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Cogent Business & Management

Provided in Cooperation with:
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Suggested Citation: Al-Faryan, Mamdouh Abdulaziz Saleh (2024) : Firm-level factors influencing CEO turnover in Saudi Arabia, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 11, Iss. 1, pp. 1-40, https://doi.org/10.1080/23311975.2023.2262710

This Version is available at:
https://hdl.handle.net/10419/325885

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Cogent Business & Management

ISSN: 2331-1975 (Online) Journal homepage: www.tandfonline.com/journals/oabm20

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To cite this article: Mamdouh Abdulaziz Saleh Al-Faryan (2024) Firm-level factors influencing CEO turnover in Saudi Arabia, Cogent Business & Management, 11:1, 2262710, DOI: 10.1080/23311975.2023.2262710

To link to this article: https://doi.org/10.1080/23311975.2023.2262710

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Published online: 13 May 2024.

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COGENT BUSINESS & MANAGEMENT
2024, VOL. 11, NO. 1, 2262710
https://doi.org/10.1080/23311975.2023.2262710

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Firm-level factors influencing CEO turnover in Saudi Arabia

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ABSTRACT

Saudi Arabian firms are evolving from government or family-run businesses to larger corporations due to foreign investments. However, the role of a chief executive officer (CEO) is retained by family members. This study investigates the factors responsible for CEO turnover in Saudi Arabia in relationship to firm performance and compares them against those in other countries. This study is the first to look at CEO turnover in the Saudi context. Using panel data from 169 Saudi firms listed between 2007 and 2014, average marginal effects from a binary probit model, and differences-in-differences analysis, the effects of the following independent variables were assessed: CEO age, retirement age, tenure, pay, shareholdings, duality, board size and composition, firm ownership, and firm performance, with CEO turnover as the binary dependent variable. Results indicated that CEO turnover negatively relates to firm performance, irrespective of whether the dismissal is voluntary or forced, reaffirming a negative turnover—performance sensitivity. Further, CEOs with less than 5% shareholding face a greater likelihood of dismissal by the board, whereas larger shareholders are more entrenched. CEOs in government-owned firms show higher performance-related turnover, while those in family or foreign firms show no such relationship.

ARTICLE HISTORY
Received 20 May 2023
Accepted 20 September 2023

KEYWORDS
CEO turnover; corporate governance; firm performance; forced dismissal; Saudi Arabia; voluntary dismissal

REVIEWING EDITOR
Collins G. Ntim, University of Southampton, United Kingdom

SUBJECTS
Economics; Finance; Business, Management and Accounting

JEL CLASSIFICATION
G32; G34; G38; M12; O16

1. Introduction

The separation of ownership and control gave rise to the agency theory, wherein the management of a firm or "the agent" is held accountable for its performance. Therefore, it can generally be inferred that poor performance can have consequences for CEOs or other managers. The CEOs are responsible for the day-to-day running of the company, based on the strategies set by the board of directors (BOD). However, concerns remain regarding the capability of the board to exercise adequate control in ensuring that the CEO does not deviate from shareholder wealth maximisation (Jensen & Meckling, 1976; Ntim & Soobaroyen, 2013; Shleifer & Vishny, 1997). An effective BOD should have the ability to dismiss the CEO (Fama & Jensen, 1983; Lin, 1996). Fama (1980) argues that the threat of dismissal is the main mechanism available to control the actions of the CEO.

However, the ability and willingness to remove CEOs is contested (Jensen, 1993; Lipton & Lorsch, 1992). The board can fail in its duties to protect shareholder interests if it does not have adequate incentives to avoid attempts by the CEO to limit its influence. In one view, boards have skewed contracts that disproportionately favour the CEO, owing to their ability to set the directors' pay (Bebchuk & Fried, 2003). The internal corporate governance mechanisms of the board are managerial share ownership and managerial pay. These

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are deployed to ensure that the CEO and management adhere to the interests of the shareholders. This is also facilitated by external mechanisms such as the market for corporate control and external auditing. The extent to which such regulatory mechanisms are implemented varies across firms and countries, being influenced by the developmental history of a country's legal and institutional frameworks.

Corporate governance mechanisms differ across firms and an intricate measure of their effectiveness is difficult to obtain, especially when data are limited (Coles et al., 2001). Several studies have focused on CEO turnover as a consequence of poor performance relative to the industry average (Boone et al., 2007; Fredrickson et al., 1988; Linck et al., 2008). The CEO plays the most important role and is ultimately held accountable (Berry et al., 2006). Others have focused on other factors, such as ownership structure and board independence. Barkema and Gomez-Mejia (1998), and Coles et al. (2008) show that board size, structure, and firm characteristics are important variables in terms of CEO turnover. Nelson (2005) studied the influence of CEO characteristics on turnover. Furthermore, CEO turnover is not only related to firm performance but to other characteristics of the firm, CEO, board, and industry. From previous empirical studies, the key determinants of CEO turnover comprise firm performance, firm size, ownership structure, board size, and board characteristics.

