Internal vs. external executive board composition and firm performance during crisis situations

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Abstract

This thesis investigates the relationship between leadership origin, board composition, and firm performance in German listed companies, focusing on the pre-crisis year 2019 and the Covid-19 crisis year 2020. Using a balanced quarterly panel of 122 firms, the study examines whether internally appointed CEOs and executives outperform external appointees and whether such effects are moderated by liquidity reserves, gender diversity, and ownership structure. Performance is measured via industry-demeaned Return on Assets (ROA) and Tobin's Q, with controls for firm, industry, and time effects.

The findings show no consistent performance premium for internally appointed CEOs in Germany, in contrast to evidence from U.S. one-tier systems. However, a higher proportion of internally promoted executives on the management board is positively associated with ROA across both years, suggesting that collective internal continuity matters more than CEO origin alone. This effect does not strengthen during the crisis, and high cash holdings, female representation, and the strongest investor presence show limited or context-specific performance impacts.

These results underscore the role of institutional context in shaping leadership-performance dynamics. In Germany's stakeholder-oriented, two-tier governance system, the advantages of internal leadership appear steady over time rather than crisis-dependent, with implications for succession planning and governance strategy.

Keywords: CEO origin, internal promotion, corporate governance, two-tier board system, firm performance, crisis management, Covid-19, German listed firms.

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Esta dissertação investiga a relação entre a origem da liderança, a composição do conselho executivo e o desempenho de empresas listadas na Alemanha, com foco no ano pré-crise de 2019 e no ano da Covid-19 em 2020. Utilizando um painel trimestral balanceado de 122 empresas, o estudo examina se CEOs e executivos nomeados internamente apresentam desempenho superior a nomeações externas e se tais efeitos são moderados por liquidez, diversidade de gênero e estrutura acionária. O desempenho é medido pelo Retorno sobre Ativos (ROA) ajustado por setor e pelo Q de Tobin, com controles para efeitos de empresa, setor e tempo.

Os resultados não evidenciam prêmio de desempenho consistente para CEOs nomeados internamente na Alemanha, em contraste com evidências observadas em sistemas unitários (one-tier) nos Estados Unidos. No entanto, maior proporção de executivos promovidos internamente no conselho executivo está positivamente associada ao ROA em ambos os anos, sugerindo que a continuidade coletiva importa mais do que a origem do CEO isoladamente. Esse efeito não se intensifica durante a crise, e altos níveis de caixa, representação feminina e a presença de um investidor majoritário apresentam impactos limitados ou dependentes do contexto.

Esses resultados destacam o papel do contexto institucional na relação entre liderança e desempenho. No sistema de governança dual alemão, orientado para stakeholders, as vantagens da liderança interna parecem estáveis ao longo do tempo, em vez de dependentes de crises, trazendo implicações para o planejamento sucessório e a estratégia de governança.

Palavras-chave: origem do CEO, promoção interna, governança corporativa, sistema de conselho dual, desempenho empresarial, gestão de crises, Covid-19, empresas listadas na Alemanha.

Título: Composição interna vs. externa do conselho executivo e desempenho da empresa em situações de crise

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Table of Contents

List of Figures

List of Tables

List of Abbreviations

Abbreviation	Meaning
CEO	Chief Executive Officer
CI	Confidence Interval
DAX	German stock Index (Deutscher Aktien Index)
FE	Fixed effect Model
GICS	Global Industry Classification Standard
MDAX	Mid cap German stock index
NACE	Statistical Classification of Economic Activities in the European Community
Obs.	Observations
RE	Random Effect Model
RBV	Resource Based View
ROA	Return on Assets
SD	Standard Deviation
SDAX	Small cap German stock index
TMT	Top Management Team
UET	Upper Echelons Theory
VP	Vice President

1 Introduction

Crisis situations like the Covid-19 pandemic have tested the resilience of corporate governance systems around the world as firms are forced to react to new operational, financial, and strategic challenges imposed by exogenous shocks (Golubeva, 2021). Leadership competencies and decision-making skills are essential during crises, helping to navigate uncertain and volatile market conditions, sudden shifts in demand, or supply chain disruptions (Pearson & Clair, 1998). While exogenous shocks often accelerate changes in strategy, they also stress test leaders and firms' adaptability and stability (Groh, 2014). Besides these capabilities and characteristics of the top management team (TMT), a major role in the success during a crisis is the composition of the TMT, in particular, the origin of the Chief Executive Officer (CEO) and other executive management board members (Hambrick & Mason, 1984).

The origin of the leadership team, defined as whether an individual has been promoted internally within the firm or hired externally from another firm, influences firm performance through various mediating mechanisms (Zhang & Rajagopalan, 2004). Internally appointed executives inhabit a deepened firm-specific knowledge that has been established over an extensive period within the organisation. This allows a precise understanding of operational processes and unique value propositions (Harris & Helfat, 1997). While these attributes and advantages may provide stability and allow for immediate and coordinated responses, external hires can provide a fresh perspective, disrupting problematic routines, introducing experience from other organisational backgrounds and contexts (Zhang & Rajagopalan, 2004). These qualities may benefit firms during uncertain environments. Determining which leadership origin effect leads to better performance during crises is important, both from a theoretical and a practical perspective.

Prior research in the U.S. suggests that CEOs who have been promoted internally tend to provide better firm performance than their external counterparts during a crisis. Haque et al.'s (2022) research provides a significant positive correlation between internal CEOs and firm performance during the Covid-19 pandemic. This study focuses on the U.S., which is known for its one-tier board system. The U.S. corporate governance system is characterised by its high concentration of executive power in the role of the CEO (Adams et al., 2010). Whether the result of Haque et al. (2022) is unify applicable for all different corporate governance systems, such as the German corporate governance system, dividing executive and supervisory power in a two-tier board system, as well as dividing executive power between multiple executives, remains to be analysed.

The German corporate governance system features specific arrangements, including codetermination laws, mandatory supervisory boards, and a stronger emphasis on stakeholder interests compared to the corporate governance system in the U.S., which focuses on shareholder interests (Porter et al., 2003). These features may moderate the relationship between leadership origin and firm performance, particularly during crises. Additionally, Germany's more conservative financial policies and its coordinated policy response to the pandemic, such as the "Kurzarbeit" short-time work program to avoid lay-offs, could have reduced performance volatility and therefore reduced any potential crisis-specific advantages of internal leadership (Fitzenberger et al., 2023).

This thesis examines these issues by analysing a balanced quarterly panel of 122 publicly listed German firms over 2019–2020, yielding 976 firm-quarter observations and spanning both pre-crisis and crisis phases of the Covid-19 pandemic. The primary objective is to investigate the relationship between leadership origin and firm performance within the institutional framework of the German two-tier governance system, including whether internally appointed executives provide measurable advantages over external appointments. Building on Haque et al. (2022), the study uses Return on Assets (ROA) and Tobin's Q as key performance indicators, lagged and industry-demeaned to reflect relative performance. It incorporates leadership composition, female representation, financial flexibility, and relevant firm- and board-level controls. Regression models are estimated with firm, industry, and time fixed effects, alongside robustness checks such as winsorization and fixed-versus-random-effects comparisons. This approach allows to test whether the benefits of firm-specific knowledge attributed to internal executives (Barney, 1991; Hambrick & Mason, 1984) have different effects under normal conditions and during the exogenous shock of the pandemic.

A further goal is to explore the influence of additional board characteristics, such as the proportion of female executives on the executive board and the ownership concentration in interaction with executive origin, on firm performance. The combination of these variables into an integrated framework provides a more comprehensive understanding of the effect of executive origin and institutional and situational factors on accounting-based and market-based performance metrics. This approach allows for the identification of patterns that may be hidden when leadership origin is studied in isolation, especially in environments with strong structural limits on executive decision-making.

Building on this perspective, the study follows a set of clear research questions aimed at understanding how leadership origin can affect firm performance in the specific context of the German corporate governance system. The key research question is therefore whether the origin of a CEO or the proportion of origin of the whole executive board is associated with firm performance, and if this relationship is influenced by the presence of a crisis. Following both origin measurements,

the CEO as a sole leader but also the executive board, allows for a comparison of results with recent research, such as Haque et al. (2022) study in the U.S., while also adjusting the research approach to the corporate governance system in Germany.

In addition to the leadership origin, the study analyses mediating factors that may influence these effects. These mediating factors are high liquidity reserves in crisis periods, the influence of ownership concentration on the executive board composition, and the impact of gender diversity of the executive board on firm performance, also in consideration of the board's origin. By combining these questions and hypotheses, the study creates a framework for exploring leadership composition in Germany's two-tier governance system, with its different characteristics from the one-tier, shareholder-focused structures. This approach does not just add to the conversation about leadership and performance but also opens the discussion up to comparisons with other countries and corporate governance systems.

This thesis provides three key contributions. First, it extends the literature on leadership origin by testing findings from research on U.S. data in the German two-tier governance context. It thereby highlights the influence of institutional settings on leadership effects. Second, it provides a more holistic view of the leadership topic by analysing the executive board composition rather than the focus on the CEO alone. Third, it adds additional aspects into the leadership consideration, such as gender diversity, firm-specific aspects like liquidity, and ownership concentration, as potential performance moderating characteristics. This allows for a multidimensional perspective on leadership effects.

Practical implications are new insights for boards, investors, and policymakers. Potential benefits and limitations of internal promotions, the board composition effect during crises, and the results of mediating factors may or may not result in performance gains. These findings can support supervisory boards in designing more effective succession planning processes. Results can also support supervisory boards in aligning leadership selection with long-term strategic objectives rather than short-term pressures. For policymakers, the results also provide guidance on how institutional arrangements, such as diversity quotas or codetermination laws, interact with leadership origin to shape firm resilience and performance.

The remainder of this thesis is structured as follows. The literature review analyses prior research on relevant topics such as CEO succession, executive board composition, and firm performance, with attention to leadership in crisis contexts and institutional differences between governance systems. In the hypothesis development, based on the theoretical foundations, testable hypotheses are formulated

regarding the impact of leadership origin, board composition, and contextual factors on firm performance. The Methodology section focuses on introducing the data set used, explaining relevant variables and their respective definition, and outlining the analytical strategy. The Results section examines the evidence in detail, beginning with descriptive statistics and visual trends of the data set before moving to regression analyses suited to each hypothesis. In the Discussion, findings of the result part are interpreted in the context of theory and empirical work, with a focus on potential implications for theory and practice. The thesis ends with the Conclusion, which summarises the key contributions identified, reflects on the study's limitations, and identifies directions for future research on leadership composition and organisational resilience.

2 Literature Review

The goal of this literature review is to synthesise research on the relationship between executive board composition and firm performance, with a focus on how these relationships are influenced during crises. Based on foundational theories and contemporary empirical evidence, this literature review will focus on the theoretical foundations of Upper Echelons Theory (UET), the resource-based view (RBV), and agency theory. This is followed by a research review on executive succession dynamics, the role of leadership during crisis, and the context of ownership and governance structures. In the end, this review will identify key research gaps that this thesis aims to address through providing an addition for understanding the impact of executive origin on firm performance and crisis resilience.

2.1 Upper Echelons Theory

Through the Upper Echelons Theory (UET), Hambrick and Mason (1984) introduced a foundational perspective in strategic management, stating that both organisational strategic choices and firm performance are consequences of the values, cognitive bases, and experiences of the firm's top managers. The theory is built on the concept of bounded rationality, suggesting that complex and uncertain strategic situations are interpreted through the personal lens of top executives rather than objectively (Plöckinger et al., 2016). Therefore, to understand why organisations behave in certain ways in situations as they do, it is important to consider potential biases and experiences of their top executives (Hambrick, 2007). This perspective highlights that executives act based on their personal

preferences, experiences, and interpretations of strategic situations and that these actions are a function of their individual, unique values and personalities (Hambrick, 2007).

The core idea of UET stresses that the individual-specific knowledge, experience, values, and pretences of top managers significantly influence their analyses and assessment of environmental situations and therefore influence the strategic decisions they take (Sosik et al., 2012). Their individual characteristics are seen as a direct lever for strategic choices and firm performance or organisational outcomes (Wang et al., 2016). Studies have shown that CEO characteristics, including metrics like tenure, education, and experience, are significantly related to firm strategic actions and subsequently firm performance (Wang et al., 2016). The UET suggests, as an example, that a CEO's background in operations might lead to a cost reduction strategy, or long experience and tenure in one industry results in hesitance to diversify from that industry and its norms (Hambrick & Mason, 1984). Besides demographics also psychological attributes or personal traits, such as overconfidence or narcissism, and their potential influence on financial reporting or firm strategy have been analysed (Ting et al., 2015).

While UET focused initially on the collective attributes of the TMT, a growing recognition of the unique and disproportional influence of the CEO as the leader and "integrator" of the executive arises (Georgakakis et al., 2017). Research focus has shifted to the exploration of the CEO-TMT interface, recognising that power is not always equally distributed within the leadership structure and a dominant position of the CEO's role may be crucial in shaping TMT composition and influencing strategic outcomes (Buyl et al., 2011). The performance effect of knowledge-based TMT fault lines, the alignment of team members' experiential characteristics that splits the team into homogenous subgroups, is significantly modified by the CEO's demographic similarity to existing executives, diverse career experiences, and shared socialisation experiences with other TMT members (Georgakakis et al., 2017). This stresses how executive background shapes decisions not only individually but also through connections and relational dynamics within the TMT.

Furthermore, UET has been instrumental in understanding how executive background shapes decisions in various functional areas, including financial reporting choices. Research findings indicate that top management executives significantly influence disclosure quality, accounting conservatism, and earnings management (Plöckinger et al., 2016). For example, overconfident executives are more often involved in accounting manipulation and earnings management, while female executives tend to report more conservatively and display greater risk aversion in accounting behaviour (Plöckinger et al., 2016). The theory also suggests that the influence of executive characteristics can be moderated by contextual factors, such as environmental compatibility, dynamism, or the presence of a crisis

(Chen & Liu, 2018). This highlights that the effectiveness of a CEO's or TMT's attributes depends on their appropriateness for the specific situational needs (Hiebl, 2014). For instance, in turbulent environments, heterogeneous TMTs tend to achieve better performance, whereas less heterogeneous teams will be more successful in stable contexts (Nielsen, 2010).

While UET highlights the strong influence of executives' individual characteristics, other scholars argue that this influence is not universal. National institutions and governance systems can limit managerial freedom, moderating the extent to which executives can shape firm outcomes. (Crossland & Hambrick, 2011). This perspective suggests that the predictive power of UET may vary in different corporate governance contexts. It may be weaker in Germany's two-tier corporate governance system, where decision-making authority is more distributed and tightly monitored.

Connecting to this thesis, UET provides a useful lens for analysing whether the origin of executives translates into performance advantages. Research shows that internal executives benefit from their firm-specific knowledge (Harris & Helfat, 1997), while external executives can add a new perspective and a variety of experience that may improve strategic change (Zhang & Rajagopalan, 2004). UET suggests that these differences influence decision-making, but their potential effects are likely moderated by environmental factors or crises (Chen & Liu, 2018). This aligns directly with the central research question of whether executive origin affects firm performance in Germany, particularly during the Covid-19 crisis.

While UET has primarily focused on the effects of executive heterogeneity, there is a recognised need for more research into the background of TMT diversity, understanding why TMTs are composed the way they are (Nielsen, 2010). These limitations highlight why complementary perspectives, such as the Resource-Based View, are useful to better understand the mechanisms through which executive composition affects firm performance.

2.2 Resource-Based-View

The Resource-Based-View (RBV) introduced by Wernerfelt (1984) and further developed by Barney (1991) is a theory that sees firms as a bundle of their resources that may result in sustainable competitive advantage. To achieve this advantage, the resources need to be unique to the company and hard to imitate for competitors (Wernerfelt, 1984). The theory stresses the importance of internal capabilities and resources as a primary lever of sustainable competitive advantage and, therefore, ongoing firm performance (Peng, 2001). Based on an RBV perspective, the unique and valuable

resources of a firm, which are not easily imitable or substitutable by competitors, are fundamental to the firm's success (Wernerfelt, 2013). The core premise of RBV is that a firm's competitive advantage roots from its valuable, rare, inimitable, and non-substitutable resources it controls (Barney, 2001).

In the context of executive boards and leadership, the RBV provides a powerful view that helps to understand the value of internal talent and accumulated expertise. Characteristics such as board tenure and age can be conceptualised as proxies for deep, form-specific knowledge and experience within the TMT (Haque et al., 2022). Executives with longer ongoing tenure typically have a deeper understanding of the organisation's history, operational patterns, internal networks, and its unique capabilities (Zhang & Rajagopalan, 2010). This firm-specific knowledge is based on the RBV, a strategic asset, especially as it is often rooted within the organisation, which makes it difficult to replicate or substitute for competitors (Greiner et al., 2003).

Internal CEOs promoted within a firm are an example of a valuable and firm-specific resource (Zhang & Rajagopalan, 2004). They possess a deeper understanding of the firm's history, cultural values, capabilities, processes and routines, and constraints that are often difficult for external executives to replicate (Schepker et al., 2017). This detailed knowledge allows internal executives to use resources more efficiently, implementing strategies better aligned with established capabilities, and build stronger connections with internal stakeholders (Schepker et al., 2017). Furthermore, internal CEOs can benefit from internal managers like VPs and their management assistance, as they understand the firm's core competencies and, due to the internal appointment practice, are more likely to cooperate, enhancing the firm's unique capabilities even further (Georgakakis & Buyl, 2020). However, some scholars argue that external executives may themselves be seen as valuable resources, as they bring fresh perspectives, novel routines, and knowledge from other firms or industries (Georgakakis & Ruigrok, 2017; Zhang & Rajagopalan, 2004). When integrated into the firm's existing pool of resources, this external knowledge can complement and expand internal capabilities. In turbulent environments, these outside perspectives may help to renew a firm's resource base and enable faster adaptation, effectively functioning as a form of dynamic capability (Teece et al., 1997).

During uncertain periods, such as a crisis, this firm-specific knowledge becomes even more critical. Demonstrated by Haque et al. (2022) during the Covid-19 pandemic, where firms with internal CEOs outperformed firms with external CEOs. This performance premium is attributed to the internal CEO's deeper knowledge of core competencies, an important aspect in building resilience during a crisis where strategic options are limited by exogenous shocks (Schepker et al., 2017). The ability to allocate cash to specific value-increasing projects more efficiently, made possible by firm-specific knowledge, is another possibility through which internal CEOs can reach a performance premium,

especially when the firms hold an extensive cash reserve (Zheng, 2022). Contrary, in highly dynamic environments, internal knowledge can become a liability. Over-embedded leaders may struggle to challenge routines or adapt processes, while external executives can reconfigure structures and foster strategic change (Boeker, 1993; Georgakakis & Ruigrok, 2017). The RBV evolved towards dynamic capabilities, which stresses the importance of the firm's resources and the usage and renewal of those. This aligns with the role of executive boards in navigating exogenous shocks such as the Covid-19 crisis (Wernerfelt, 1995).

The RBV also suggests that developing such human capital, executives with extensive internal organisational knowledge, deepened through extensive firm tenure, is a strategic imperative (Kelliher & Reinl, 2009). This supports the idea that continuous investment in leadership development through internal pipelines and talent acquisition within the firm can lead to a sustainable competitive advantage, particularly in periods of high uncertainty and disruption (Zhang & Rajagopalan, 2010). The firm's unique and non-imitable nature of this tacit knowledge that has been accumulated over years of tenure within the firm makes it a valuable resource that can improve a firm's adaptability and managerial wisdom (Boal & Hooijberg, 2000). RBV highlights the central research question of this thesis, questioning whether internally accumulated knowledge can provide resilience in crisis periods or whether the new perspectives of external executives are necessary to adapt to exogenous shocks.

2.3 Agency Theory

The Agency Theory introduced by Jensen and Meckling (1976) provides a framework for understanding the relationship between a principal and an agent, often illustrated by shareholders as principals and managers as agents, when there is a separation of ownership and control (Fosberg & Nelson, 1999). This separation can result in opposing or divergent interests, where agents may follow their own goals at the expense or risk of principals, giving rise to the agency problem (Combs et al., 2007). A central driver of this agency problem lies in information asymmetry, as managers have better access to firm-specific information than shareholders, enabling them to hide opportunistic behaviour or follow strategies that are misaligned with shareholder interests (Shapiro, 2005). To reduce these problems, governance mechanisms are introduced to monitor and incentivise agents to act in the best interest of the principals (Dalton et al., 1998).

A primary governance mechanism is the board of directors or supervisory board, which is responsible for monitoring and advising management to ensure that shareholder value is maximised (Bergh et al., 2016). The board composition is a central aspect of the agency theory, particularly the balance

between internal and external independent directors (Berger et al., 2013). The prevailing view, which is regularly supported by agency theory, is that a higher proportion of external directors enhances oversight effectiveness, limits self-serving and opportunistic behaviour by management, and improves firm performance (Mueller & Barker, 1997). Empirical evidence has generally supported the value of outsiders on the board, showing that firms moving towards bankruptcy tend to have a higher level of internal directors (Mueller & Barker, 1997). Contrary, too many outsiders may also reduce firm-specific knowledge at the board level, limiting effective monitoring in complex situations or crises (Dalton et al., 1998). This tension reflects the trade-off between independence and firm-specific expertise and connects directly to the RBV perspective, which stresses the value of unique internal knowledge for long-term advantage. The German two-tier corporate governance system, in which the supervisory board takes responsibility for the monitoring role, separates supervision from executive functions and thereby reduces risks associated with CEO duality that often complicates governance in one-tier systems (Hopt & Leyens, 2021).

In addition to board composition, ownership structures can play a crucial role in the agency problem. Anchor investors, such as large institutional investors, use their significant ownership stake to actively engage in corporate governance to protect their significant investment (El-Bassiouny & El-Bassiouny, 2019). These investors can pressure boards to implement governance reforms and structures, such as higher outside director quotas or separating the CEO and board chairperson roles, limiting the CEO's power, and aiming for an increase in firm performance (Dalton et al., 1998). The presence of large institutional investors is often seen as a powerful monitoring mechanism that can influence strategic decisions and executive behaviour by highlighting the importance of shareholder value (Dalton et al., 1998).

