.

COMPUTE Interaction\_BoardIndependence = PolicyBoardInd \* RandDExpenses\_log.

COMPUTE Interaction\_BoardExperience = PolicyBoardExperience \* RandDExpenses\_log.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROA

/METHOD=ENTER RandDExpenses\_log PolicyBoardInd PolicyBoardSize  
PolicyBoardExperience FirmSize\_log

ConsumerCyclicals Industrials Healthcare Utilities RealEstate Financials Energy

ConsumerNonCyclicals BasicMaterials Interaction\_BoardSize  
Interaction\_BoardIndependence

Interaction\_BoardExperience.

\*robustness check\*.

DATASET ACTIVATE DataSet1.

DESCRIPTIVES VARIABLES=ROE

/SAVE

/STATISTICS=MEAN STDDEV MIN MAX.

SELECT IF ZROE < 3.3.

SELECT IF ZROE > -3.3.

GRAPH

/HISTOGRAM(NORMAL)=ROE.

PLOT

/VARIABLES= ROE

/NOLOG

/NOSTANDARDIZE

/TYPE=P-P

/FRACTION=BLOM

/TIES=MEAN

/DIST=NORMAL.

REGRESSION

/MISSING LISTWISE

/STATISTICS COEFF OUTS R ANOVA COLLIN TOL

/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT ROE

```
/METHOD=ENTER RandDExpenses_log PolicyBoardInd PolicyBoardSize  
PolicyBoardExperience FirmSize_log
```

```
ConsumerCyclicals Industrials Healthcare Utilities RealEstate Financials Energy
```

```
ConsumerNonCyclicals BasicMaterials
```

```
/SCATTERPLOT=(*ZRESID ,*ZPRED).
```

```
REGRESSION
```

```
/MISSING LISTWISE
```

```
/STATISTICS COEFF OUTS R ANOVA
```

```
/CRITERIA=PIN(.05) POUT(.10)
```

```
/NOORIGIN
```

```
/DEPENDENT ROE
```

```
/METHOD=ENTER RandDExpenses_log PolicyBoardInd PolicyBoardSize  
PolicyBoardExperience FirmSize_log
```

```
ConsumerCyclicals Industrials Healthcare Utilities RealEstate Financials Energy
```

```
ConsumerNonCyclicals BasicMaterials Interaction_BoardSize  
Interaction_BoardIndependence
```

```
Interaction_BoardExperience.
```

```
*2e robustness check nu niet controlen*.
```

```
REGRESSION
```

```
/MISSING LISTWISE
```

```
/STATISTICS COEFF OUTS R ANOVA
```

```
/CRITERIA=PIN(.05) POUT(.10)
```

```
/NOORIGIN
```

```
/DEPENDENT ROA
```

/METHOD=ENTER RandDExpenses\_log PolicyBoardInd PolicyBoardSize  
PolicyBoardExperience

Interaction\_BoardSize Interaction\_BoardIndependence

Interaction\_BoardExperience.

### 8.13 Research integrity form

#### Research Integrity Form – Master thesis

Name: Kirsty Oort	Student number: s1054840
RU e-mail address: Kirsty.oort@ru.nl	Master specialization: International Business

Thesis title: Examining the engine of growth

Brief description of the study:

This study investigated the relationship between a firm's level of innovation and its performance, and how this relationship is influenced by the quality of corporate governance. This was done in the context of the Asian Tigers (Hong Kong, Singapore, South Korea, and Taiwan). This was done by conducting a multiple regression analysis on 257 firms in the Asian Tigers. The results imply that the quality of a firm's corporate governance does not influence the relationship between innovation and firm performance of firms in the Asian Tigers. The study highlights the direct impact of a policy regarding board experience, the importance the industry context, and offers information that is relevant for examining investment decisions. The study suggests further research should focus on refining measurement methods and further explore policy implications related to corporate governance and innovation in complex economies like the Asian Tigers.

It is my responsibility to follow the university's code of academic integrity and any relevant academic or professional guidelines in the conduct of my study. This includes:

- providing original work or proper use of references;
- providing appropriate information to all involved in my study;
- requesting informed consent from participants;

- transparency in the way data is processed and represented;
- ensuring confidentiality in the storage and use of data;

If there is any significant change in the question, design or conduct over the course of the research, I will complete another Research Integrity Form.

Breaches of the code of conduct with respect to academic integrity (as described / referred to in the thesis handbook) should and will be forwarded to the examination board. Acting contrary to the code of conduct can result in declaring the thesis invalid.

Student's Signature:  Date: 17/06/2024

**To be signed by supervisor**

I have instructed the student about ethical issues related to their specific study. I hereby declare that I will challenge him / her on ethical aspects through their investigation and to act on any violations that I may encounter.

Supervisor's Signature: \_\_\_\_\_ Date:

8.14 Consent form repository

**Rights and duties of the user**

Because of this consent form a user of the theses repository may use the thesis for private study and/or educational and research purposes, in accordance with the provisions of the Copyright Act (Auteurswet), with full mention of the name of the student and the location of the thesis.

Student number : s1054840

Student name: Kirsty Oort

Thesis title: Examining the engine of growth

- ✓ Yes, I grant permission to make available my thesis with the above title in

the Radboud thesis Repository.

Signature:

A handwritten signature in black ink, appearing to be 'Kha' or similar, written in a cursive style.

Date: 17/06/2024