While the agency theory focuses primarily on shareholder interest, there is a growing recognition in corporate governance research of a broader perspective, including stakeholder interests (Jo et al., 2016). This upcoming perspective suggests that effective boards should not only focus on shareholder interests but also consider and satisfy the interests of all stakeholders, such as employees, customers, and the community (Ayuso et al., 2014). Boards that effectively address shareholder interests are also more likely to address stakeholder interests, particularly in relation to Corporate Social Responsibility reporting (Garcia-Torea et al., 2016). This implies that good governance, based on an agency perspective focusing on shareholders, can sometimes align with stakeholder interests more broadly.

The relationship between CEO power and board composition also presents an interesting dynamic within agency theory. Research suggests that CEO power can moderate the board composition-firm performance relationship (Combs et al., 2007). Powerful CEOs might try to reduce the impact of the

board or take more risks, which can lead to paradoxical results during a crisis. At the same time, both a strong CEO and a powerful board are often seen as beneficial, although their objectives or approaches may come into conflict (Bundy et al., 2017). Contrary to that, a powerful CEO may be able to act and react through rapid decisions, which can reduce the risk of failure in a crisis, demonstrating a potential benefit of a centralised power structure (Bundy et al., 2017).

In the German corporate governance system, where executive power is shared across the executive board, this tension takes a different form. Agency challenges may arise from the balance between internal executives with high firm-specific knowledge and external executives who improve independence. This connects the agency theory to UET, since it highlights how the characteristics and background of executives influence the way governance mechanisms operate.

2.4 Executive Succession

Succession of the executive board and the CEO himself is a defining and important event with significant impacts on a firm's subsequent financial performance (Hutzschenreuter et al., 2012). The literature on CEO succession often examines its outcomes through two competing theoretical viewpoints, the disruption perspective and the adaptation perspective (Schepker et al., 2017). The disruption perspective suggests that CEO succession imposes costs on organisations, leading to negative effects on short-term performance (Schepker et al., 2017). This can arise from uncertainty within the TMT, increased politicisation, conflict, and fragmentation, especially when an interim CEO is appointed or when a new CEO introduces changes to the executive board (Ballinger & Marcel, 2010). Contrary, the adaptation perspective proposes that CEO succession is a mechanism for organisational renewal and strategic change, requiring time for its positive effects to show as lagged improvements in performance (Georgakakis & Ruigrok, 2017). This tension between disruption and adaptation shows that outcomes of succession events are not uniform but depend on the context and organisational factors such as governance structures, board independence, and the nature of the shock the firm is facing.

This tension can be directly connected to the main research question of this thesis. Internal appointments may reduce disruptive effects by ensuring continuity and leveraging firm-specific knowledge, whereas external hires may increase adaptation by introducing new perspectives and strategies (Finkelstein et al., 2009). Simultaneously, external appointments may increase short-term instability, especially in environments with strong institutional constraints, such as Germany's two-

tier governance system, where decision-making power is distributed across the management board rather than concentrated in a single CEO (Crossland & Hambrick, 2011).

A central discussion in this field revolves around the internal versus external origin of the new CEO and its implications for firm performance (Zhang & Rajagopalan, 2010). Research consistently shows mixed results regarding the overall impact of CEO succession on firm performance (Schepker et al., 2017). Schepker et al. (2017) suggest that CEO succession generally negatively influences performance in the short term, but its long-term effects are mediated by strategic change and the new CEO's origin. Specifically, inside CEOs improve long-term performance and engage in less strategic change, whereas hiring an outside CEO leads to more strategic change that often results in lower long-term performance (Schepker et al., 2017). This perspective shows that internal appointments tend to use the firm's resources more effectively, while external appointments push for strategic adaptation. This adaptation could either improve firm outcomes or destabilise the firm, depending on timing and context.

The significance of CEO origin is particularly highlighted during crises. The study by Haque et al. (2022) provides direct evidence that internal CEOs outperform their counterparts during crisis periods, specifically during the Covid-19 pandemic. This is because internal CEOs possess a deeper understanding of the firm's core competencies, which is crucial for building resilience when investment opportunities and access to external financing are restricted (Haque et al., 2022). External CEOs, often lacking a deepened understanding of internal resources and the competitive environment, are less likely to improve performance through risky and time-consuming innovation strategies during a crisis (Haque et al., 2022). The empirical findings indicate that internally led firms had higher quarterly ROA compared to externally led firms during the crisis, consistent with prior general findings that internal CEOs generate better accounting performance (Haque et al., 2022). Nevertheless, crises may also represent opportunities for strategic change, where external executives could provide a new perspective and innovative approaches that internal executives may miss (Greiner et al., 2003).

The decision to appoint an external executive is often forced by the absence of qualified internal candidates, especially in poorly performing firms seeking to change the status quo (Boeker, 1993). Boards are increasingly under pressure to put more focus on the CEO succession planning within the boardroom (Zhang & Rajagopalan, 2010). Despite reported discussions about CEO succession planning, a significant percentage of boards (30%) do not have a long-term or emergency succession plan, 60% lack a documented description of required skills for the next CEO, and just over half do not have a formal process to review internal candidates (Mooney et al., 2013). This lack of a talent

pipeline often forces firms to look outside, despite the higher likelihood of failure for external CEOs (Mooney et al., 2013). These challenges are not limited to the U.S. context but are also evident in Germany. Succession planning remains comparatively underdeveloped, with many firms relying on ad-hoc or reactive approaches rather than systematic preparation. Studies highlight that both large and smaller firms often lack structured pipelines for executive succession, creating risks for continuity and strategic alignment (Durst & Wilhelm, 2012; Gabriel & Bitsch, 2019). This institutional weakness emphasises the relevance of executive origin in the German context, where boards need to hire external executives, increasing the risk of disruption.

The research strongly indicates that, in the long term, companies tend to fare better with CEOs developed from the inside (Zhang & Rajagopalan, 2010). Therefore, boards have an important role in developing internal succession processes to ensure the availability of qualified internal candidates (Zhang & Rajagopalan, 2010).

2.5 Crisis Leadership

The steady increase of crises over the last decades showcases that crises are an inherent reality in today's fast-paced business world, formed by unexpected and unpredictable changes that demand immediate reactions from organisations (Fener & Cevik, 2015). A crisis can be defined as a sequence of events with substantial negative consequences for society or firms if not managed appropriately (Pedersen et al., 2020). These events can have their root internally, such as through misconduct and poor safety standards, or externally, such as through natural disasters and economic downturns like the Covid-19 pandemic (Herbane, 2013). The severity of a crisis for an individual firm is not always uniform, and the magnitude and duration of the impact can vary widely (Osiyevskyy et al., 2020).

The importance of crisis leadership has emerged as a critical element of crisis management research, focusing on the competencies and behaviours required by leadership to navigate organisations through uncertain and turbulent periods (Bhaduri, 2019). Unlike in routine emergencies, crisis management involves surprises, short time frames, and high stakes, often combined with life and death consequences or significant organisational threats (Van Wart & Kapucu, 2011). Crisis leadership is also regarded as the capability of optimal and timely assessment of adverse conditions effects, regardless of the reasons for these effects (Fener & Cevik, 2015).

The literature highlights several leadership styles and competencies as crucial during a crisis, including directive, cognitive, transformational, and transactional leadership, as well as broader skills

such as sense-making, agility, decision-making, communication, and the ability to foster organisational resilience and learning (Van Wart & Kapucu, 2011). For instance, cognitive leaders utilise their knowledge and expertise for strategic problem-solving, while transformational leaders seek consensus and provide a broader vision (Bhaduri, 2019). The effectiveness of leadership in a crisis is interdependent on the organisational culture, as organisations with a crisis-sensitive culture that encourages crisis management strategies and actions, coupled with competent leadership, are better prepared (Bhaduri, 2019). The effectiveness of these styles may differ depending on the institutional context. While transformational leadership may flourish in more CEO-centric systems, in Germany's collective decision-making boards, the integration of diverse executive perspectives becomes more central to crisis navigation (Crossland & Hambrick, 2011).

A significant aspect of crisis leadership is the importance of team stability or disruption. While some research focuses on the CEO's individual role, the collective actions of the TMT are equally important (Liu et al., 2018). For example, in abruptly dynamic environments like the 2008 global financial crisis, TMT job-related diversity can negatively influence a firm's resilient performance, and TMT group longevity significantly moderates this relationship (Chen & Liu, 2018). This suggests that while diversity can be beneficial in stable times for information processing, it can have a negative effect during high turbulence (Georgakakis & Ruigrok, 2017). This tension is highly relevant to the research question of this thesis as it introduces the perspective whether the benefits of external hires outweigh their risks, or if internal hires provide, through better stability and firm knowledge, a better option.

Financial capabilities and preparedness, such as extensive cash reserves or liquidity securities, play an important role in crisis resilience (Zheng, 2022). Firms with sufficient cash reserves are better positioned to overcome external shocks due to financial freedom and the capabilities to implement strategic decisions, as internal slack is often less expensive than external debt, especially when credit access is limited (Haque et al., 2022). During a crisis, explorative strategies may benefit firms by allowing them to capitalise on the crisis by identifying new opportunities (Osiyevskyy et al., 2020). Contrary, an exploitative strategy, leveraging existing resources, may lead to performance declines but ensure lower variation in outcomes, which might be preferred by firms that favour stability and securing a reliable revenue stream in times of financial threats (Osiyevskyy et al., 2020). Both perspectives highlight the strategic dilemma faced by firms in uncertain periods, balancing short-term survival through exploitation on the one side with long-term viability through exploration on the other side (Osiyevskyy et al., 2020). The important managerial factor during a crisis is the immediate understanding of the situation, maintaining an overview of potential strategic opportunities, while avoiding panic, to ensure precise planning (Pedersen et al., 2020)

Overall, the crisis leadership literature reinforces the need to examine how executive origin shapes resilience and decision-making. Internal executives may better exploit firm-specific resources, such as leader reputation and tacit knowledge, while external executives may be better at explorative strategies and renewal, consistent with adaptation perspectives. This tension makes executive origin a central variable when examining crisis resilience within the German two-tier governance system (Sohn & Lariscy, 2012).

2.6 Ownership & Governance

Ownership and governance structures can play a critical role in shaping firm characteristics such as strategy, performance, and board composition, particularly through how firms manage crises and the executive succession planning. Corporate governance research extensively analyses the role of the board of directors, including the composition, independence, size, and the potential effect of outside directors on the board on firm performance (Post & Byron, 2015).

In the German corporate governance context, with its two-tier board structure, empirical evidence suggests that the relationship between board size and composition and firm performance is not clear. There appears to be no consistent or robust evidence of an effect of supervisory board size or composition on firm performance across German listed firms (Bermig & Frick, 2010). While some argue that this reflects a broader institutional balance that limits the influence of any single board characteristic (Vitols, 2004), others stress that it makes leadership composition and succession choices even more critical levers for firm outcomes (Jackson & Deeg, 2008). Similarly, the influence of female directors remains unclear. While some studies find a positive association with governance quality and the effectiveness of monitoring, the direct link to firm performance is often not statistically significant or small, and mostly dependent on the institutional environment (Adams & Ferreira, 2009; Pletzer et al., 2015; Post & Byron, 2015).

The ownership structure of firms is another central lever of governance outcomes. In the German context, a high level of ownership concentration, often in the form of family holdings or large institutional shareholders, can show significant influence over board composition, strategic decisions and orientations, and executive succession decisions (Bottenberg et al., 2017). These investors frequently request governance arrangements that ensure adequate monitoring, such as a higher proportion of outside directors or ensuring a general alignment with shareholder interests (Dalton et al., 1998). Additionally, agency-principal conflicts may intensify when external executives are less aligned with shareholder interests (Jensen & Meckling, 1976). Research on the separation of

ownership and control showed the importance of the governance role in reducing these agency costs (Fama & Jensen, 1983). The two-tier board system present in the German corporate governance system, in combination with the codetermination requirements, means that ownership influence interacts with worker representation, which creates a unique governance dynamic that differs from other corporate governance systems, like the U.S. shareholder-oriented model (Bottenberg et al., 2017). Empirical evidence suggests further that anchor shareholders often prefer internal leadership succession to ensure firm-specific knowledge within the TMT (Bermig & Frick, 2010).

Executive succession planning, particularly the CEO succession, is another critical dimension of governance. Boards are tasked with the ongoing evaluation of the executive team as well as the preparation of a leadership transition (Zhang & Rajagopalan, 2010). Despite the strategic importance of succession of the TMT, research shows that many boards do not have formalised, long-term succession plans, which often results in rather reactive appointments that may favour external hires in the absence of prepared and ready internal candidates (Mooney et al., 2013). Such externally driven succession is associated with a higher rate of failure compared to internal executives, imposing a potential continuity risk for the firm (Zhang & Rajagopalan, 2010).

Governance considerations are also transferable to financial decision-making. The UET and related empirical work showcase that CEO characteristics such as overconfidence, age, prior experience, educational level, and firm tenure can influence capital structure choices significantly (Ting et al., 2015). Overconfident executives may have a preference for higher leverage, especially through short-term debt structures, which affects a firm's financial stability (Huang et al., 2015). This again connects governance mechanisms to leadership composition, as ownership concentration and supervisory boards may play a key role in monitoring or constraining risky behaviours (Combs et al., 2007).

Overall, ownership concentration and governance structures are highly important to a firm's ability to navigate through periods of uncertainty. They can shape the effectiveness of the board, influence the selection of executive leaders, and guide and monitor strategic and financial decisions. In the German environment, the interaction between concentrated ownership, codetermination, and the two-tier governance structure produces a specific environment in which the power of the CEO is reduced, moving from a CEO centric focus to a collective leadership process. This context is also relevant for the research question. If ownership concentration favours internal appointments while institutional structures reduce CEO discretion, then the link between executive origin and firm performance may differ substantially from more CEO-centric systems such as the U.S. (Jackson & Deeg, 2008).

2.7 Research Gaps

Regardless of the amount of academic literature on executive leadership, board composition, and firm performance, especially within the theories of UET, RBV, and Agency Theory, multiple research gaps remain. These gaps are particularly relevant for understanding firm performance during crises and highlight the importance of examining the composition of the entire executive board, which offers a more comprehensive perspective on executive leadership.

First, while there is robust research on CEO succession and the impact on firm performance, studies often separate CEO succession into internal or external succession and focus on these categorisations on the CEO alone (Barker Iii et al., 2001). Although Haque et al. (2022) provide valuable insight into the performance premium of internal CEOs during the Covid-19 pandemic, the focus remains solely on the CEOs' origin. There is a recognised need for research to consider the replacement of the CEO in parallel with the changes the new leader triggers within the firm to the overall executive group, rather than focusing on the CEO effect alone (Georgakakis & Buyl, 2020). The process through which CEO succession affects organisational performance through its influence on the dynamics and processes within the TMT is less systematically documented (Georgakakis & Buyl, 2020). This thesis aims to explore this further, moving from the CEO centric view to a more collective executive board perspective.

Second, while the influence of TMT diversity on firm performance has received increasing attention, empirical evidence, especially regarding its role in abrupt environments influenced through exogenous shocks like financial crisis, is often inconsistent (Chen & Liu, 2018). Some studies suggest that TMT diversity may even negatively influence resilience in turbulent times (Chen & Liu, 2018). Furthermore, while some research analyses crisis leadership characteristics, there is a lack of specificity and empirical examination of recommended organisational structures to support crisis leadership (Bundy et al., 2017). How different internal factors, including specific executive board composition, combine to influence crisis management effectiveness remains uncertain (Bundy et al., 2017).

Thirdly, the role of demographic characteristics of individual executives, such as age, education, and experience, on financial reporting choices and behaviour, and by extension on firm performance during crises, is sometimes contradictory and ambiguous (Plöckinger et al., 2016). While UET provides a strong framework, there is a need for a more systematic understanding of the multilevel nature of the performance impact of a CEO's origin, recognising that contextual factors at organisational levels and environmental levels are highly important (Georgakakis & Ruigrok, 2017).

This indicates an empty space in fully integrating the various layers of influence on firm performance during crises, as well as investigating the magnitudes of managerial influence (Plöckinger et al., 2016).

Fourthly, while Agency Theory highlights the importance of board composition for monitoring management and aligning interests with shareholders, the specific impact of the balance of internal versus external executive board members, beyond just the position of the CEO, on performance during crisis situations remains underexplored in an integrated manner. For instance, the role of board independence is examined in relation to CEO origin and strategic change (Schepker et al., 2017), but its interaction with the overall internal or external composition of the executive board during an exogenous shock like a pandemic needs further investigation. There's a particular lack of research focusing on human competencies required to prevent and manage crises (Bhaduri, 2019).

Finally, while some studies have examined the relationship between TMT gender diversity and firm performance, particularly during economic crises (Sieweke et al., 2023), the understanding of how crisis management best practices are formed and implemented remains limited. This is partly due to a predominant focus on failures and a lack of longitudinal comparison studies of crisis-hit versus non-crisis firms using robust empirical methods (Bundy et al., 2017). There is also a gap in systematically exploring real-time discourse and information exchange between organisations and stakeholders during a crisis (Bundy et al., 2017).

This thesis intends to address these gaps by focusing on the specific interplay between internal and external executive board composition and firm performance during crises. By moving beyond the focus on the CEO to represent the entire executive board, this research aims to provide a more comprehensive understanding of leadership effects. It examines crisis as a critical moderator to identify the conditions under which different board compositions lead to performance premiums during turbulent and uncertain times. This involves investigating how the collective attributes and dynamics of the executive board, shaped by the proportion of internal and external members, influence strategic responses and financial resilience when confronted with shocks.

3 Hypothesis Development

Building on the prior study by Haque et al. (2022), which explored CEO origin and firm performance during the Covid-19 crisis in the U.S., this thesis mirrors the approach and extends it to the German market and modifies it for the respective corporate governance characteristics. This change in analytical focus allows for new insights on how TMTs, rather than one individual, drive firm performance in a crisis, aligning with UET's view that organisational outcomes reflect the characteristics and decisions of top executives (Hambrick & Mason, 1984).

To answer the central research question of this thesis, whether the origin of a CEO or the proportion of origin of the whole executive board is associated with firm performance, and if this relationship is influenced by the presence of a crisis, the main hypotheses 1 and 2 are formed and focused on. While Hypothesis 1 follows the question of whether a higher proportion of internal executives on the executive board is positively associated with firm performance, Hypothesis 2 adds the crisis interaction and analyses whether the relationship between the internal executives and firm performance is stronger during crisis periods than in non-crisis periods. Together, both hypotheses address the main research question by analysing whether there is, in general, a positive association between executive origin and firm performance, followed by analysing whether a crisis affects this relationship.

Based on the theoretical foundation of UET and RBV, the specific knowledge of executives, either deeper firm-specific knowledge of internal executives or broader industry knowledge and fresh perspectives from external executives, can play a substantial role in firm outcomes, both in general and in a crisis period (Barney, 1991; Hambrick & Mason, 1984). These qualities can be leveraged to make more effective decisions and strategic changes, benefiting the firm's performance overall.

Additionally, potential moderating factors are analysed in further hypotheses. Hypothesis 3 focuses on the question of whether firms with above median cash holdings compared to their industry peers experience higher firm performance during crisis periods, analysing whether liquidity reserves influence flexibility and opportunities during crisis periods.

Hypotheses 1 to 3 mirror the approach of Haque et al. (2022), leveraging the approach, variables, and reasoning while simultaneously allowing for comparison of the results of this thesis with the U.S. sample. By extending the original scope of Haque et al. (2022) from a CEO-focused perspective to the entire executive board, this study also explores whether governance system differences translate into distinct patterns of executive performance.

With Hypothesis 4, this thesis examines whether ownership concentration influences the composition of the management board with differences in these effects during crisis and non-crisis periods. Based on the German corporate governance, results may show the connection between shareholders, supervisory boards as executive appointers, the executive management board composition, and firm performance. Hypotheses 5 and 6 focus on gender diversity on the executive team, whereas Hypothesis 5 focuses on the general question of whether a higher proportion of female executives on the executive board is positively associated with firm performance during crisis periods. Hypothesis 6 connects the gender diversity and origin of the TMT, questioning whether the relationship between executive origin and firm performance is moderated by gender diversity on the executive board, with the nature and magnitude of this interaction potentially changing during crisis periods.

While prior studies, like Haque et al. (2022), emphasise CEO origin, this hypothesis extends the focus to another key dimension of board composition. Gender diversity within executive boards, the TMT, and senior management is theorised to increase decision-making quality, improve monitoring, and introduce new perspectives for strategic orientations and decisions (Dwyer et al., 2003). In situations of heightened uncertainty or crises, the capacity for information processing and the generation of innovative solutions becomes even more critical (Perryman et al., 2016). However, research presents mixed results for the diversity impact (Triana et al., 2019). For instance, while some studies found that women directors improve monitoring intensity and could add value in firms with weak governance, the overall effect of board gender diversity on firm performance was often mixed, sometimes positive, but frequently negative (Triana et al., 2014). These findings suggest that gender-diverse TMTs can result in better firm outcomes, but through overmonitoring and contradicting perspectives, decrease value creation as gender diversity is not always adding value on average (Triana et al., 2014).

In crises, the unique combination of strong firm-specific knowledge of internal executives and diverse perspectives of a diverse executive board may enhance strategic decisions and crisis management, while contrary, competing priorities and leadership styles may create tensions and roadblocks, potentially reducing performance benefits (Perryman et al., 2016). This stresses the importance of analysing not only the independent effect of gender diversity and executive origin, but also the interaction between them.

4 Methodology

4.1 Research Design

This study employs a quantitative, deductive research design, testing theory-driven hypotheses derived from the RBV, UET, and crisis leadership literature. The analysis focuses on how executive board origin relates to firm performance during the Covid-19 crisis, thereby extending corporate governance research with evidence from the German market.

The analysis is based on balanced panel data of 976 quarterly firm-level observations from 122 German publicly listed firms. This allows the analysis of both time-variant effects, such as crisis periods, and firm-specific characteristics, such as governance structures and firm resource characteristics and levels. The time span of the data set reaches from the first quarter of 2019 to the last quarter of 2020. This allows a comparison between pre-crisis (2019) and crisis (2020) periods. Firm-performance variables are lagged by one quarter to reflect the time required for managerial decisions to influence firm outcomes and industry-demeaned.

The dataset was compiled from multiple sources. Financial firm data were obtained from S&P Capital IQ, while industry averages for the calculation of industry-demeaned variables were taken from Moody's Orbis. Governance and executive composition data were collected manually from annual reports, corporate websites, LinkedIn profiles, and entries in the German commercial register extracts. The classification of executives' origin as internal or external follows Haque et al. (2022) and is based on whether they had been employed by the firm for at least two years prior to their appointment to the executive board.

4.2 Sample Description

The initial data sample consisted of all firms listed in the German stock index (DAX), mid-cap DAX (MDAX), and small-cap DAX (SDAX) Indices as of January 1, 2019, totalling up to 160 firms. All firms with their headquarters located outside of Germany, as well as firms in the Financial and Utilities sectors based on the Global Industry Classification Standard (GICS), have been excluded from the initial data set. Consistent with the approach of Haque et al. (2022), these industries are excluded due to their sector-specific regulatory frameworks and accounting standards, which may bias comparability in performance measures and governance structures. Firms that have been delisted from the German Stock Exchange due to insolvencies, mergers, privatisation, or any other reason

during the relevant periods of 2019 and 2020 have been excluded from the dataset due to their reduced financial or governance data availability as well.

After the application of these filters, the final dataset consists of 122 firms across the eight different GICS industries Consumer Discretionary, Consumer Staples, Health Care, Industrials, Information Technology, Communication Services, Real Estate, and Materials. Each firm is observed over eight firm-quarter periods, resulting in a panel dataset where each firm-quarter results in an individual observation. This structure enables fixed-effects modelling, allowing the analysis to control for unobserved heterogeneity across firms and over time.

4.3 Data Processing and Adjustments

To preserve as many firms as possible and minimise data loss from missing or irregularly reported values, several data adjustments were made during the data preparation stage.

In cases where only annual data were available for certain financial variables, most frequently capital expenditures (CAPEX), the annual value was divided evenly across the four quarters of the corresponding year. This approach ensured temporal consistency while retaining the company in the sample.

For balance sheet items, including total assets, cash, debt, and equity, quarterly figures were occasionally missing from reported accounts. The respective missing value was imputed as the arithmetic mean of the prior quarter and the following quarter of the missing value. This interpolation of balance sheet values preserved the continuity of the time series while minimising the introduction of artificial volatility.

The classification of executives as internal or external is based on whether they had been employed by the firm for at least two years before their appointment to the executive board. For variables relating to the respective age of the CEO or executive board, the date of birth of executive board members was retrieved from the German commercial register extracts whenever possible. If the precise date of birth was not stated in the respective German commercial register extracts, the birthdate was researched using company reports, official biographies, and other reputable online sources. In cases where only partial birth date information was available (e.g., year but not month or day), the midpoint of the respective range was used as an approximation (e.g., June 30 if only the birth year was known).

For the classification of CEO origin, an adjustment was required, taking into consideration that the German Corporate Governance Code only recommends but does not mandate the appointment of a single CEO or spokesperson. This results in some companies either having no designated CEO or operating with co-CEOs, in general, or occasionally temporarily during leadership transitions. In these cases, the CEO origin was calculated as the average origin of all serving executive board members for that quarter. This adjustment ensures that the measure reflects the leadership's internal versus external orientation even when authority is collectively exercised rather than concentrated in a single CEO, which also has been acknowledged in both the literature on co-CEO arrangements (Krause et al., 2014) and the unique characteristics of German two-tier boards (Andres & Theissen, 2008).

While for industry classification purposes, the GICS was used to determine the initial sample composition and to exclude Financials and Utilities. For the calculation of industry-demeaned performance variables, the NACE classification was applied, as it allows greater specification for distinguishing between sub-industries in the German context. This two-tier approach ensured both international comparability in sample selection and sectoral precision in performance adjustment.

4.4 Variables

Firm performance is measured using two dependent variables. Return on Assets (ROA) is calculated as net profit divided by total assets, measured on a one-quarter lag basis and adjusted for industry averages. Tobin's Q is computed as the sum of market capitalisation and total debt divided by total assets, also industry-demeaned and lagged by one quarter (Haque et al., 2022). These lagged structures ensure that the performance measures reflect outcomes that follow the explanatory variables in time.

The key independent variable is the origin of either the CEO (*CEO*) or the executive board composition (*Internal Quota*), defined as the proportion of executive board members who were internally promoted. For this purpose, the definition for internal and external individuals used by Haque et al. (2022) has been chosen, defining individuals as internal when they have at least two years of firm tenure before they have been appointed to the executive board. Otherwise, they are classified as external executives. This classification does not change over time within the same firm, as the initial appointment to the executive board is seen as the relevant event for classification. The crisis dummy variable equals one for observations in 2020, capturing the Covid-19 pandemic period, and zero for 2019. High cash holdings are represented by a dummy variable set to one if a firm's

cash-to-assets ratio is above the median for its industry, year, and quarter. Additional variables include the age of the CEO (*CEO Age*), the average age of executive board members (*Board Age*), the proportion of women on the executive board (*Female Quota*), the number of executive board members (*Board Size*), firm size as the natural logarithm of total assets, sales growth, capital expenditure to assets (*CAPEX*), leverage, and ownership metrics such as the share of the strongest investor (*Strongest Investors*) and the number of anchor investors (*Number Anchor investors*), defined as the amount of investors holding at least 5% of the firms shares at the beginning of the quarter. Industry fixed effects are included to control for sector-specific patterns and seasonality.

Table 1. Definition of Variables

Variable	Explanation
Revenue	Natural logarithm of total firm sales.
Sales Growth	Quarterly sales growth, calculated as *(Sales_t - Sales_t-1) / Sales_t-1*
Firm Size	Natural logarithm of total assets.
Stock Return	Logarithmic change in stock price, measured as (*Price_t - Price_t-1) / Price_t-1*
MV Equity	Market value of equity, measured as share price multiplied by the number of outstanding shares.
MB	Market-to-book ratio of equity, defined as the market value of equity divided by the book value of equity.
Cash	Ratio of cash and cash equivalents to total assets.
Leverage	Financial leverage, defined as total debt divided by total assets.
CAPEX	Capital expenditures relative to total assets.
ROA	Industry-adjusted return on assets, calculated as firm net profit/total assets minus the industry–quarter average, lagged by one quarter.
Tobin's Q	Industry-adjusted Tobin's Q, defined as (Market value of equity + Book value of debt) / Total assets minus the industry–quarter average, lagged by one quarter.
ROA (raw)	Raw return on assets, calculated as net profit/total assets, lagged by one quarter.
Tobin's Q (raw)	Raw Tobin's Q, defined as (Market value of equity + Book value of debt) / Total assets, lagged by one quarter.
High Cash	Dummy variable equal to 1 if a firm's cash-to-assets ratio is above the industry median in a given quarter, and 0 otherwise.
CEO	Dummy variable equal to 1 if the CEO was promoted internally (with at least two years of tenure in the firm prior to appointment), and 0 otherwise.
CEO Age	Natural logarithm of CEO age.
Board Size	Natural logarithm of the number of executives on the executive board.
Internal Quota	Share of executive board members who were promoted internally (i.e., with at least two years of firm tenure before appointment).
Female Quota	Proportion of women on the executive board.
Board Age	Natural logarithm of the average board age.
Male Age	Average age of male executive board members.
Female Age	Average age of female executive board members.
Strongest Investor	Ownership share of the largest single shareholder.
Number of Anchor Investors	Number of shareholders holding ≥ 5% of the firm's equity.

4.5 Statistical Techniques

The empirical analysis uses panel regression models with fixed effects to control for unobserved, time-invariant firm characteristics, therefore isolating the potential effects of changes within firms over time. Within the corporate governance area, this research is particularly useful as firm-specific attributes and characteristics, such as historical strategic orientation or organisational culture, may influence results otherwise.

To ensure robust inference in the presence of heteroskedasticity and serial correlation within firms over time, standard errors are clustered at the firm level (Stock & Watson, 2008). This adjustment allows for arbitrary correlation of the error terms within each firm while maintaining independence across firms. The use of clustered standard errors is well-suited to datasets with repeated observations per firm, as it accounts for the non-independence of residuals without assuming homoscedasticity.

The baseline model is expressed as:

$$Performance_{it} = \beta_0 + \beta_1 Executive\ Origin_{it} + \beta_2 Crisis_{it} + \beta_3 (Executive\ Origin \times Crisis)_{it} + \beta_4 Controls_{it} + a_i + y_t + \delta_j + \varepsilon_{it}$$

where α_i denotes firm fixed-effects, γ_t denotes time fixed-effects, δ_j denotes time fixed-effects, and ε_{it} is the idiosyncratic error term. Robustness checks include alternative model specifications and different fixed effects structures.

4.6 Validity and Ethics

All data used in this study are publicly accessible and collected in compliance with academic standards for secondary data use. Financial data were obtained through a university-licensed subscription to S&P Capital IQ and Moody's Orbis, while governance and biographical data were sourced from company filings, official registers, and reputable online sources.

The classification of executives as internal or external was performed manually using official company information in annual reports and company websites as the main source, if available. For missing information, LinkedIn and other available online sources have been taken into consideration. No private or sensitive personal data was processed. The study follows all relevant ethical guidelines for the responsible use of publicly available data in academic research.

5 Results

5.1 Descriptive Statistics

Descriptive statistics of the whole dataset are introduced to provide an broad overview of the data set as well as characteristics and differences between variables. For each variable, the minimum, maximum, mean, and standard deviation are reported.

Over the period from the beginning of 2019 to the end of 2020, within these 122 firms, 766 unique executive managers were present. Overall, during this two-year time period, 131 executives joined a new firm while 147 executive managers left their firm, either joining one of the other firms in the scope or moving to firms out of the scope of the data set. This represents an average firm-joining quota of 3.24% per quarter, as well as an average firm-leaving quota of 3.64% per quarter for executive managers.

5.1.1 Descriptive Summary Table

Table 2. Descriptive Statistics Overview

Descriptive Statistics

Panel A. Pre-Covid (2019)							
Variables	**Internal CEO Sample**			**External CEO Sample**			**Mean Diff.**
	Obs.	Mean	SD	Obs.	Mean	SD	
Revenue	264	4417.21	10214.74	224	1635.88	2495.05	2781.32***
Sales Growth	264	0.03	0.23	224	0.05	0.28	-0.02
Firm Size	264	28077.77	63212.47	224	9252.52	14758.11	18825.25***
Stock Return	264	0.03	0.15	224	0.04	0.18	-0.01
MV Equity	264	13536.29	20919.99	224	6817.34	12997.89	6718.95***
MB	264	2.83	2.54	224	3.18	3.71	-0.35
Cash	264	10.67	10.49	224	12.18	11.61	-1.51
Leverage	264	25.37	16.12	224	25.44	14.56	-0.07
CAPEX	264	1.02	0.91	224	0.89	0.83	0.14*
ROA_{t+1}	264	0.55	1.85	224	0.23	3.3	0.32
$TobinsQ_{t+1}$	264	-0.06	0.85	224	0.04	1.6	-0.1
$ROA\ (raw)_{t+1}$	264	0.78	1.74	224	0.66	2.76	0.12
$Tobin's\ Q\ (raw)_{t+1}$	264	1.46	1.21	224	1.5	1.78	-0.05
High Cash	264	0.37	0.48	224	0.46	0.5	-0.09**
CEO Age	264	55.52	7.7	224	54.58	6.19	0.94
Board Members	264	4.58	1.87	224	3.78	1.47	0.8***
Internal Quota	264	0.71	0.24	224	0.28	0.25	0.43***
Female Quota	264	0.07	0.11	224	0.07	0.13	-0.01
Board Age	264	53.08	4.57	224	52.56	3.12	0.52
Male Age	264	53.22	4.83	224	52.67	3.35	0.55
Female Age	86	51.81	4.08	63	51.1	6.32	0.71
Strongest Investor	264	29.57	20.89	224	22.73	15.77	6.84***
Number of Anchor Investors	264	2.25	1.36	224	2.49	1.45	-0.24*
Panel B. Covid Period (2020)							
Variables	**Internal CEO Sample**			**External CEO Sample**			**Mean Diff.**
	Obs.	Mean	SD	Obs.	Mean	SD	
Revenue	247	4372.66	9485.71	241	1345.01	2072.31	3027.65***
Sales Growth	247	0.01	0.26	241	0.05	0.33	-0.04
Firm Size	247	31532.10	67604.13	241	8471.28	13572.99	23060.82***
Stock Return	247	0.01	0.28	241	0.01	0.29	0
MV Equity	247	14960.04	22069.06	241	5366.89	8411.26	9593.15***
MB	247	3.01	3.32	241	2.94	3.44	0.08
Cash	247	12.20	10.04	241	14.84	13.72	-2.64**
Leverage	247	27.06	15.34	241	27.57	15.13	-0.51
CAPEX	247	0.90	0.87	241	0.71	0.63	0.18***
ROA_{t+1}	247	0.28	2.83	241	0.2	5.48	0.08
$TobinsQ_{t+1}$	247	-0.05	1.02	241	0.04	1.57	-0.09
$ROA\ (raw)_{t+1}$	247	0.54	2.6	241	0.67	5.06	-0.13
$Tobin's\ Q\ (raw)_{t+1}$	247	1.56	1.31	241	1.54	1.76	0.02
High Cash	247	0.39	0.49	241	0.51	0.5	-0.12***
CEO Age	247	55.49	7.89	241	54.51	5.78	0.98
Board Members	247	4.62	1.79	241	3.5	1.32	1.13***
Internal Quota	247	0.70	0.24	241	0.26	0.25	0.44***
Female Quota	247	0.08	0.11	241	0.09	0.14	-0.01
Board Age	247	52.96	4.43	241	53.26	3.43	-0.31
Male Age	247	53.10	4.8	241	53.38	3.6	-0.28
Female Age	95	51.74	4.08	75	52.24	6.69	-0.5
Strongest Investor	247	30.71	21.13	241	24.27	17.3	6.44***
Number of Anchor Investors	247	2.36	1.51	241	2.51	1.4	-0.15

This table reports the descriptive statistics of the variables used in the baseline regression for the pre-Covid period (Panel A) and the Covid period (Panel B). All variables are defined in Table 1. All continuous variables are winsorized at the 1% and 99% levels. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. A extended descritpive Overview is in the Appendix.
For interpretation purposes, Revenue and Firm Size have not been transformed using the natural logarithm. Cash, Leverage, and CAPEX have been multiplied by 100.

Table 2 presents the descriptive statistics for the main relevant variables used in the study based on observations of 122 publicly listed German firms in the years 2019 and 2020. For a comparable overview between different years and executive origin, the table has been grouped by CEO origin and year. The panel is structured on a quarterly basis and balanced across the two years. This allows for an analysis of the CEO origin, internally promoted or externally hired, under both environmental macroeconomic situations, the pre-crisis year (2019), and the Covid-19 crisis year (2020).

In both years, firms led by intern CEOs tend to be larger, both in terms of total assets as well as in terms of revenue. While in 2019 the mean firm size for firms led by internal CEOs was 28,077, the mean firm size for firms led by external CEOs was only 9,252. An equal picture shows the comparison of Revenue, where the mean of internally led firms was 4,417, and the mean for externally led firms was 1,635. During the crisis year 2020, a comparable premium for internally led firms is visible, with

the mean difference for both Revenue and Firm Size increasing from 2,781 (Revenue) and 18,825 (Firm Size) in 2019 to 3,027 (Revenue) and 23,060 (Firm Size) in 2020. Market Value of Equity, acting as a market value-oriented indicator for the size of a firm, shows equal differences and development between internally and externally led firms over the two years, increasing the difference from 6,718 in 2019 to 9,593 in 2020.

Contrary to the increasing difference in firm size metrics in the crisis years, the difference in performance metrics between internal and external CEOs decreases in the crisis year. While internal CEOs outperform in quarterly ROA with 0.55 compared to their external counterparts with 0.23, they are not able to achieve the same mean level of Tobin's Q with only -0.06 compared to 0.05 of externally led firms. Still, the mean difference for ROA of 0.32 and Tobin's Q of -0.10 decreases in 2020 to only 0.08 and -0.09, respectively.

The Board composition also shows differences between CEO origin, with internally led firms having larger executive board sizes with a mean difference of 0.8 people in 2019, growing to 1.13 people in 2020. Differences are also visible in the internal quota of the executive board between CEO origin, with internally led firms having a mean internal quota of 0.61 in 2019 and 0.6 in 2020, while externally led firms only having a mean internal quota of 0.38 and 0.37. These values have been computed without the respective CEO to avoid a dilution of the values due to the CEO origin. Board diversity is nearly identical between CEO origin in both years, with only minor differences of -0.01.

Looking at executive demographics, internal CEOs are on average less than one year older, 0.94 in 2019 and 0.98 in 2020. The mean age of the whole executive board mirrors the difference in the CEO age in 2019 (0.52), while in 2020, the mean age for executive boards of internally led firms is smaller compared to externally led firms (52.96 to 53.26). These differences in both years are slightly stronger for female executives (0.71 and -0.5) compared to the differences for male executives (0.55 and -0.28).

Further control variables show only minor differences, if at all. While Cash holdings tend to be slightly higher for externally led firms in both years, leverage and capital expenditure (CAPEX) are nearly identical between CEO origins over both years. Growth metrics such as Sales Growth and Stock growth present equally minor differences, with external CEOs reporting marginally higher means in both years for both variables

Internally led firms do have a higher mean in their strongest investor in both years, with 29.57 in 2019 compared to 22.73 for externally led firms, reducing the differences marginally in 2020 with 30.71 for internal CEOs and 24.27 for external CEOs. Contrary to the differences in the strongest investor,

external CEOs present more anchor investors with 2.49 compared to 2.25 in 2019 and 2.51 compared to 2.36 in 2020. This indicates a generally stronger concentration of shareholders at internally led firms over both years.

While these patterns are visible from the descriptive statistics, several of the mean differences between internally and externally led firms are statistically significant. Firm size metrics (Revenue, Total Assets, and Market Value of Equity) as well as board-related characteristics (board size and internal quota) show consistent and significant differences in both years. Some control variables also display significant variation between the two groups. These findings indicate that the structural profiles of internally and externally led firms differ in meaningful ways and should be considered carefully when interpreting performance comparisons.

Overall, the descriptive statistics showcase differences between internally and externally led firms, especially in firm size, ownership structure, and board composition, with minor differences in firm performance and other firm characteristics. While differences continue in the crisis year, the size of the difference, such as in ROA, mostly decreases. These findings set the foundation for the multivariate analysis that follows, where the relationship between executive origin and firm performance will be formally tested.

5.1.2 Data comparison with U.S. data

As the empirical part of the thesis is oriented at the recent study by Haque et al. (2022), and by choosing to adapt variables and design from the study, it allows for comparison of the results of the descriptive statistics from the German sample with the sample from the U.S., provided by Haque et al. This comparison allows to analyse the differences in firm performance, characteristics, and board composition in an international context throughout different corporate governance systems, market dynamics, and institutional constraints in Germany and the United States. These structural differences are reflected in the descriptive patterns and magnitude of key variables as well as in changes over the years.

Consistently, both samples show a performance premium for internal CEOs over external CEOs in terms of ROA during both years. In the U.S. study, the performance gap is substantial and also statistically significant, with a mean ROA for internally led firms of 1.13 in 2019 and 1.36 in 2020 compared to the external counterparts of -0.89 and -1.11, respectively. While the similarity in direction of the difference persists in both studies, the significance as well as the development from

2019 to the crisis year 2020 vary. As the difference in the German sample decreases, the mean difference of the Haque et. al. sample increases in 2020. This might indicate a universal performance advantage for internal CEOs both in normal situations as well as in crisis, but the smaller effect size in Germany may indicate significant differences in the effect of CEO origin. While the general smaller effect indicates a smaller focus on the importance of the CEO alone, potentially implicated through the codetermination as well as the two-tier board system, the different direction in development may indicate a certain level of stability, reducing downside volatility in Germany.

Firm size metrics showcase a parallel pattern in both studies, with internally led firms tending to be larger on average. The size premium for internally led firms is equal with a mean difference of 1.02 in the U.S. sample in 2020, compared to 0.61 in the German Sample. While the general mean level of firm size in the German Sample appears to be higher than in the U.S. Sample, this effect may be influenced by the significantly larger sample size of Haque et al.'s study, with 1299 unique firms compared to 122 firms in the German Sample. This size premium pattern may reflect a tendency for larger, more complex organisations to favour internal succession, possibly due to the higher stakes of leadership continuity and the greater need for firm-specific knowledge.

The level of cash holdings follows the same directional trend in both countries. While in the U.S., the mean difference in 2020 equals 8.6 percentage points, 0.245 for external CEOs and 0.159 for internal CEOs, the mean difference in the German sample only equals three percentage points, with 0.15 for external CEOs and 0.12 for internal CEOs. External CEOs therefore hold a larger liquidity buffer, a potential indication of a more conservative financial management by external leaders. The smaller gap in Germany may reflect a more uniform approach to cash policy and cash holdings or a lower variation in liquidity preferences due to stakeholder-oriented governance norms.

One of the strongest differences between the samples appears in board gender diversity. In the U.S. sample, female director representation is 0.21 for internal and 0.18 for external CEOs in 2020, substantially larger than in the German sample, where the female quota only reaches 0.08 for internal and 0.09 for external CEOs in the crisis year. Despite the difference in gender diversity level, the general direction in both samples over the years 2019 and 2020 is positive, showcasing an increasing trend by roughly one to two percentage points in the German sample and two to three percentage points in the U.S. sample. Potential reasons for the lower level in the German sample may be differences in the corporate board structures, as well as later implementation of gender quota legislation and slower cultural shifts towards gender parity in executive levels.

Firm performance metrics offer another point of divergence. In the U.S., externally led firms showcase a much wider dispersion in ROA, with negative values during the crisis period, suggesting greater downside risk under external leadership. While the German sample also shows slightly higher standard deviations for external CEOs, the magnitude of volatility is smaller overall. Institutional mechanisms, tighter governance oversight, and less extreme market pressures in Germany likely moderated firm-level performance swings.

Finally, both datasets report low capital expenditure ratios, with only minor differences by CEO origin. In Germany, CAPEX levels are almost identical across internal and external CEOs, while in the U.S., there is a slight tendency for higher R&D spending among externally led firms. These investment-related variables appear less sensitive to CEO origin in both contexts, particularly during the short-term crisis horizon.

Overall, both data sets reveal a similar qualitative pattern in the relationship between executive origin and firm performance between the U.S. and Germany. However, the magnitudes and dispersion levels for variables differ strongly between the two studies. German firms show smaller gaps between internal and external CEOs and experience lower volatility in crises. Differences in variables between CEO origin tend to decrease rather during a crisis, indicating a higher level of stability compared to Haque et al.'s study. Potential influences may be found in different institutional safeguards and norms, as well as a less CEO-centric two-tier board system regulating the influence of a single executive.

5.1.3 Data Visualisation

5.1.3.1 Visualisation of Dependent Variables ROA and Tobin's Q

Complementary to the introduced results from the descriptive statics in Table 2, providing visual representation of the distribution of the two key performance metrics ROA (Figure 1), as an accounting-based performance measure, and Tobin's Q (Figure 2), as a market-based valuation metric, allow for a better understanding of key aspects and differences between internally and externally led firm performance over the pre-crisis year 2019 and the crisis year 2020. The Y-axis of Figures 1 and 2 have been limited at certain levels to increase the visibility of the interquartile range. The unlimited version can be found in Appendix 2. Both performance metrics are industry-demeaned to enhance comparability between sectors and reduce potential influences of sector-specific shocks or developments.

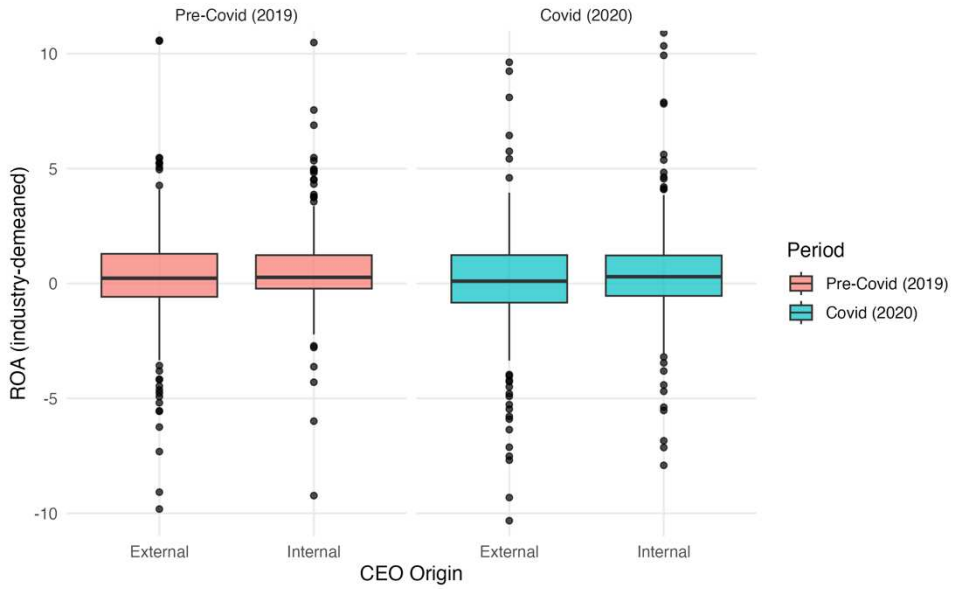

Figure 1. Distribution of ROA grouped by CEO origin and year

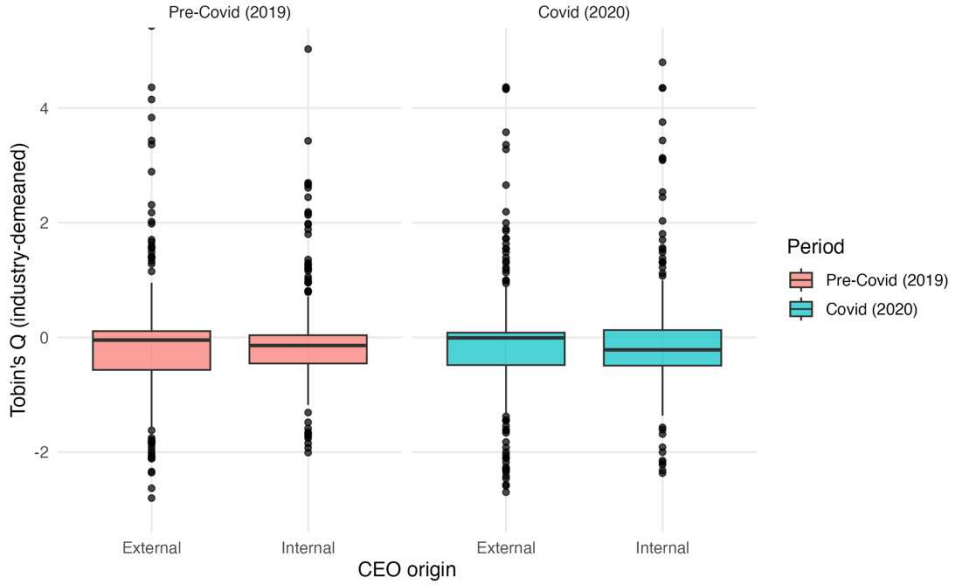

Figure 2. Distribution of Tobin's Q by CEO origin and year

The primary aim of the visualisation is to confirm and contextualise the findings of the descriptive statistics and additionally offer insights that are more difficult to extract from the descriptive summary alone. First, Figures 1 and 2 showcase that the difference in mean performance between internally and externally led firms is minor. This aligns with the descriptives and the statistically non-significant results established by the two-sample t-test. Comparing the mean ROA between groups and years shows that internally led firms had a higher mean ROA with 0.55 (SD 1.85) compared to the mean

ROA of firms led by external CEOs with 0.23 (SD 3.30) in 2019. Both averages declined slightly in 2020 to 0.28 (SD 2.83) for internal CEO's and 0.20 (SD 5.48) for external CEO's.

Similarly, Tobin's Q values were close to zero in both groups across the two years (e.g., in 2020, the mean for internally led firms was -0.05 with SD 1.02, while for externally led firms it was 0.04 with SD 1.57). These small differences support the conclusion that internal origin is not associated with systematic differences in either of the key performance variables.

Second, the distributional patterns highlight some differences in variability. For ROA, externally led firms show a wider interquartile range and more extreme outliers, which is especially noticeable during the crisis year 2020, when external CEOs were associated with both very high positive ROA values (up to 59.4%) and very low negative values (down to -25.8%). Internally led firms, by contrast, ranged more narrowly between -21.2% and 10.9%. This suggests a greater dispersion of operational performance outcomes under external leadership. This aligns with the view that externally led firms may be subject to more performance volatility in periods of high uncertainty, such as in the crisis year 2020. Aligning with this view is also the more compact distribution of internally led firms across both years, indicating greater stability in accounting-based performance compared to sector peers.

Third, the Tobin's Q plots reveal that median valuations for both CEO origin groups remain close to the sector-adjusted benchmark in both years, yet the spread of values is again larger for externally led firms, particularly in 2020. Maximum values for Tobin's Q reached 10.1 for externally led firms compared to 4.8 for internally led firms, pointing to isolated cases of strong market revaluation. Simultaneously, the lower tail of the distribution extends further for firms with external CEOs with a minimum of -2.7 compared to firms with internal CEO's with a minimum of -2.4, showcasing the higher variability in market-based outcomes.

Overall, the visualisations align with the insights taken from the descriptive statistics by showing patterns such as dispersion, skewness, and outliers better. Although there is no systematic difference in general tendency between internally and externally led firms visible by visualisation, the graphs suggest a potential stability advantage associated with internal CEOs, which is consistent during uncertain crisis periods.

5.1.3.2 Temporal Development of Dependent Variables ROA and Tobin's Q

Figures 3 and 4 show the development of the firm performance metrics ROA and Tobin's Q, industry-demeaned, on a quarterly basis over both periods of 2019 and 2020, separated between internal and

external CEO groups. Performance metrics are lagged by one quarter to capture the time executive decisions need to influence accounting- or market-based outcomes. Therefore, the reported values show the firm's performance or valuation in the following quarter.

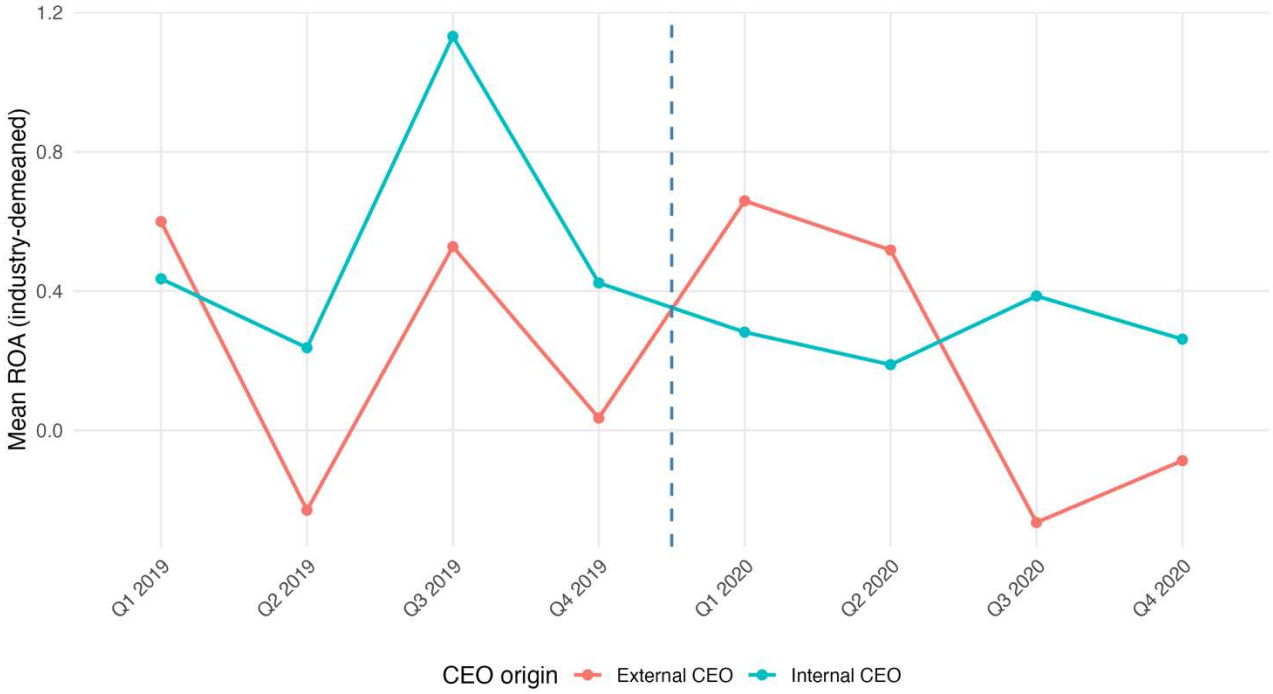

Figure 3. Development of mean ROA by CEO origin

Figure 3 shows substantial quarter-to-quarter variation in ROA between CEO origin groups. Internal CEOs experienced in Q3 2019, with 1.162 the highest industry-demeaned ROA overall, outperforming both industry peers and external CEOs, whose ROA was only 0.497 in the same quarter. Also, the lowest ROA quarter pre-crisis was experienced by external CEOs in Q2 2019 with an ROA of -0.130, while internal CEOs achieved an ROA of 0.311 in the same quarter. In the crisis year 2020, performance for both CEO origin groups diverged overall, with external CEOs decreasing their ROA more significantly to their lowest crisis result in Q3 2020 of -0.121. Contrary, in Q3 2020, internal CEOs achieved their highest crisis ROA with 0.314. Overall, internal CEOs experienced consistently a positive ROA, while external CEOs experienced a negative ROA in three out of eight quarters a negative ROA. This indicates an overall consistent outperformance of internal CEOs compared to their industry peers, in relative terms, indicating a greater resilience in operating performance during a crisis.

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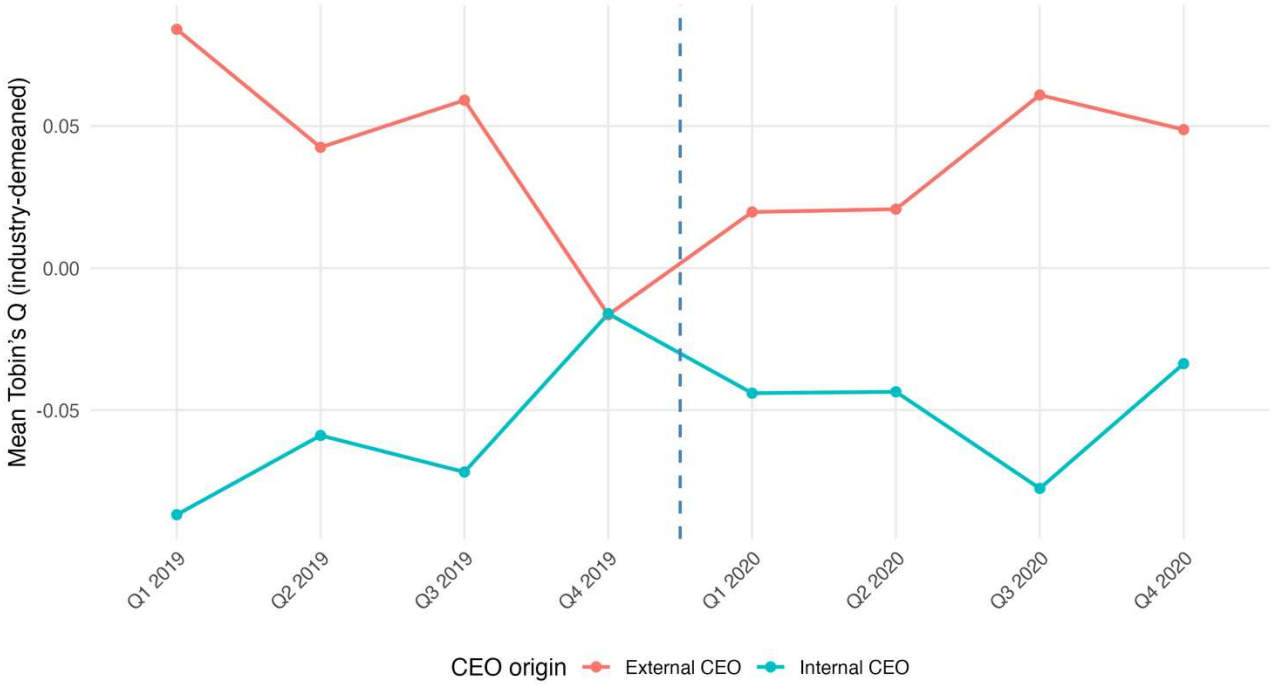

Figure 4. Development of Tobin's Q by CEO origin

Figure 4 shows a rather stable quarter-on-quarter development for Tobin's Q for both CEO origin groups. External CEOs consistently experience higher Tobin's Q values compared to internal CEOs throughout the entire observation period, with only a near identical result in Q4 2019, where externally led firms resulted in a Tobin's Q of -0.014 while internally led firms resulted in a Tobin's Q of -0.015. During the crisis year 2020, both groups remained close to their long-term average with only minor variations. Internal CEOs reach their peak in 2020 in Q4 with -0.079, whereas internal CEOs reach their highest Tobin's Q in 2020 in Q3 with 0.063. Overall, capital market valuations appear to be relatively unaffected by the operational performance differences observed in the ROA metric before, indicating that indicating an anticipated recovery by investors or a greater focus on long-term fundamentals rather than short-term results.

The temporal patterns reveal a gap between accounting-based and market-based performance across CEO origin groups during the crisis. As ROA declines more sharply for externally led firms, Tobin's Q remains rather stable for both groups, with a slim premium for externally led firms.

5.1.3.3 Visual Exploration of Leadership Composition

Figures 5 and 6 present a visual analysis of two board composition metrics, Internal Quota and Female Quota, grouped by internal and external CEO origin, and both included periods, 2019 and 2020. The

internal quota measures the percentage of internal executives on the management board, extending the CEO-centric view from Haque et al. (2022) to the whole board, aligning with corporate governance characteristics in Germany. To not dilute the respective values for the internal quota at internal CEOs, the Internal Quota has been calculated without the influence of the CEO itself. The female Quota captures the proportion of women on the management board. Both variables are relevant for understanding the leadership composition, as board quotas and, therefore, diversity may influence the decision-making process, influence strategic priorities and initiatives, and affect adaptability in times of crisis.

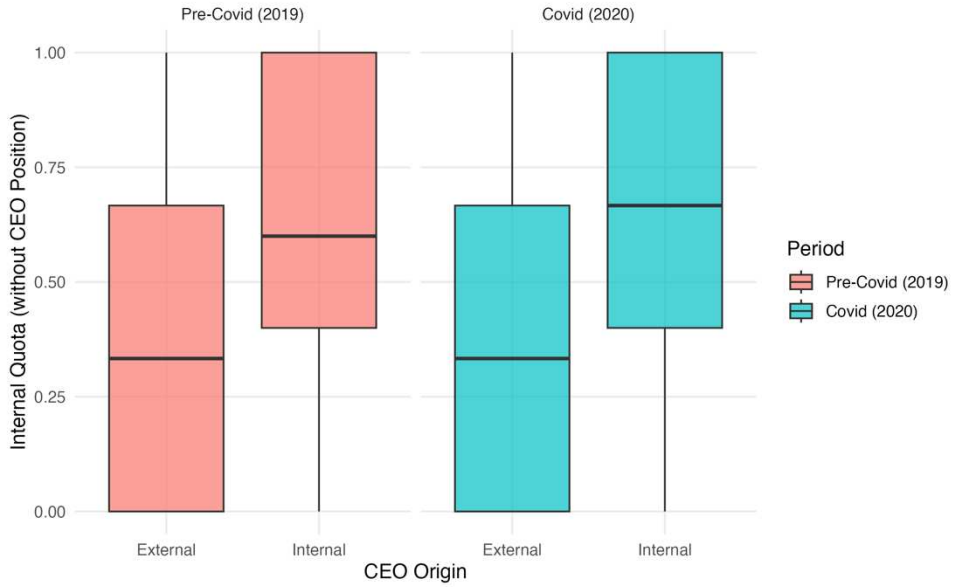

Figure 5. Distribution of Internal Quota by CEO origin and year

The visualisation of Internal Quota reveals a strong and persistent difference between the internal and external CEO groups. In both years, internally led firms show a notably higher internal quota on their management boards. The interquartile ranges of the two individual groups show minimal overlaying. This clear difference mirrors the strong and highly significant difference identified in the statistical test and suggests that the association between CEO origin and internal promotion patterns is not identical between CEO origin groups. The consistency of this gap over time points to a structural relationship, which may arise from shared professional networks, established succession pipelines, or a preference for leadership teams of shareholders. This visual representation also showcases that these differences are stable over both the pre-crisis period and the crisis period, indicating that economic turbulences through exogenous shocks did not influence the composition pattern.

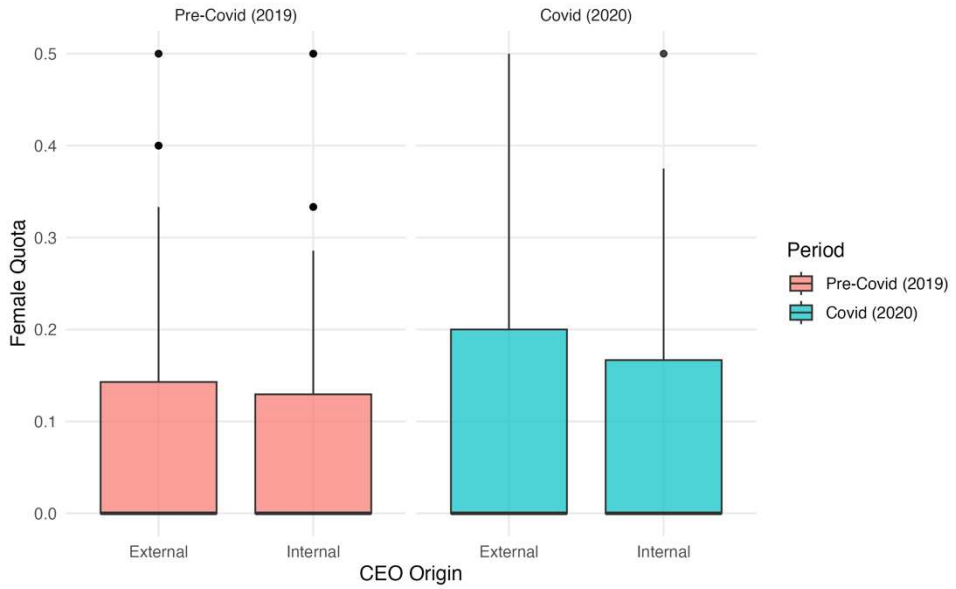

Figure 6. Distribution of Female Quota by CEO origin and year

Contrary, Female Quota visualisation in Figure 6 shows a substantial overlap in the distribution patterns of internal and external CEO groups, which is consistent with the absence of statistically significant mean differences reported in Table 2 earlier. Over both years, female representation remains relatively low, with only minor variation within each group and a few outliers, but overall, without any significant differences between CEO origin groups. Figure 6 reinforces the interpretation that gender diversity on management boards is largely independent of CEO origin.

The visualisation provides a complementing view on the descriptive statistics, providing variability, range, symmetry, and the presence of outliers While Table 2 quantifies differences between CEO origin groups and years as well as establishes statistical significance, the Figures 5 and 6 enable a more intuitive understanding of the magnitude, distribution, difference, and stability of those variables, as well as an overview of the overlap between groups. Together, the patterns confirm the structural persistence of internal promotion tendencies along with the relative neutrality of CEO origin in regards of gender diversity in executive boards.

5.1.3.4 Temporal Development of Internal and Female Representation

Figures 7 and 8 show the quarter-on-quarter development of the two board composition variables, internal quota and female quota, grouped by the CEO origin over the whole observation period of the two years 2019 and 2020. The visualisation adds a level of understanding not only to the development of these variables over time but also to how these patterns vary between CEO origins.

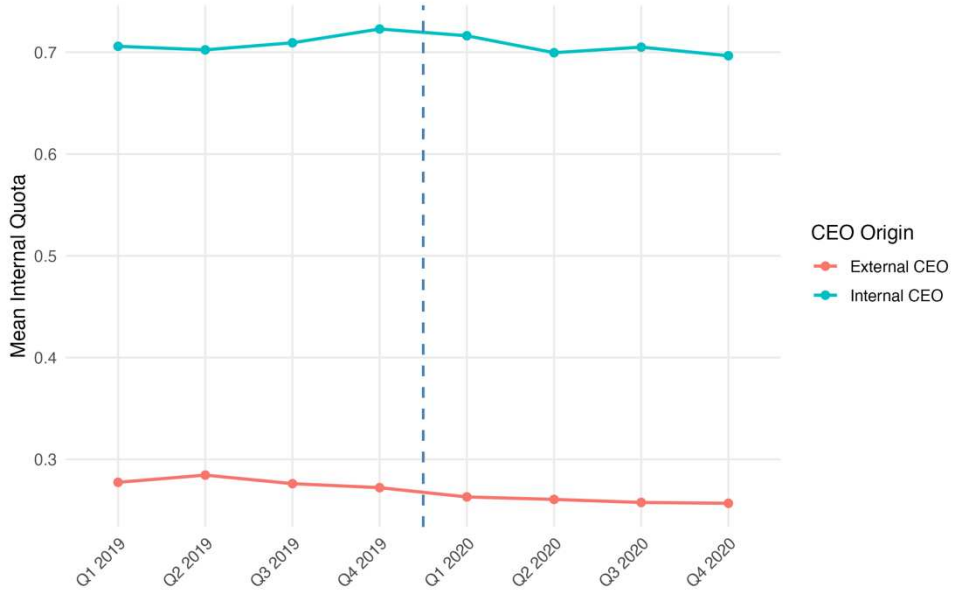

Figure 7. Mean Internal Quota over time, grouped by CEO origin

Internal Quota remains mostly stable across time within each CEO origin group, yet the difference between internally and externally led firms is significant and consistent over time. Throughout both periods, internally led firms consistently report values around the 70% mark, indicating that a substantial majority of their executive board members were promoted internally within the organisation. Contrary, externally led firms average an internal quota of roughly 27% over both years, reflecting a much lower concentration on internal executives. Notably, neither of the two groups experienced a major fluctuation during the crisis year, suggesting that CEO origin is closely tied to a stable board composition preference that resists short-term shocks. The consistently wide gap between the CEO origin groups aligns with the results presented earlier and reinforces the view on succession planning and recruitment strategies, showcasing a structurally embedded preference in firm leadership models.

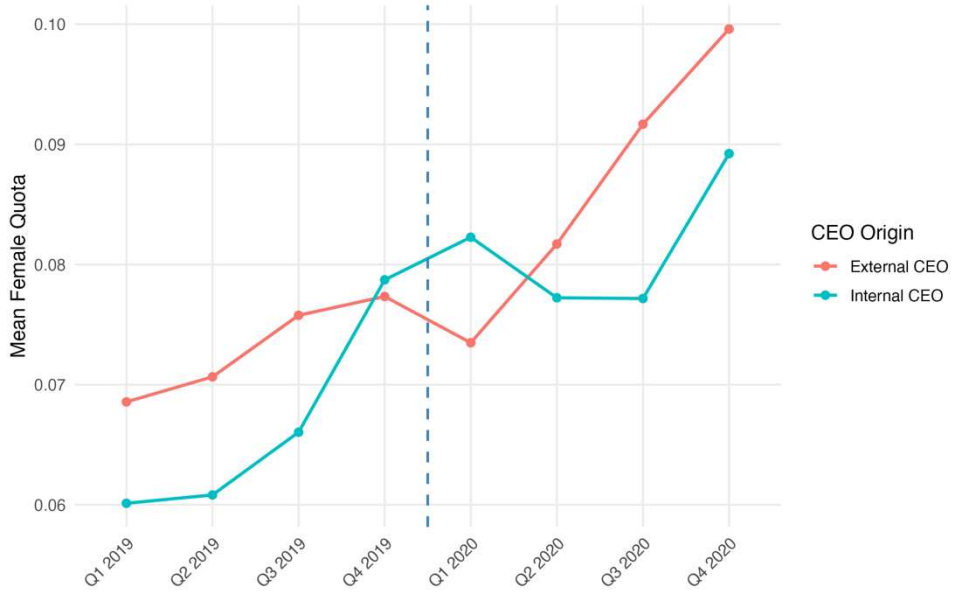

Figure 8. Mean Female Quota over time, grouped by CEO origin

The Female Quota shows a gradual upward trend for both internally and externally led firms, though the absolute level of female quota remains modest for both groups. Starting at the beginning of 2019, female executives only represent 6-7% for both groups. After two years, at the end of 2020, the quota had risen to 9% for internally led firms and 10% for externally led firms. The trend for both CEO groups runs mostly parallel to each other, with only short crossing values in Q4 2019 and Q1 2020. This does not showcase any systematic divergence over time, indicating that gender diversity progress is mostly independent of CEO origin. The continuing rise of both groups suggests that broader institutional, regulatory, and societal pressures for diversity continue to shape the board composition landscape regardless of CEO characteristics.

The visualisations are aligned with the earlier introduced descriptive findings while additionally adding a temporal and distributional aspect. The stable level of internal quota and its gap between CEO origin groups underscores the structural link between leadership type and board composition preference. The parallel positive trend in female quotas for both groups highlights that diversity on executive boards is an emerging topic and increasingly important, but also its independence from CEO origin.

5.2 Regression Results

5.2.1 H1: Internal Executives and Firm Performance

Hypothesis 1 posits that a higher proportion of internal executives on the executive board is positively associated with firm performance.

Table 3 presents the pooled 2019–2020 regression results for ROA, estimated with two alternative measures of external origin: (1) a dummy variable for the CEO origin, mirroring Haque et al.'s (2022) approach, and (2) the proportion of internal executives on the management board ("internal quota"). All specifications include firm, industry, and quarter fixed effects, and standard errors are clustered at the firm level.

Table 3. Regression Results for internal executives on firm performance (H1)

H1: Internal Executives and Firm Performance (ROA, 2019–2020)

	Dependent variable:	
	ROA	
	Internal CEO	Internal Quota
	(1)	(2)
Internal CEO	0.519	
	(0.673)	
Internal Quota		1.754*
		(0.998)
Firm Size	-1.319	-1.238
	(4.131)	(4.026)
Cash	4.757	4.777
	(6.814)	(6.813)
Leverage	2.452	2.428
	(6.219)	(6.179)
CAPEX	22.177	19.309
	(19.419)	(20.102)
Board Size	-0.234	-0.253
	(0.700)	(0.725)
Female Quota	2.175*	2.038*
	(1.211)	(1.204)
CEO Age	-0.312	-0.719
	(1.699)	(1.603)
Board Age	1.767	2.724
	(4.572)	(4.650)
Constant	6.437	2.128
	(49.018)	(49.943)
Fixed effects: Firm, Industry, Quarter	Yes	Yes
Observations	976	976
Adjusted R^2	0.066	0.068
Note:	*p<0.1; **p<0.05; ***p<0.01	

In Model 1, the coefficient on internal CEO status is positive but statistically insignificant ($\beta = 0.519$, $p > 0.1$), suggesting no evidence of a systematic performance premium for firms led by internally

appointed CEOs. As shown in the left panel of Figure 9, the adjusted ROA line is nearly flat, moving up by roughly 0.5 units from external to internal CEOs, and the 95% confidence interval spans zero across the range, reinforcing the lack of statistical support.

In Model 2, the internal quota is positively associated with ROA and reaches marginal statistical significance ($\beta = 1.754$, $p < 0.1$). Panel B of Figure 9 visualises this relationship over the full range from 0 (0%) to 1 (100%) internal quota, illustrating a steeper upward slope compared to the CEO model. Moving from a fully external to a fully internal executive team is associated with an estimated ROA increase of approximately 1.75 units, although the wide confidence intervals, especially present at both extremes, indicate considerable uncertainty. This pattern suggests that a higher overall share of internally promoted executives, rather than the CEO's origin alone, may be more relevant for enhancing accounting-based performance.

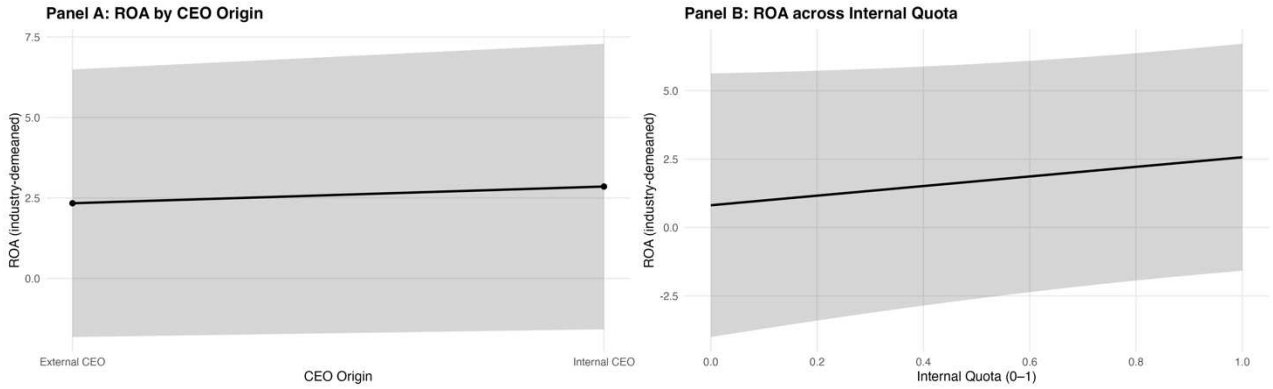

Figure 9. Predicted ROA based on Regression results (H1) for executive origin and firm performance

Among the controls, the female quota is positively associated with ROA at the 10% level in both models (Model 1: $\beta = 2.175$, $p < 0.1$; Model 2: $\beta = 2.038$, $p < 0.1$), while other covariates, such as firm size, leverage, and board size, do not show significant effects.

For completeness, Appendix 3 reports the corresponding Tobin's Q models. Neither internal CEO status ($\beta = -0.049$, $p > 0.1$) nor internal quota ($\beta = 0.003$, $p > 0.1$) shows statistically significant relationships with market-based valuations. This difference in significance between accounting- and market-based measures suggests that potential operational benefits from internal promotions may not be immediately reflected in investor assessments.

Overall, the results provide partial support for Hypothesis 1. While appointing an internal CEO alone does not appear to enhance firm performance, a broader culture of internal executives is associated with modestly higher ROA in the pooled sample. These findings echo prior work by Haque et al. (2022), which found no consistent internal CEO advantage, while extending the analysis to the

German two-tier board context, where board-wide continuity and firm-specific knowledge may matter more than single-position origin.

5.2.2 H2: Crisis Moderation Effect

Hypothesis 2 predicts that the performance benefits of internal executives would be more pronounced during the Covid-19 crisis period, given their firm-specific knowledge and familiarity with organisation-specific processes.

Table 4. Regression Results for internal executives on firm performance during crisis (H2)

H2: Crisis Moderation Effect – Internal Executives and Firm Performance (ROA)

	Dependent variable:			
	ROA			
	Crisis Year (2020)	Crisis Year (2020)	Whole Period (2019-2020)	Whole Period (2019-2020)
	(1)	(2)	(3)	(4)
CEO	-1.824		0.499	
	(1.149)		(0.802)	
Internal Quota		-0.282		1.833*
		(2.806)		(1.017)
Crisis			-0.148	-0.027
			(0.296)	(0.356)
Firm Size	1.422	1.355	-1.079	-1.060
	(8.590)	(8.566)	(4.172)	(4.061)
Cash	-16.179	-16.327	5.290	5.216
	(15.802)	(15.827)	(7.060)	(7.064)
Leverage	24.432**	24.234**	2.924	2.765
	(9.628)	(9.673)	(6.166)	(6.163)
CAPEX	21.670	20.335	16.455	14.860
	(52.969)	(52.749)	(19.382)	(20.247)
Board Size	-3.534*	-3.646*	-0.291	-0.295
	(1.980)	(1.907)	(0.679)	(0.712)
Female Quota	4.112	4.073	2.401**	2.203*
	(3.003)	(3.013)	(1.171)	(1.203)
CEO Age	11.541	10.227	-0.371	-1.029
	(11.343)	(11.080)	(1.702)	(1.660)
Board Age	-12.445	-11.960	2.467	3.580
	(12.760)	(12.470)	(4.476)	(4.770)
CEO × Crisis			-0.271	
			(0.441)	
Internal Quota × Crisis				-0.472
				(0.603)
Constant	-10.680	-6.128	1.492	-1.714
	(87.450)	(83.928)	(48.965)	(50.563)
Firm, Industry, and Quarter FE	Yes	Yes	Yes	Yes
Observations	488	488	976	976
Adjusted R^2	0.077	0.076	0.066	0.067
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 4 reports four regression specifications. Models 1 and 2 are specifically for the 2020 crisis year, while Models 3 and 4 use the pooled 2019–2020 sample and include interaction terms between the internal executive measures and the crisis indicator. All models control for firm, industry, and quarter fixed effects, with standard errors clustered at the firm level.

In the crisis-year-only results, Model 1 (CEO origin) shows a negative but statistically insignificant coefficient ($\beta = -1.824$, $p > 0.1$), while Model 2 (internal quota) yields a small, negative, and insignificant coefficient ($\beta = -0.282$, $p > 0.1$). These estimates suggest no systematic performance premium for internal promotions, neither for the CEO alone nor for the internal quota of the management board, when looking solely at the crisis year.

The pooled interaction models provide a fuller test of the crisis moderation effect. In Model 3, the coefficient on internal CEO status is positive but insignificant ($\beta = 0.499$, $p > 0.1$), and the CEO × Crisis interaction is likewise insignificant ($\beta = -0.271$, $p > 0.1$). In Model 4, the internal quota is positively associated with ROA ($\beta = 1.833$, $p < 0.1$), suggesting a modest general performance link, but the Internal Quota × Crisis term remains insignificant ($\beta = -0.472$, $p > 0.1$), indicating no change of the effect during the pandemic.

Among the controls, leverage is positively associated with ROA at the 5% level in the crisis-only specifications, while the female quota remains positively related to ROA at the 10% level in the models with the whole period. Other covariates do not exhibit consistent or significant effects.

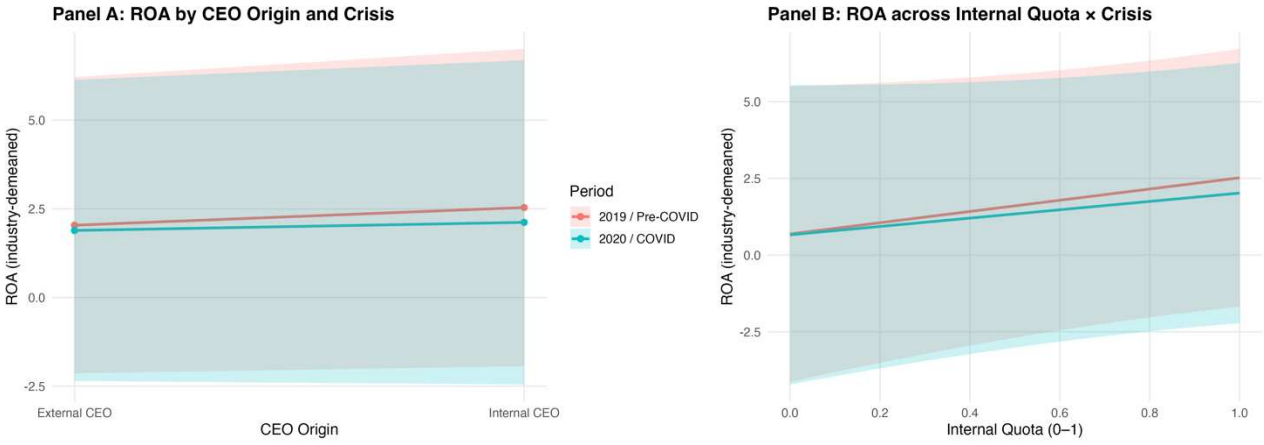

Figure 10. Predicted ROA based on Regression results (H2) for executive origin and firm performance during crisis

Figure 10 visualises the industry-demeaned ROA predictions from the pooled interaction models. Panel A plots CEO origin across pre-crisis and crisis periods, and Panel B plots the internal quota. In both cases, the lines for 2019 (pre-Covid) and 2020 (Covid) run largely parallel, with only minor visible differences in steepness, matching the lack of significant interaction effects in the regression estimates.

For completeness, Appendix 4 presents corresponding Tobin's Q models. Across all specifications, neither the main effects nor the interaction terms are statistically significant, and coefficients remain

small, suggesting no observable market-based performance premium for internal promotions during the crisis.

Overall, the results do not support Hypothesis 2. While only a higher internal quota results in significant correlation with ROA across the full sample, there is no evidence that the relationship between internal quota and ROA changes in times of crisis. This finding contrasts with the expectation that firm-specific knowledge would be especially valuable during disruption and uncertainty. Potential explanations lie in the unique nature of the Covid-19 shock or the moderating influence of the German two-tier governance system.

5.2.3 H3: Cash Holding Effect

Hypothesis 3 proposed that firms with extensive cash reserves, defined as above-median cash holdings relative to their industry peers, would perform better during a crisis. The rationale was that larger liquidity reserves acting as a buffer allow firms to leverage flexibility both from a strategic and financing view, especially when options and external financing are limited in uncertain macroeconomic situations. This allows firms to sustain operations, deal with demand shocks, and continue firm performance on an adaptable level. Furthermore, it was expected that leadership composition could moderate this relationship, with internally appointed CEOs or higher internal executive shares potentially leveraging liquidity more effectively during turbulent times.

To test this, we estimated pooled OLS regressions for 2020 with ROA as the dependent variable, including a “High Cash” dummy (1 = above industry median) and interaction terms with either CEO origin or internal quota. All models control for firm size, leverage, capital expenditures, board characteristics, and fixed effects for firm, industry, and quarter. Standard errors are clustered at the firm level.

Table 5. Regression Results for internal executives and high cash on firm performance during crisis (H3)

H3: Cash Holdings and Crisis Resilience – High Cash Interactions (ROA, 2020)

	Dependent variable:	
	ROA	
	CEO	Internal Quota
	(1)	(2)
High Cash	0.049	0.193
	(1.011)	(0.895)
CEO	-1.817	
	(1.135)	
Internal Quota		-1.058
		(2.797)
Firm Size	1.885	1.658
	(8.746)	(8.786)
Cash	-20.670	-20.246
	(17.803)	(17.860)
Leverage	23.467**	24.189**
	(9.280)	(9.759)
CAPEX	23.453	20.389
	(51.360)	(53.476)
Board Size	-4.054*	-3.684*
	(2.223)	(1.917)
Female Quota	4.286	4.240
	(3.196)	(3.158)
CEO Age	11.843	10.713
	(11.501)	(11.150)
Board Age	-13.806	-12.979
	(13.332)	(12.849)
High Cash × CEO	2.330	
	(1.894)	
High Cash × Internal Quota		1.815
		(2.071)
Constant	-9.330	-6.219
	(86.740)	(83.943)
Firm, Industry, and Quarter FE	Yes	Yes
Observations	488	488
Adjusted R^2	0.079	0.075
Note:		*p<0.1; **p<0.05; ***p<0.01

In the CEO-origin specification (Model 1), the coefficient for high cash holdings is small and statistically insignificant ($\beta = 0.049$, $p > 0.1$). The High Cash × CEO interaction term is also not statistically significant ($\beta = 2.330$, $p > 0.1$), suggesting no distinct crisis-year performance benefit for internally appointed CEOs when liquidity buffers are larger. In the internal quota specification (Model 2), the main effect of high cash holdings remains insignificant ($\beta = 0.193$, $p > 0.1$), as does the High Cash × Internal Quota interaction ($\beta = 1.815$, $p > 0.1$).

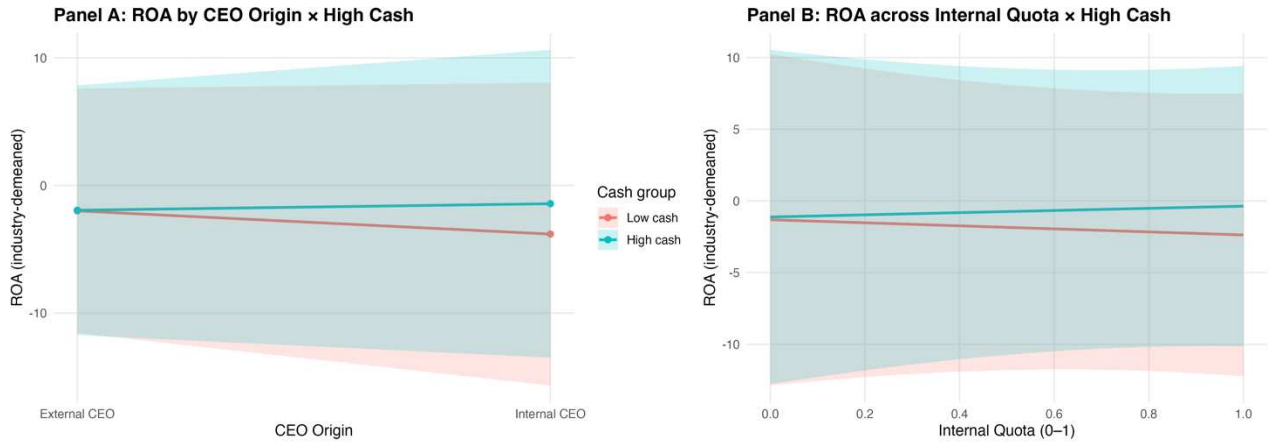

Figure 11. Predicted ROA based on Regression results (H3) for executive origin and High Cash holdings

Figure 11 visualises the adjusted ROA predictions from both models. The left panel shows CEO origin by cash group, and the right panel plots internal quota against cash group. In both cases, the slopes are relatively flat and the confidence intervals overlap substantially, indicating no discernible performance differences between high- and low-cash firms for either leadership measure.

For robustness, the same models were estimated with Tobin's Q as the dependent variable (Appendix 5), and the results were consistent: neither the high cash dummy nor its interaction terms approached statistical significance, and adjusted R^2 values were dominated by firm and industry effects rather than the liquidity variable.

Overall, the regression and visualisation results provide no support for Hypothesis 3. High cash holdings did not show a statistically significant association with ROA during the crisis period, and leadership composition, whether measured by CEO origin or internal quota, did not alter this relationship.

5.2.4 H4: Ownership Influence

The fourth hypothesis investigates whether the ownership share of the strongest investor is associated with board composition, focusing on (1) the probability that the CEO is internally appointed and (2) the proportion of internally promoted executives. Models are estimated using pooled data, controlling for firm size, ROA, and industry fixed effects.

Table 6. Regression Results for ownership concentration and executive origin (H4)

H4: Strongest Investor and Board Composition (2019-2020)

	Dependent variable:	
	CEO Whole Period (2019-2020)	Internal Quota Whole Period (2019-2020)
	(1)	(2)
Strongest Investor	0.033**	0.001
	(0.016)	(0.001)
Crisis	-0.279	-0.031
	(0.260)	(0.023)
Firm Size	0.521***	0.042**
	(0.200)	(0.019)
ROA	0.010	0.002
	(0.023)	(0.003)
Strongest Investor × Crisis	-0.002	0.00001
	(0.008)	(0.001)
Constant	13.933	0.213
		(0.156)
Industry FE	Yes	Yes
Observations	976	976
Adjusted R^2		0.277
Note:	*p<0.1; **p<0.05; ***p<0.01	

In the logistic regression for CEO origin (Model 1), the coefficient on Strongest Investor is positive and statistically significant ($\beta = 0.033$, $p < 0.05$), suggesting that higher ownership concentration by the strongest investor is associated with a greater likelihood of appointing an internal CEO. Firm size is also positively related to the probability of an internal CEO ($\beta = 0.521$, $p < 0.01$). In contrast, the crisis dummy and its interaction with Strongest Investor are not statistically significant, indicating that this relationship does not change meaningfully between the pre-crisis and crisis periods.

In the OLS model for Internal Quota (Model 2), Strongest Investor is again positive but very small and statistically insignificant ($\beta = 0.001$, $p > 0.1$). Firm size remains positively associated with the proportion of internally promoted executives ($\beta = 0.042$, $p < 0.05$), while the crisis variable and interaction term are again insignificant.

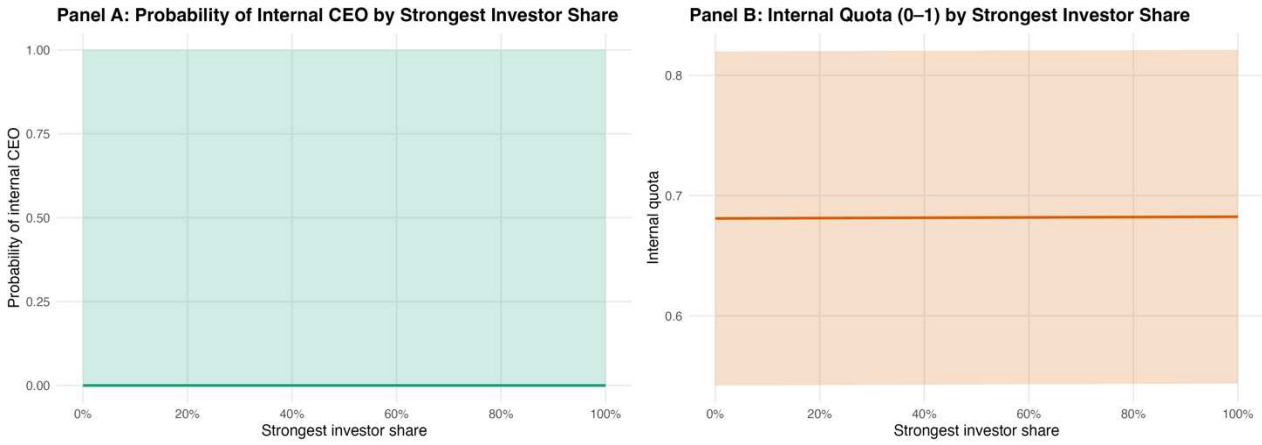

Figure 12. Predicted executive origin based on Regression results (H4)

The visualisations plot the predicted values from each model across the full range of strongest investor ownership shares (0–100%), holding other covariates at their means. The left panel shows a modest upward relationship between ownership concentration and the probability of appointing an internal CEO, while the right panel confirms the absence of a clear trend for Internal Quota. Consistent with the regression results, the presence of the strongest investor appears to influence CEO origin decisions but not the broader composition of the executive board.

Taken together, these results suggest that the presence of the strongest investor is linked to the likelihood of having an internally promoted CEO but does not appear to meaningfully influence the overall share of internally promoted executives on the board. The effect of the crisis period and its interaction with the strongest investor status are negligible in both specifications.

5.2.5 H5: Board Diversity

The hypothesis tests whether a higher proportion of female executives on the management board is associated with stronger firm performance, and whether this relationship differs between the pre-crisis and crisis periods.

Table 7. Regression Results for board diversity and firm performance (H5)

H5: Board Diversity and Crisis Performance (ROA)

	Dependent variable:	
	ROA	
	Crisis Year (2020)	Whole Period (2019-2020)
	(1)	(2)
Female Quota	4.064	2.414*
	(3.001)	(1.255)
Crisis		-0.317
		(0.225)
Female Quota × Crisis		0.125
		(1.139)
Firm Size	1.355	-1.114
	(8.555)	(4.147)
Cash	-16.317	5.444
	(15.811)	(7.070)
Leverage	24.257**	2.904
	(9.593)	(6.170)
CAPEX	20.175	16.861
	(52.703)	(19.554)
Board Size	-3.624*	-0.292
	(1.983)	(0.712)
CEO Age	10.183	-0.325
	(11.108)	(1.696)
Board Age	-11.907	3.199
	(12.668)	(4.737)
Constant	-6.436	-1.191
	(85.161)	(51.442)
Firm, Industry, and Quarter FE	Yes	Yes
Observations	488	976
Adjusted R^2	0.079	0.067
Note:	*p<0.1; **p<0.05; ***p<0.01	

The crisis-year-only results (Model 1) show a positive but statistically insignificant coefficient (β = 4.064, p > 0.1). These estimates suggest no systematic performance premium for female executives in a crisis year alone.

In the pooled model (Model 2), Female Quota shows a positive and marginally significant association with ROA (β = 2.414, p < 0.1). The crisis dummy itself is negative and statistically insignificant (β = -0.317, p > 0.1). The interaction term between Female Quota and Crisis is small and statistically insignificant (β = 0.125, p > 0.1), suggesting no meaningful change in the relationship between gender diversity and performance during the Covid-19 period.

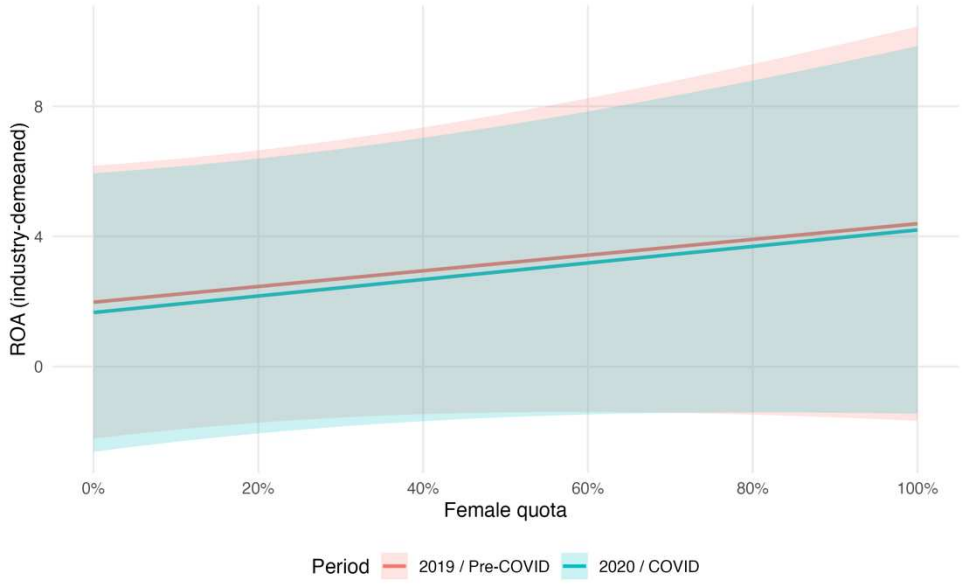

Figure 13. Predicted firm performance based on Regression results (H5) for board diversity

Figure 13 visualises the marginal effects from the pooled model. Predicted ROA increases slightly with higher female representation on the management board in both periods, with the crisis and pre-crisis lines running nearly parallel. The pattern of the visualisation reflects the near identical effect during both years, resulting in an insignificant difference represented through the crisis interaction. The general width of the confidence intervals, especially at both extremes, indicates a high level of uncertainty around the predicted values.

Overall, the results do not provide strong empirical support for the hypothesis that greater female representation on the management board improves firm performance during crisis periods. The only notable result, a marginally significant positive association with ROA in the pooled model, suggests a potential underlying relationship, but its absence in the crisis-year model and across Tobin's Q specifications (Appendix 7) indicates that any such effect is likely limited in magnitude and sensitive to model choice.

5.2.6 H6 Board Diversity and Board Composition during Crisis

This hypothesis examines whether the relationship between board composition, measured either through CEO origin or the proportion of internal executives, and firm performance is moderated by the share of female executives on the management board, and whether these dynamics differ during crisis periods. Firm performance is assessed using ROA, with separate estimations for the crisis year 2020 and pooled models for 2019–2020, including a triple interaction with the crisis indicator.

Table 8. Regression Results for board diversity and executive origin during crisis on firm performance (H6)

H6: Female Quota × Board Composition and Firm Performance (ROA)

	Dependent variable:			
	ROA			
	Crisis Year (2020)	Whole Period (2019-2020)	Crisis Year (2020)	Whole Period (2019-2020)
	(1)	(2)	(3)	(4)
CEO	-1.824	0.658		
	(1.146)	(0.937)		
Internal Quota			1.060	2.146*
			(3.303)	(1.157)
Female Quota	4.822	3.392*	7.203*	3.650*
	(4.069)	(1.831)	(4.302)	(2.085)
Crisis		-0.085		-0.026
		(0.369)		(0.438)
CEO × Female Quota	-2.824	-2.626		
	(5.783)	(2.597)		
CEO × Crisis		-0.401		
		(0.604)		
Female Quota × Crisis		-0.885		
		(1.937)		
CEO × Female Quota × Crisis		1.956		
		(3.025)		
Internal Quota × Female Quota			-9.372	-3.776
			(7.607)	(3.316)
Internal Quota × Crisis				-0.500
				(0.778)
Female Quota × Crisis				-0.498
				(2.107)
Internal Quota × Female Quota × Crisis				1.142
				(3.713)
Constant	-10.759	1.615	-6.391	-1.167
	(87.634)	(49.406)	(84.154)	(50.855)
Other control variables	Included	Included	Included	Included
Firm, Industry, and Quarter FE	Yes	Yes	Yes	Yes
Observations	488	976	488	976
Adjusted R^2	0.074	0.063	0.075	0.064
Note:				*p<0.1; **p<0.05; ***p<0.01

In the CEO origin models, the 2020 specification (Model 1) shows a negative but statistically insignificant coefficient for internal CEO origin (β = -1.824, p > 0.1) and a positive but insignificant coefficient for the female quota (β = 4.822, p > 0.1). The interaction term CEO × Female Quota is negative (β = -2.824, p > 0.1), indicating no reinforcing effect. In the pooled model (Model 2), the female quota remains positive and marginally significant (β = 3.392, p < 0.1), while CEO origin and its interaction with female quota are insignificant. The triple interaction CEO × Female Quota × Crisis is also statistically insignificant (β = 1.956, p > 0.1).

In the internal quota models, the 2020 results (Model 3) indicate a positive and marginally significant association between female quota and ROA (β = 7.203, p < 0.1) and a small, positive, but insignificant coefficient for internal quota (β = 1.060, p > 0.1). The interaction Internal Quota × Female Quota is negative (β = -9.372, p > 0.1). In the pooled model (Model 4), both female quota (β = 3.650, p < 0.1) and internal quota (β = 2.146, p < 0.1) are positively associated with ROA. The interaction term on

the other hand, remains negative and insignificant (β = -3.776, p > 0.1). The triple interaction Internal Quota × Female Quota × Crisis is also insignificant (β = 1.142, p > 0.1).

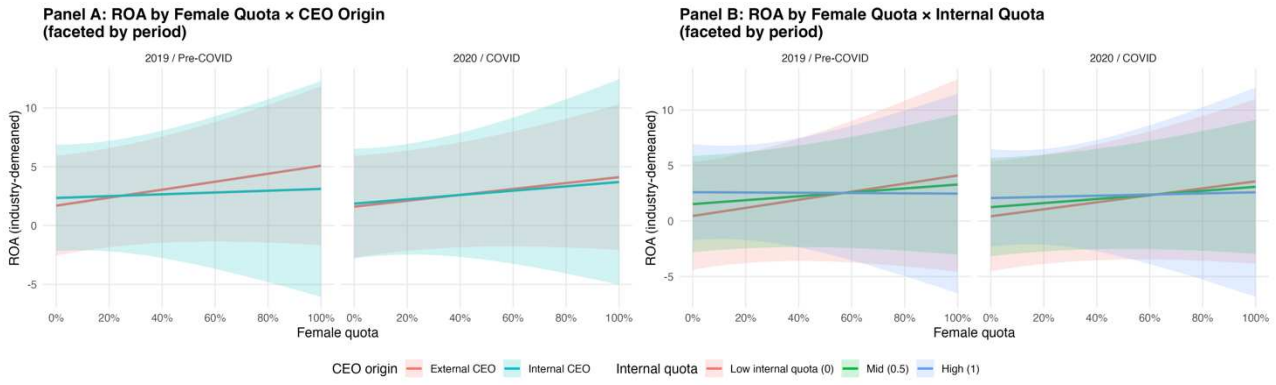

Figure 14. Predicted firm performance based on Regression results (H6) for board diversity and executive origin during crisis

The predicted values from the pooled models are visualised in Figure 14. The left panel plots predicted ROA across female quota levels for internal vs. external CEOs, separately for pre-crisis and crisis periods. The right panel repeats this for low, medium, and high internal quota levels. In both cases, predicted ROA increases with increasing female quota, consistent with the positive main effect in the regressions, but differences between CEO origins or internal quota levels are small, and the confidence intervals are wide, indicating the uncertainty.

Overall, the results provide only limited support for the hypothesis. While the female quota shows a positive association with ROA in both pooled specifications, the moderating effect of the board composition in both interaction levels, two-way and three-way, is rather small and statistically insignificant. This suggests that the performance benefit of a higher gender board diversity does not meaningfully depend on CEO origin or internal executives' share, nor do they systematically change in crisis periods.

5.3 Robustness Checks

To ensure the validity and reliability of the empirical results, multiple robustness checks were conducted. All models were estimated using winsorized data at the 1st and 99th percentiles to limit the influence of potential outliers. Extreme observations and their disproportionally effect on coefficients can be reduced while simultaneously preserving the general structure and variation within the dataset. Regressions estimated with a different level of winsorized data, such as the 2nd and 98th percentiles, showed consistent results with the main findings. This indicates that the results are not driven by a small number of extreme outliers.

As an additional robustness check, random effects (RE) estimations were calculated (Appendix 9 - 14) alongside the main fixed effects (FE) models. To formally test whether FE or RE was more appropriate, a Hausman specification test was conducted for each hypothesis model (Hausman, 1978). In most cases, the test statistics indicated that the null hypothesis of no systematic difference between FE and RE estimates could not be rejected, suggesting that RE was a viable specification. However, given the theoretical rationale for controlling for unobserved firm-specific heterogeneity and the conservative nature of FE estimation, the primary analysis relies on FE results. The consistency between FE and RE specifications, together with the Hausman test outcomes, strengthens confidence in the robustness of the reported findings.

5.4 Key Findings Summary

The results of the empirical analyses, consisting of both descriptive statistics and multivariate regression models, provide a differentiated picture of the relationship between executive origin, board composition, and firm performance in the German two-tier board context during the Covid-19 pandemic.

Across all hypotheses, the empirical results show a nuanced picture of the relationship between the board composition, origin of the CEO and the executive board, and firm performance.

For Hypothesis 1, no statistically significant performance premiums were shown from firms led by internal CEOs. Instead, a higher proportion of internal executives on the executive board provides a positive and statistically significant correlation with ROA as an accounting-based performance over the observation period of 2019 to 2020. This suggests that in the German corporate governance setting, executive board origin is more significant than CEO origin alone.

Hypothesis 2 predicts that this potential performance premium for higher internal quotas would be stronger during a crisis. For this, no results provide evidence to support this statement. Neither the CEO origin nor the internal quota in interaction with the crisis resulted in significant results. This is also contrary to the U.S. findings by Haque et al. (2022). This indicates that the influence of executive origin is rather stable during a crisis and not crisis-leveraging.

With Hypothesis 3, the predicted performance benefit of high cash holdings in a crisis does not materialise, as no interaction effect with any executive origin variable is observed, suggesting that liquidity advantages are not influenced by executive origin.

Hypothesis 4 reveals that the concentration of investors, namely the percentage of equity of the strongest investor in the firm, is associated with a greater likelihood of appointing internal executives, both CEOs and management board members. A significant result was only for the likelihood of internal CEOs being visible, but no significant effect during a crisis was observed.

In Hypothesis 5, female representation on the management board is marginally positively related to ROA. This effect is small and not crisis specific. With Hypothesis 6, the moderating effect of female representation on internal composition and firm performance was tested, but no significant evidence was found for any executive origin variable.

The combination of descriptive statistics and regression results reveals that the differences between internal and external executives and their effect on firm performance in Germany are more structural than performance-driven. Firms led internally tend to be larger and have a higher quota of internal executives. They maintain these characteristics consistently across years and exogenous shocks. Overall, performance gaps between different executive compositions, both in ROA and Tobin's Q, are small and statistically not significant. The broader view on internal quota of the management board, rather than the CEO centric perspective, results in a marginal link to ROA. Neither cash reserves nor crisis conditions moderate this effect. While board diversity rises in general, there is only a limited performance impact of gender diversity in management boards. Taken all together, these findings suggest that in the German governance environment, executive origin plays only a modest role in shaping firm performance. Board composition characteristics as well as institutional safeguards may moderate both risks and opportunities of internal executives during periods of uncertainty.

6 Discussion

6.1 Interpretation of Findings

The empirical evidence presented in this thesis indicates that, within Germany's two-tier corporate governance system, performance differences between firms led by internal and external CEOs are small in magnitude and largely statistically insignificant. Descriptive statistics and visual analyses show that, if anything, the gap in accounting performance decreases during the crisis year, and the more outstanding distinction concerns distribution rather than central tendency. In particular,

externally led firms display a wider spread and more extreme outcomes in ROA during 2020, whereas internally led firms present comparatively tighter distributions around industry-adjusted benchmarks.

The multivariate results reinforce this pattern. Internal CEO status by itself is not associated with a performance premium on either ROA or Tobin's Q, while the broader internal composition of the executive board, captured by the internal quota, shows a modest, marginally significant association with ROA. Taken together, these findings suggest that, in the German context, continuity and firm-specific knowledge are more plausibly team attributes than individual ones. What matters is not the CEO's origin per se but the degree to which the executive board as a whole inhabits accumulated organisational knowledge and routines.

Crisis-specific analyses suggest that the institutional and economic context of Germany during the Covid-19 pandemic may have reduced or mitigated potential performance differences. Therefore, significant effects of executive origin, board composition, and diversity may have been limited. The advantage of firm-specific knowledge, suggested by some theoretical perspectives, has rather been decreased during the crisis, levelling the playing field and reducing any meaningful impact of executive origin. Key aspects that may have led to this reduced effect may lie in the nature of the crisis. While the shock of the crisis came quickly, it influenced all sectors in an equal way and time, and therefore left little room for leadership-specific strategies. Extensive governmental policy interventions, such as "Kurzarbeit", liquidity guarantees, or fiscal reliefs, helped to stabilise firm operations fast and reduced potential negative impacts on financial metrics like ROA. These measures, therefore, may have reduced the possibility for differences in strategies and decision-making processes, which would have resulted in observable gaps in ROA or Tobin's Q.

The lack of significant results regarding cash holding advantages reinforces this interpretation. The Covid-19 crisis primarily constrained demand and mobility, not access to capital markets. Liquidity reserves were partially ensured by governmental securities, but could not be converted into revenue-generating opportunities. This suggests that in the Covid-19 context, excess cash alone was insufficient to generate an accounting performance premium. This may reflect the nature of the pandemic shock, where operational restrictions and demand collapses limited the extent to which financial flexibility could be effectively deployed, particularly in an environment where German-listed firms already maintain conservative liquidity policies. The observed association between ownership and a preference for internal CEO appointments reflects governance preferences rather than direct performance outcomes. This highlights that not all governance characteristics are translatable directly into financial advantages. The steady but slow increase in gender diversity on

executive boards across firms suggests a structural trend, driven by regulation and societal pressure rather than a measurable effect on firm performance in general or in a crisis.

Figure 15. Development of German Stock Indices (DAX, MDAX, SDAX) from 2019 to 2020

The absence of significant findings for Tobin's Q (Appendix 3 – 8) and the small magnitude of ROA effects may, at least in part, be explained by the broader macroeconomic and policy environment of 2020. German equity indices (DAX, MDAX, SDAX) experienced a strong decline in late February and March 2020 as the pandemic unfolded (Figure 15). However, these losses were followed by a rapid recovery beginning in the second quarter, with many sectors regaining most of their lost market value within months. Given the quarterly frequency of the present dataset, the initial drop and subsequent rebound are aggregated into the same period, compressing the volatility and leaving only a small net change. This mechanical smoothing effect reduces the likelihood of detecting leadership-related differences in Tobin's Q, especially when any leadership influence on market valuation would have to compete with sector-wide shocks and recoveries. Compared to the findings of Haque et al. (2022), whose study reports significant effects of the CEO origin on Tobin's Q in the U.S. sample, the results of this thesis should be interpreted with caution for several reasons. The substantially larger sample size and the higher activity of the capital markets in the U.S. may increase the visibility and statistical significance of these effects. The smaller German sample and less dynamic market environment may reduce potential observable relationships. Further, the inclusion of firm, industry, and time fixed effects is necessary to account for unobserved heterogeneity, the resulting adjusted R^2

values for all Tobin's Q models of over 0.9 suggest potential overspecification. This indicates that the fixed effects absorb a portion of the explanatory variation, limiting the potential effects of leadership origin.

6.2 Comparison with Literature

These results contrast with the U.S. evidence reported by Haque et al. (2022), who document a statistically significant performance premium for internal CEOs that widens during a crisis. In the German sample, mean differences are weakened and often insignificant, and volatility is lower for both groups. The difference aligns with institutional arguments that emphasise the segregation of decision rights and monitoring in coordinated market economies (Jackson & Deeg, 2008). Codetermination and the two-tier board structure reduce the centrality of the CEO and integrate leadership within a collective decision-making body (Vitols, 2004). Where CEO discretion is moderated and stakeholder interests are institutionalised, theory would predict compressed performance dispersion across leadership types (Fiss, 2006). Nevertheless, causal evidence from different contexts highlights that CEOs can have a significant influence under situations with less institutionally constrained systems. Unexpected CEO absence leads to significant performance shifts, highlighting the importance and centrality of individual leaders when discretion is higher (Bennedsen et al., 2020). The arising contrast with the findings of this study reinforces the argument that institutional frameworks moderate the magnitude of the impact a CEO has on the firm's outcomes.

The partial association between the internal share of executives and ROA also aligns with work in the resource-based view and upper-echelons traditions that stress the value of firm-specific human capital and shared mental models (Kor & Mahoney, 2005). Yet the fact that internal CEO status itself is not performance-enhancing highlights the limits of CEO-centric explanations in settings where authority is distributed and succession operates through broader pipelines (Crossland & Hambrick, 2011). The limited and non-robust diversity–performance link observed here also echoes an extensive literature that finds small average effects that are highly contingent on context, time horizon, and measurement choices (Post & Byron, 2015). Finally, the null results for cash underscore that the option value of liquidity depends on the nature of the shock and on operational constraints (Bates et al., 2009); a pandemic that limited demand and mobility appears to have restricted the channels through which cash buffers translate into measurable performance benefits.

6.3 Theoretical Implications

The findings contribute to several theoretical debates. First, the findings challenge the crisis-contingent leadership advantage implied by some applications of the RBV and human capital theory. The results show that insider advantage in Germany is stable and incremental rather than situational. Secondly, they stress the moderating role of institutional context on firm performance and crisis resilience, whereas U.S evidence suggests that CEOs can leverage firm-specific knowledge more aggressively during a crisis. Within the German system's collective oversight and two-tier board system, potential leveraging effects are rather reduced and transformed into stable benefits.

The results also refine governance theories that link ownership structure to leadership compositions and characteristics. The association between concentrated ownership and internal CEO appointments suggests that larger shareholders or majority shareholders may favour leaders with deep firm knowledge. Potentially, this roots in the greater trust in their alignment and execution capabilities; however, the absence of an effect on internal quota implies that investor influence may be targeted more at the CEO role, rather than shaping the whole management team.

Lastly, the lack of evidence for a moderating effect for gender diversity on management boards challenges assumptions dealing with synergies between different board composition variables. The independence of these effects indicates that board diversity and board composition or origin may influence firm performance through distinct channels.

6.4 Practical Implications

The findings of this study are relevant for supervisory boards and nomination committees, suggesting adapting the internal succession planning by moving from the CEO centric view to a holistic management board view, extending the appointment strategy to all potential upper management positions. This is aligned with insights from the UET, which emphasises how organisational outcomes are shaped by the characteristics and composition of the entire top management team rather than by a single individual. Building a board with high internal representation may allow steady operational benefits, especially in stakeholder-oriented contexts such as in Germany, even if these benefits are not immediately visible in aspects such as market valuation.

As there is no crisis-specific insider executive premium, this should caution against strong reliance on internal leadership components as a crisis management strategy. While firm-specific knowledge is valuable, it may be only one of many chains in providing the best environment for crisis resilience.

This view needs to be adapted with external knowledge and perspectives, especially during exogenous shocks requiring rapid adaptation. From an RBV perspective, internal experience provides an important but not sufficient firm-specific asset, and it needs to be complemented by external knowledge and perspectives, especially during exogenous shocks that demand rapid adaptation.

Shareholders should note the link between concentrated ownership and internal CEO appointments. The results suggest opportunities in aligning executive succession planning with long-term strategic objectives.

For policymakers, the steady increase in female representation, even during uncertain periods such as crises, underscores the potential effectiveness of quota-based regulation in driving diversity. Nevertheless, the lack of a significant performance effect suggests that such measures should be justified not solely on performance aspects but rather including fairness, representation, and governance quality.

6.5 Limitations

The study's several limitations must be considered when interpreting the results. First, while the two-year observation window of 2019 and 2020 includes both pre-crisis and crisis data, the uniqueness of the Covid-19 pandemic makes these results not universally applicable. Both the length as well as the nature of the crisis do not allow a generalisation to other crises or longer time horizons.

Second, the sample comprises 122 German listed firms, representing only a small size and therefore a variance in company characteristics. Compared to the U.S. study by Haque et al. with over 1200 companies, this study is only based on a smaller sample and therefore might not be able to represent a full picture. Additionally, this study is only focused on publicly listed companies, which excludes a large segment of the German economy, consisting largely of private and family-owned firms (Gabriel & Bitsch, 2019). These may exhibit different leadership performance dynamics.

Thirdly, the application outside of Germany may be limited, as specific corporate governance structures, as well as country-specific macroeconomic situations and governmental crisis support initiatives, vary and may moderate firm performance outcomes in general and crisis years.

Fourth, the definition of internal or external executive is based on the observable career history of the individual. This does not necessarily capture firm-specific knowledge for internal individuals or new external knowledge for external individuals.

Lastly, the use of fixed effects reduces bias from time-invariant unobserved heterogeneity. The analysis remains correlational and cannot fully rule out endogeneity or reverse causality between leadership composition and performance.

6.6 Future Research

Future research could extend the findings of this thesis in several directions. First, analysing a broader dataset, covering longer time horizons and multiple crises, could help in assessing whether the incremental effects observed here are specific to the Covid-19 crisis or generalisable across different crisis durations and types. Second, research on additional executive characteristics, such as career trajectories, international experience, or psychological traits, could provide a deeper understanding of the effect of individual- and team-level factors on firm performance. Third, studies comparing listed firms with private and family-owned firms in Germany could explore whether different kinds of ownership and governance logics result in different performance outcomes of executive origins and compositions. Lastly, cross-country comparisons between coordinated and liberal market economies could allow a better understanding of how institutional environments moderate the performance effects of leadership origin and diversity.

7 Conclusion

This thesis aims to examine whether the executive origin of the CEO and the executive board influence firm performance in the German corporate governance context during crises. The Covid-19 pandemic is used as an example of a recent relevant crisis. By combining quantitative analyses with descriptive and visual exploration, a comprehensive view of executive composition and its potential performance effect has been created.

The central result of the study is that in the German two-tier and stakeholder-oriented corporate governance system, only marginal differences between internally and externally led firms regarding firm performance occur. Results are largely statistically insignificant, and more visible in performance stability than in average outcomes. These results suggest that CEO origin is not a crucial driver of short-term firm performance. However, leadership effects appear to be rather rooted in the origin of the executive board, where firm-specific knowledge and continuity may be bundled and contribute to stability and consistent decision-making.

These patterns remained consistent during the crisis year of 2020. Expected advantages of internal executive leadership in these uncertain conditions were not visible. Additionally, neither high cash holdings nor a greater gender diversity of the executive board resulted in significant short-term firm performance benefits. The observed stability, both visually and analytically, across both periods indicates a strong resilience of the German governance model, stressing the importance of shared executive authority among the executive board as part of a collective leadership structure rather than a CEO centric power concentration.

Viewed in an international context, the results of this study underscore the role of the institutional context in shaping leadership outcomes. More CEO-centric systems, such as in the U.S., leadership origin may produce larger performance premiums, especially in times of crisis. Contrary, in Germany, the structural features of codetermination, supervisory board oversight, and collaborative executive decision making appear to reduce such effects. This compresses differences between executive origin groups while also reducing volatility. These comparative insights stress that leadership research cannot be fully understood without considering external factors such as the institutional framework in which executives and the firm operate.

The overall implication of this study is that leadership succession and composition should be understood within its governance system framework rather than as an isolated strategic aspect. Extended internal succession pipelines and connected executive boards may be valuable for potential benefits regarding stability or coordination, even if they do not directly influence firm performance. Therefore, leadership composition acts rather as an investment in organisational stability and robustness than as a short-term performance driver. This also suggests to investors and supervisory boards that leadership effectiveness should be an incorporated measure of consistency, adaptability, and risk mitigation alongside conventional performance metrics.

The results also align with ongoing debates on corporate governance reforms from a policy perspective. The immediate link between diversity and succession planning may be modest, but for legitimacy, representation, and innovation aspects, they are important factor. The focus should shift to these aspects rather than a long-term strategic and societal context where benefits build up gradually and through multiple indirect channels. Improved decision quality, talent attractions, and stakeholder trust may only be some of the long-term benefits achievable.

While the study inhabits a temporal and national scope, based on the chosen country and crisis, it offers a foundation for further research on how executive composition interacts with institutional context to influence firm performance and stability. Extending the analysis to new coordinated market

economies, analysing different crises, or taking longer time horizons into consideration could provide deeper insights into relevant mechanisms.

Concluding, the evidence from German listed firms suggests that executive effectiveness is less about who occupies the CEO role and what the career background is, but more about how leadership responsibilities are distributed across the executive team. This view shifts the focus from one individual leader to the concept of shared leadership systems, highlighting the value of stability, cohesion, and institutional safeguards, especially in uncertain periods, to ensure consistent firm performance. It also reinforces the idea that leadership research benefits from not solely focusing on universal performance effects, but rather trying to understand the context-specific configurations that enable firms to remain resilient and adaptive in a crisis simultaneously.

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Appendix

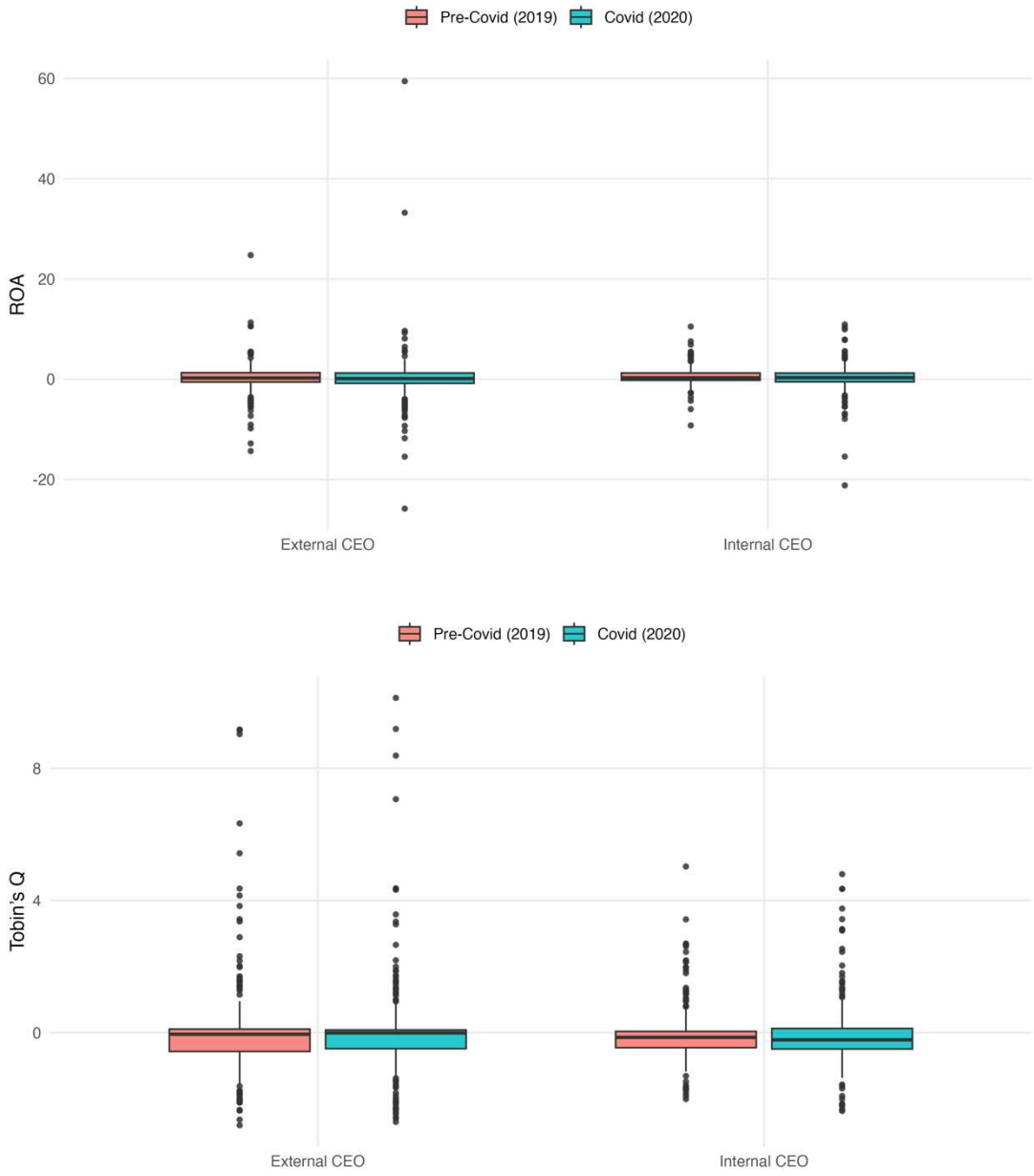
Appendix 1 – Extended Version of the Descriptive Statistics

Descriptive Statistics

Panel A. Pre-Covid (2019)													
Variables	**Internal CEO Sample**						**External CEO Sample**						**Mean Diff.**
	Obs.	Min	Max	Mean	Median	SD	Obs.	Min	Max	Mean	Median	SD	
Revenue	264	12.47	66015	4417.21	904.37	10214.74	224	1.3	11264	1635.88	428.82	2495.05	2781.32***
Sales Growth	264	-0.61	1.54	0.03	0.01	0.23	224	-0.61	1.54	0.05	0.01	0.28	-0.02
Firm Size	264	142.18	298856.75	28077.77	4778.25	63212.47	224	142.18	67006	9252.52	3745.32	14758.11	18825.25***
Stock Return	264	-0.49	0.51	0.03	0.03	0.15	224	-0.61	0.54	0.04	0.06	0.18	-0.01
MV Equity	264	200.69	89079.56	13536.29	4246.26	20919.99	224	169.68	89079.56	6817.34	2371.23	12997.89	6718.95***
MB	264	0.29	13.54	2.83	1.76	2.54	224	0.42	17.17	3.18	1.87	3.71	-0.35
Cash	264	0.5	54.64	10.67	7.10	10.49	224	0.42	54.64	12.18	8.28	11.61	-1.51
Leverage	264	0.2	61.56	25.37	23.90	16.12	224	0.2	61.57	25.44	25.44	14.56	-0.07
CAPEX	264	0	5.13	1.02	0.81	0.91	224	0	5.13	0.89	0.72	0.83	0.14*
ROA_{t+1}	264	-9.23	10.49	0.55	0.27	1.85	224	-14.34	24.73	0.23	0.23	3.3	0.32
$TobinsQ_{t+1}$	264	-2.01	5.03	-0.06	-0.14	0.85	224	-2.8	9.17	0.04	-0.05	1.6	-0.1
$ROA\ (raw)_{t+1}$	264	-11.57	8.53	0.78	0.81	1.74	224	-12.79	17.44	0.66	0.73	2.76	0.12
$Tobin's\ Q\ (raw)_{t+1}$	264	0.2	7.94	1.46	0.98	1.21	224	0.25	11.73	1.5	0.93	1.78	-0.05
High Cash	264	0	1	0.37	0.00	0.48	224	0	1	0.46	0	0.5	-0.09**
CEO Age	264	29	75	55.52	56.00	7.7	224	39	72	54.58	54	6.19	0.94
Board Members	264	2	9	4.58	4.00	1.87	224	2	10	3.78	4	1.47	0.8***
Internal Quota	264	0.2	1	0.71	0.67	0.24	224	0	0.8	0.28	0.25	0.25	0.43***
Female Quota	264	0	0.5	0.07	0.00	0.11	224	0	0.5	0.07	0	0.13	-0.01
Board Age	264	38.5	62.12	53.08	53.33	4.57	224	43.5	59.5	52.56	53	3.12	0.52
Male Age	264	36	63.5	53.22	53.50	4.83	224	43.5	60	52.67	53	3.35	0.55
Female Age	86	42	59	51.81	52.00	4.08	63	42	72	51.1	50	6.32	0.71
Strongest Investor	264	4.33	76.03	29.57	27.50	20.89	224	4.45	70.16	22.73	22.19	15.77	6.84***
Number of Anchor Investors	264	0	7	2.25	2.00	1.36	224	0	7	2.49	2	1.45	-0.24*
Panel B. Covid Period (2020)													
Variables	**Internal CEO Sample**						**External CEO Sample**						**Mean Diff.**
	Obs.	Min	Max	Mean	Median	SD	Obs.	Min	Max	Mean	Median	SD	
Revenue	247	13.92	67398	4372.66	970.2	9485.71	241	1.84	9304	1345.01	382.03	2072.31	3027.65***
Sales Growth	247	-0.61	1.54	0.01	0	0.26	241	-0.61	1.54	0.05	0.01	0.33	-0.04
Firm Size	247	164.86	298856.75	31532.1	6429.9	67604.13	241	142.18	69554	8471.28	3795.19	13572.99	23060.82***
Stock Return	247	-0.71	0.54	0.01	0.06	0.28	241	-0.71	0.54	0.01	0.06	0.29	0
MV Equity	247	169.68	89079.56	14960.04	4226.65	22069.06	241	169.68	58100.3	5366.89	2394.83	8411.26	9593.15***
MB	247	0.29	17.17	3.01	1.73	3.32	241	0.29	17.17	2.94	1.76	3.44	0.08
Cash	247	0.42	54.64	12.2	9.79	10.04	241	0.42	54.64	14.84	9.97	13.72	-2.64**
Leverage	247	0.2	61.57	27.06	26.87	15.34	241	0.2	61.57	27.57	28.27	15.13	-0.51
CAPEX	247	0	5.13	0.9	0.66	0.87	241	0	3.39	0.71	0.58	0.63	0.18***
ROA_{t+1}	247	-21.19	10.91	0.28	0.3	2.83	241	-25.82	59.42	0.2	0.1	5.48	0.08
$TobinsQ_{t+1}$	247	-2.37	4.8	-0.05	-0.22	1.02	241	-2.7	10.13	0.04	-0.01	1.57	-0.09
$ROA\ (raw)_{t+1}$	247	-21.9	11.09	0.54	0.71	2.6	241	-11.31	59.86	0.67	0.64	5.06	-0.13
$Tobin's\ Q\ (raw)_{t+1}$	247	0.22	7.78	1.56	1.01	1.31	241	0.2	12.94	1.54	0.99	1.76	0.02
High Cash	247	0	1	0.39	0	0.49	241	0	1	0.51	1	0.5	-0.12***
CEO Age	247	30	76	55.49	56	7.89	241	40	73	54.51	54	5.78	0.98
Board Members	247	2	9	4.62	4	1.79	241	1	7	3.5	3	1.32	1.13***
Internal Quota	247	0.69	2.08	0.7	0.75	0.24	241	0	0.83	0.26	0.25	0.25	0.44***
Female Quota	247	0.2	1	0.08	0	0.11	241	0	0.5	0.09	0	0.14	-0.01
Board Age	247	38.5	62.12	52.96	53.2	4.43	241	41	61.25	53.26	53.71	3.43	-0.31
Male Age	247	35.75	64.5	53.1	53.4	4.8	241	41	61.25	53.38	53.5	3.6	-0.28
Female Age	95	43	60	51.74	52	4.08	75	31	73	52.24	51	6.69	-0.5
Strongest Investor	247	4.33	76.03	30.71	27.5	21.13	241	4.33	76.03	24.27	21.01	17.3	6.44***
Number of Anchor Investors	247	0	7	2.36	2	1.51	241	0	7	2.51	2	1.4	-0.15

This table reports the descriptive statistics of the variables used in the baseline regression for the pre-Covid period (Panel A) and the Covid period (Panel B). All variables are defined in Table 1. All continuous variables are winsorized at the 1% and 99% levels. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.
For interpretation purposes, Revenue and Firm Size have not been transformed using the natural logarithm. Cash, Leverage, and CAPEX have been multiplied by 100.

Appendix 2 – Uncut distribution of ROA and Tobin's Q grouped by CEO Origin and Year



Appendix 3 – H1: Tobin's Q Model

H1: Internal Executives and Firm Performance (Tobin' Q, 2019–2020)

	Dependent variable:	
	Tobin's Q	
	CEO	Internal Quota
	(1)	(2)
Internal CEO	-0.049	
	(0.045)	
Internal Quota		0.003
		(0.116)
Firm Size	0.139	0.146
	(0.225)	(0.227)
Cash	-0.169	-0.173
	(0.243)	(0.243)
Leverage	0.082	0.077
	(0.206)	(0.207)
CAPEX	-1.361	-1.435
	(3.138)	(3.069)
Board Size	0.109	0.103
	(0.102)	(0.102)
Female Quota	-0.048	-0.048
	(0.228)	(0.229)
CEO Age	-0.013	-0.041
	(0.252)	(0.244)
Board Age	0.060	0.024
	(0.511)	(0.510)
Constant	-1.603	-1.413
	(2.843)	(2.901)
Fixed effects: firm, industry, quarter	Yes	Yes
Observations	976	976
Adjusted R^2	0.949	0.949
Note:	*p<0.1; **p<0.05; ***p<0.01	

Appendix 4 – H2: Tobin's Q Model

H2: Crisis Moderation Effect – Internal Executives and Firm Performance (Tobin's Q)

	Dependent variable:			
	Tobin's Q			
	Crisis Year (2020)	Crisis Year (2020)	Whole Period (2019-2020)	Whole Period (2019-2020)
	(1)	(2)	(3)	(4)
CEO	0.052		-0.059	
	(0.058)		(0.053)	
Internal Quota		-0.076		-0.027
		(0.249)		(0.114)
Crisis			-0.012	-0.028
			(0.039)	(0.050)
Firm Size	-0.185	-0.183	0.139	0.151
	(0.253)	(0.253)	(0.216)	(0.220)
Cash	-0.311	-0.310	-0.162	-0.160
	(0.406)	(0.405)	(0.276)	(0.275)
Leverage	-0.221	-0.222	0.076	0.079
	(0.356)	(0.352)	(0.210)	(0.206)
CAPEX	-0.253	-0.168	-1.345	-1.469
	(3.186)	(3.138)	(3.255)	(3.155)
Board Size	-0.046	-0.049	0.106	0.097
	(0.167)	(0.157)	(0.103)	(0.103)
Female Quota	0.211	0.215	-0.042	-0.033
	(0.241)	(0.241)	(0.222)	(0.222)
CEO Age	-0.157	-0.107	-0.024	-0.025
	(0.879)	(0.840)	(0.247)	(0.253)
Board Age	-0.292	-0.321	0.093	0.021
	(0.967)	(0.947)	(0.509)	(0.508)
CEO × Crisis			0.022	
			(0.053)	
Internal Quota × Crisis				0.058
				(0.085)
Constant	3.781	3.745	-1.676	-1.488
	(4.162)	(4.129)	(2.716)	(2.761)
Firm, Industry, and Quarter FE	Yes	Yes	Yes	Yes
Observations	488	488	976	976
Adjusted R^2	0.973	0.973	0.949	0.949
Note:				*p<0.1; **p<0.05; ***p<0.01

Appendix 5 – H3: Tobin's Q Model

H3: Cash Holdings and Crisis Resilience (Tobin's Q, 2020)

	Dependent variable:	
	Tobin's Q	
	CEO	Internal Quota
	(1)	(2)
High Cash	0.053	0.064
	(0.045)	(0.071)
CEO	0.052	
	(0.058)	
Internal Quota		-0.040
		(0.239)
Firm Size	-0.188	-0.189
	(0.255)	(0.255)
Cash	-0.471	-0.473
	(0.491)	(0.491)
Leverage	-0.219	-0.232
	(0.366)	(0.357)
CAPEX	-0.446	-0.403
	(3.280)	(3.267)
Board Size	-0.045	-0.054
	(0.168)	(0.154)
Female Quota	0.217	0.220
	(0.241)	(0.240)
CEO Age	-0.155	-0.116
	(0.882)	(0.848)
Board Age	-0.288	-0.304
	(0.967)	(0.952)
High Cash × CEO	-0.027	
	(0.057)	
High Cash × Internal Quota		-0.054
		(0.111)
Constant	3.793	3.768
	(4.157)	(4.124)
Firm, Industry, and Quarter FE	Yes	Yes
Observations	488	488
Adjusted R^2	0.973	0.973
Note:	*p<0.1; **p<0.05; ***p<0.01	

Appendix 6 – H4: Tobin's Q Model

H4: Strongest Investor and Firm Performance (Tobin's Q)

	Dependent variable:		
	Tobin's Q		
	Pre-Crisis (2019)	Crisis Year (2020)	Whole Period (2019-2020)
	(1)	(2)	(3)
Strongest Investor	-0.003	0.001	-0.002
	(0.030)	(0.001)	(0.006)
Crisis			0.019
			(0.038)
Firm Size	-0.170	-0.182	0.133
	(0.551)	(0.253)	(0.193)
Cash	-0.475	-0.302	-0.191
	(0.970)	(0.406)	(0.266)
Leverage	-0.480	-0.208	0.056
	(0.658)	(0.356)	(0.209)
CAPEX	-3.089	-0.124	-1.436
	(5.410)	(3.153)	(2.954)
Board Size	-0.141	-0.039	0.103
	(0.121)	(0.169)	(0.100)
Female Quota	0.287	0.208	-0.047
	(0.373)	(0.244)	(0.231)
CEO Age	0.032	-0.136	-0.007
	(0.327)	(0.864)	(0.274)
Board Age	-0.921	-0.274	-0.050
	(0.946)	(0.969)	(0.614)
Strongest Investor × Crisis			-0.001
			(0.001)
Constant	5.874	3.568	-1.114
	(7.499)	(4.147)	(2.312)
Firm, Industry, and Quarter FE	Yes	Yes	Yes
Observations	488	488	976
Adjusted R^2	0.936	0.973	0.949
Note:			*p<0.1; **p<0.05; ***p<0.01

Appendix 7 – H5: Tobin's Q Model

H5: Board Diversity and Crisis Performance (Tobin's Q)

	Dependent variable:	
	Tobin's Q	
	Crisis Year (2020)	Whole Period (2019-2020)
	(1)	(2)
Female Quota	0.212	-0.032
	(0.240)	(0.237)
Crisis		0.004
		(0.033)
Firm Size	-0.183	0.143
	(0.253)	(0.212)
Cash	-0.307	-0.178
	(0.404)	(0.271)
Leverage	-0.216	0.075
	(0.355)	(0.211)
CAPEX	-0.211	-1.390
	(3.164)	(3.242)
Board Size	-0.043	0.104
	(0.167)	(0.105)
CEO Age	-0.119	-0.038
	(0.847)	(0.249)
Board Age	-0.307	0.019
	(0.956)	(0.511)
Female Quota × Crisis		-0.027
		(0.158)
Constant	3.661	-1.369
	(4.131)	(2.654)
Firm, Industry, and Quarter FE	Yes	Yes
Observations	488	976
Adjusted R^2	0.973	0.949
Note:	$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$	

Appendix 8 – H6: Tobin's Q Model

H6: Female Quota × Board Composition and Firm Performance (Tobin's Q)

	Dependent variable:			
	Tobin's Q			
	Crisis Year (2020)	Crisis Year (2020)	Whole Period (2019-2020)	Whole Period (2019-2020)
	(1)	(2)	(3)	(4)
CEO	0.051		-0.057	
	(0.057)		(0.064)	
Internal Quota		-0.182		-0.046
		(0.293)		(0.131)
Female Quota	0.171	-0.032	-0.012	-0.038
	(0.305)	(0.462)	(0.328)	(0.351)
Crisis			-0.003	-0.014
			(0.048)	(0.059)
CEO × Female Quota	0.157		0.018	
	(0.469)		(0.371)	
CEO × Crisis			0.005	
			(0.071)	
Female Quota × Crisis			-0.103	
			(0.226)	
CEO × Female Quota × Crisis			0.202	
			(0.352)	
Internal Quota × Female Quota				0.149
				(0.445)
Internal Quota × Crisis				0.030
				(0.104)
Female Quota × Crisis				-0.185
				(0.263)
Internal Quota × Female Quota × Crisis				0.377
				(0.499)
Constant	3.785	3.765	-1.778	-1.663
	(4.161)	(4.112)	(2.695)	(2.737)
Other Control Variables	Included	Included	Included	Included
Firm, Industry, and Quarter FE	Yes	Yes	Yes	Yes
Observations	488	488	976	976
Adjusted R^2	0.973	0.973	0.949	0.949
Note:				*p<0.1; **p<0.05; ***p<0.01

Appendix 9 – H1: Random Effects Model for ROA and Tobin's Q

H1: Internal Executives and Firm Performance (ROA, 2019–2020): Random Effects

	Dependent variable:	
	ROA	
	Internal CEO	Internal Quota
	(1)	(2)
CEO	0.078	
	(0.261)	
Internal Quota		0.376
		(0.387)
Firm Size	0.042	0.036
	(0.147)	(0.148)
Cash	1.967	2.008
	(2.686)	(2.678)
Leverage	0.014	0.037
	(0.830)	(0.822)
CAPEX	22.074	21.523
	(14.523)	(14.848)
Board Size	0.691*	0.655*
	(0.400)	(0.390)
Female Quota	-0.515	-0.478
	(1.170)	(1.172)
CEO Age	-1.904*	-1.885
	(1.142)	(1.146)
Board Age	-1.157	-1.198
	(2.374)	(2.360)
Constant	10.802	10.832
	(8.061)	(7.998)
Observations	976	976
Note:		*p<0.1; **p<0.05; ***p<0.01

H1: Internal Executives and Firm Performance (Tobin's Q, 2019–2020): Random Effects

	Dependent variable:	
	Tobin's Q	
	Internal CEO	Internal Quota
	(1)	(2)
CEO	-0.062	
	(0.042)	
Internal Quota		-0.002
		(0.097)
Firm Size	-0.090	-0.088
	(0.079)	(0.079)
Cash	0.166	0.168
	(0.280)	(0.282)
Leverage	0.177	0.177
	(0.199)	(0.200)
CAPEX	-0.643	-0.699
	(3.014)	(2.982)
Board Size	0.143*	0.134
	(0.086)	(0.086)
Female Quota	-0.083	-0.080
	(0.210)	(0.210)
CEO Age	-0.107	-0.139
	(0.239)	(0.236)
Board Age	-0.136	-0.176
	(0.546)	(0.540)
Constant	1.508	1.754
	(1.492)	(1.487)
Observations	976	976
Note:		*p<0.1; **p<0.05; ***p<0.01

Appendix 10 – H2: Random Effects Model for ROA and Tobin's Q

H2: Crisis Moderation Effect – Internal Executives and Firm Performance (ROA): Random Effects

	Dependent variable:			
	ROA			
	Crisis Year (2020)	Crisis Year (2020)	Whole Period (2019-2020)	Whole Period (2019-2020)
	(1)	(2)	(3)	(4)
CEO	-0.228		0.243	
	(0.419)		(0.276)	
Internal Quota		-0.088		0.660*
		(0.594)		(0.375)
Crisis			0.034	0.151
			(0.375)	(0.449)
Firm Size	0.126	0.121	0.044	0.039
	(0.187)	(0.189)	(0.147)	(0.148)
Cash	0.030	0.075	2.055	2.063
	(3.744)	(3.737)	(2.652)	(2.648)
Leverage	-0.213	-0.170	0.059	0.064
	(1.404)	(1.381)	(0.859)	(0.857)
CAPEX	32.370	31.440	21.370	21.065
	(21.302)	(21.876)	(14.570)	(14.945)
Board Size	0.543	0.478	0.692*	0.655*
	(0.568)	(0.558)	(0.397)	(0.388)
Female Quota	-0.445	-0.390	-0.484	-0.490
	(1.550)	(1.571)	(1.182)	(1.190)
CEO Age	-1.669	-1.771	-1.882	-1.932*
	(1.590)	(1.582)	(1.164)	(1.155)
Board Age	-5.889	-5.671	-1.188	-1.134
	(4.086)	(3.943)	(2.499)	(2.432)
CEO × Crisis			-0.340	
			(0.444)	
Internal Quota × Crisis				-0.581
				(0.647)
Constant	28.449**	28.031**	10.781	10.651
	(13.780)	(13.509)	(8.248)	(8.124)
Observations	488	488	976	976
Note:				*p<0.1; **p<0.05; ***p<0.01

H2: Crisis Moderation Effect – Internal Executives and Firm Performance (Tobin's Q): Random Effects

	Dependent variable:			
	Tobin's Q			
	Crisis Year (2020)	Crisis Year (2020)	Whole Period (2019-2020)	Whole Period (2019-2020)
	(1)	(2)	(3)	(4)
CEO	0.032		-0.067	
	(0.089)		(0.044)	
Internal Quota		0.031		-0.020
		(0.191)		(0.092)
Crisis			-0.002	-0.013
			(0.036)	(0.046)
Firm Size	-0.169**	-0.169**	-0.092	-0.089
	(0.084)	(0.084)	(0.076)	(0.078)
Cash	0.069	0.072	0.147	0.152
	(0.266)	(0.271)	(0.281)	(0.284)
Leverage	-0.212	-0.208	0.157	0.163
	(0.291)	(0.291)	(0.189)	(0.190)
CAPEX	1.627	1.629	-0.458	-0.542
	(1.843)	(1.831)	(3.212)	(3.149)
Board Size	0.054	0.058	0.143	0.133
	(0.130)	(0.126)	(0.088)	(0.087)
Female Quota	0.165	0.164	-0.086	-0.079
	(0.203)	(0.202)	(0.207)	(0.207)
CEO Age	-0.743	-0.726	-0.111	-0.119
	(0.632)	(0.618)	(0.234)	(0.247)
Board Age	-0.099	-0.105	-0.136	-0.208
	(0.842)	(0.842)	(0.541)	(0.550)
CEO × Crisis			0.021	
			(0.049)	
Internal Quota × Crisis				0.047
				(0.078)
Constant	4.725*	4.673*	1.547	1.820
	(2.744)	(2.691)	(1.469)	(1.463)
Observations	488	488	976	976
Note:				*p<0.1; **p<0.05; ***p<0.01

Appendix 11 – H3: Random Effects Model for ROA and Tobin's Q

H3: Cash Holdings and Crisis Resilience – High Cash Interactions (2020): Random Effects

	Dependent variable:	
	ROA	
	CEO	Internal Quota
	(1)	(2)
High Cash	-0.364	-0.745
	(0.565)	(0.559)
CEO	-0.803	
	(0.504)	
Internal Quota		-1.063
		(0.724)
Firm Size	0.185	0.195
	(0.169)	(0.170)
Cash	-0.352	-0.362
	(4.435)	(4.423)
Leverage	-0.515	-0.673
	(1.437)	(1.446)
CAPEX	34.547	31.820
	(21.195)	(21.976)
Board Size	0.549	0.513
	(0.565)	(0.545)
Female Quota	-0.631	-0.587
	(1.446)	(1.495)
CEO Age	-1.812	-2.048
	(1.560)	(1.570)
Board Age	-5.331	-5.029
	(4.154)	(3.924)
High Cash × CEO	1.232	
	(0.820)	
High Cash × Internal Quota		2.130*
		(1.124)
Constant	26.638*	26.526**
	(13.964)	(13.461)
Observations	488	488
Note:		*p<0.1; **p<0.05; ***p<0.01

H3: Cash Holdings and Crisis Resilience – High Cash Interactions (2020): Random Effects

	Dependent variable:	
	Tobin's Q	
	CEO	Internal Quota
	(1)	(2)
High Cash	0.030	0.040
	(0.038)	(0.058)
CEO	0.037	
	(0.088)	
Internal Quota		0.064
		(0.186)
Firm Size	-0.171**	-0.171**
	(0.085)	(0.085)
Cash	0.019	0.015
	(0.342)	(0.346)
Leverage	-0.206	-0.212
	(0.295)	(0.295)
CAPEX	1.556	1.543
	(1.849)	(1.854)
Board Size	0.060	0.058
	(0.131)	(0.124)
Female Quota	0.166	0.166
	(0.204)	(0.202)
CEO Age	-0.754	-0.744
	(0.633)	(0.620)
Board Age	-0.085	-0.083
	(0.845)	(0.846)
High Cash × CEO	-0.034	
	(0.049)	
High Cash × Internal Quota		-0.054
		(0.089)
Constant	4.721*	4.666*
	(2.755)	(2.701)
Observations	488	488
Note:		*p<0.1; **p<0.05; ***p<0.01

Appendix 12 – H4: Random Effects Model for executive origin

H4: Strongest Investor and Board Composition (2019-2020): Random Effects

	Dependent variable:	
	CEO	Internal Quota
	Whole Period (2019-2020)	Whole Period (2019-2020)
	(1)	(2)
Strongest Investor	0.096	-0.0004
	(0.060)	(0.001)
Crisis	-1.915**	-0.041*
	(0.779)	(0.021)
Firm Size	1.110	0.001
	(0.761)	(0.032)
ROA	0.010	0.001*
	(0.054)	(0.001)
Strongest Investor × Crisis	0.002	0.001
	(0.031)	(0.001)
Constant	15.059	0.619**
	(359,555.200)	(0.246)
Observations	976	976
Note:		*p<0.1; **p<0.05; ***p<0.01

Appendix 13 – H5: Random Effects Model for ROA and Tobin's Q

H5: Board Diversity and Crisis Performance (ROA): Random Effects

	Dependent variable:	
	ROA	
	Crisis Year (2020)	Whole Period (2019–2020)
	(1)	(2)
Female Quota	-0.362	-0.818
	(1.515)	(1.011)
Crisis		-0.190
		(0.261)
Firm Size	0.119	0.046
	(0.182)	(0.144)
Cash	0.104	2.080
	(3.804)	(2.675)
Leverage	-0.162	0.052
	(1.369)	(0.843)
CAPEX	31.155	21.541
	(22.033)	(14.464)
Board Size	0.463	0.705*
	(0.552)	(0.399)
CEO Age	-1.766	-1.899
	(1.573)	(1.161)
Board Age	-5.667	-1.107
	(3.934)	(2.411)
Female Quota × Crisis		0.567
		(1.353)
Constant	27.985**	10.647
	(13.415)	(8.168)
Observations	488	976
Note:		*p<0.1; **p<0.05; ***p<0.01

H5: Board Diversity and Crisis Performance (Tobin's Q): Random Effects

	Dependent variable:	
	Tobin's Q	
	Crisis Year (2020)	Whole Period (2019–2020)
	(1)	(2)
Female Quota	0.163	-0.058
	(0.203)	(0.215)
Crisis		0.016
		(0.034)
Firm Size	-0.168**	-0.093
	(0.085)	(0.076)
Cash	0.069	0.134
	(0.266)	(0.273)
Leverage	-0.212	0.158
	(0.290)	(0.193)
CAPEX	1.642	-0.465
	(1.842)	(3.208)
Board Size	0.057	0.139
	(0.128)	(0.089)
CEO Age	-0.726	-0.130
	(0.617)	(0.238)
Board Age	-0.108	-0.206
	(0.845)	(0.552)
Female Quota × Crisis		-0.054
		(0.157)
Constant	4.696*	1.871
	(2.707)	(1.459)
Observations	488	976
Note:		*p<0.1; **p<0.05; ***p<0.01

Appendix 14 – H6: Random Effects Model for ROA and Tobin's Q

H6: Female Quota × Board Composition and Firm Performance (ROA): Random Effects

	Dependent variable:			
	ROA			
	Crisis Year (2020)	Whole Period (2019-2020)	Crisis Year (2020)	Whole Period (2019-2020)
	(1)	(2)	(3)	(4)
CEO	-0.280	0.239		
	(0.506)	(0.324)		
Internal Quota			-0.065	0.659
			(0.707)	(0.428)
Female Quota	-0.696	-0.775	-0.255	-0.924
	(2.017)	(1.347)	(1.921)	(1.674)
Crisis		0.021		0.092
		(0.482)		(0.562)
CEO × Female Quota	0.702	0.103		
	(2.433)	(1.883)		
CEO × Crisis		-0.405		
		(0.580)		
Female Quota × Crisis		0.194		
		(2.124)		
CEO × Female Quota × Crisis		0.793		
		(2.616)		
Internal Quota × Female Quota			-0.344	0.195
			(2.728)	(2.468)
Internal Quota × Crisis				-0.559
				(0.793)
Female Quota × Crisis				0.796
				(2.300)
Internal Quota × Female Quota × Crisis				-0.368
				(3.310)
Constant	28.498**	10.758	28.025**	10.616
	(13.825)	(8.247)	(13.519)	(8.105)
Other control variables	Included	Included	Included	Included
Observations	488	976	488	976
Note:				*p<0.1; **p<0.05; ***p<0.01

H6: Female Quota × Board Composition and Firm Performance (Tobin's Q): Random Effects

	Dependent variable:			
	Tobin's Q			
	Crisis Year (2020)	Whole Period (2019-2020)	Crisis Year (2020)	Whole Period (2019-2020)
	(1)	(2)	(3)	(4)
CEO	0.021	-0.070		
	(0.090)	(0.054)		
Internal Quota			-0.059	-0.046
			(0.224)	(0.107)
Female Quota	0.073	-0.077	-0.071	-0.111
	(0.264)	(0.304)	(0.391)	(0.328)
Crisis		0.007		0.001
		(0.043)		(0.054)
CEO × Female Quota	0.359	0.112		
	(0.375)	(0.337)		
CEO × Crisis		0.008		
		(0.068)		
Female Quota × Crisis		-0.097		
		(0.212)		
CEO × Female Quota × Crisis		0.137		
		(0.350)		
Internal Quota × Female Quota			0.703	0.240
			(0.677)	(0.414)
Internal Quota × Crisis				0.024
				(0.098)
Female Quota × Crisis				-0.169
				(0.247)
Internal Quota × Female Quota × Crisis				0.292
				(0.486)
Constant	4.742*	1.446	4.605*	1.625
	(2.737)	(1.500)	(2.667)	(1.487)
Other control variables	Included	Included	Included	Included
Observations	488	976	488	976
Note:				*p<0.1; **p<0.05; ***p<0.01