The caveat is that most extant studies on corporate control focus on developed economies with limited attention being given to emerging markets such as Saudi Arabia. To the best of our knowledge, no studies have yet explored CEO turnover and firm performance using data from listed Saudi firms. Therefore, to address this gap in the literature, this study analyses CEO turnover using panel data for 169 listed Saudi firms from 2007–2014, to reveal how effective Saudi firms have been in resolving the principal—agent problem in the context of divergent interests between senior management and shareholders. Linking the wealth of the senior management of Saudi firms to firm performance not only aligns the interest of shareholders to those of the management but also disrupts insider alliances between the controlling shareholder and management and, by so doing, helps protect the interests of minority shareholders. By focusing on the CEO and studying the determinants of CEO turnover, we examine the effectiveness of corporate governance. The study also utilises retirement age and CEO tenure in a novel method to test the robustness of the results and examines CEO-turnover—performance sensitivity to investigate the exogenous impact of the 2009 Saudi regulatory changes regarding board composition. Additionally, CEO share ownership is studied to gauge its impact on the CEO turnover—performance relationship. This further contributes to firms' corporate governance choices and mechanisms to counter agency issues by providing information on the impact of CEO ownership as related not just to performance incentives but also to CEO power and the likelihood of CEO turnover. More importantly, the relationship between CEO turnover and firm performance may serve as an important indicator of the functioning of Saudi corporate governance systems and help ascertain whether the corporate governance in listed Saudi firms address the agency problem. This reveals the extent to which Saudi Arabia's corporate governance mechanisms, namely the 2006 corporate governance code and its subsequent updates in 2009 and 2010, can be considered effective. Therefore, exploring the likelihood of CEO turnover provides a proxy for the effectiveness of the regulations and changes in the Saudi market, as opposed to merely studying the relationship between corporate governance and performance. The questions we seek to answer are as follows:

- Is there a negative relationship between the turnover of CEOs and firm performance in Saudi firms?
- Does the board composition of Saudi firms have a positive impact on CEO turnover?
- Do the ownership structures of (a) family-, (b) foreign-, and (c) government-owned firms have a negative relationship with CEO turnover?
- Does a high CEO share ownership have a negative relationship with CEO turnover?
- Is natural turnover, such as retirement, expected to have any relationship with CEO turnover?

The findings are expected to reveal the extent of stock market development in Saudi Arabia, the nature of imitation in relation to Western models, and the extent to which they adhere to the protocols of the OECD.

Relevant quantitative literature suggests that poor performance resulted in CEO turnover in U.S. corporations (Brickley, 2003; Huson et al., 2004; Kaplan & Minton, 2012). Similarly, the composition of the

board, in terms of board size and ratio of independent directors, has also been found to impact the possibility of CEO turnover. In the U.S., the evidence of threat of CEO turnover is obvious in the current dynamics of its capitalist economy (Jenter & Lewellen, 2021; Weisbach, 1988). However, CEO replacement decisions in the U.S. have also shown their effectiveness subsequently (Denis & Denis, 1995). Although strong evidence is lacking, both relations are simultaneously affected by corporate governance mechanisms, except in case of board independence (Hermalin & Weisbach, 2003).

For concrete evidence, we consider several governance variables that affect CEO turnover frequency and firm performance changes following prior declines in Saudi Arabia, in line with previous evidence from the U.S. Our findings confirm that CEO turnover and performance are not only interlinked but corporate governance variables serve as a conjunction between these two variables in a transition economy like Saudi Arabia; moreover, estimation of the determinants of CEO turnover will provide weak evidence in the absence of corporate governance variables. For example, firms with a small board and less representation of non-executive directors have a higher chance of CEO turnover than firms with a big board and with higher external representation. These conditions also affect firm performance under the new CEO; firms with more independent boards show better improvements in performance than firms with insider-dominated boards. Regardless of firm performance, board composition and size are helpful in determining the dynamics of CEO turnover.

Previous literature also highlights that across the different regimes of corporate governance in developed economies, the determinant of CEO turnover does not change. For example, countries such as Japan and Germany, with two tier corporate governance systems, have the same determinants of CEO turnover as their Anglo-American counterparts (Kaplan, 1994a, 1994b; Kaplan & Minton, 2012). However, this phenomenon may differ in economies such as Saudi Arabia that are experiencing legal and structural transitions for several years.

Since prior findings are uncertain and do not provide concrete evidence for the determinants of CEO turnover, evidence from transition economies might be helpful. For instance, literature suggests that a CEO may use their position and power to entrench themselves during their tenure, making the BOD to adapt to them quickly (Hermalin & Weisbach, 2003; Park & Bolton, 2022). In this case, it is likely that the effect of CEO exit probability on firm performance will be inconsistent across their tenure. Alternatively, performance effects could differ if the output of the CEO is not observable, and obtained from the firm performance; here, there must be a gap after assessment before the CEO is blamed for low performance. However, existing research is mostly silent on this issue; therefore, we consider lagged firm performance to capture the CEO turnover issue in Saudi Arabia realistically. Theoretical literature on CEO turnover also suggests that fundamental changes in the governance of the country affects the probability of CEO exits. Prior to this study period, Saudi Arabia introduced major changes in its governance, owing to which we deem this work timely and necessary to determine the current factors influencing CEO turnover.

Usually, the role of corporate governance mechanisms revolves around the hypothesis of the alignment of interests of managers with those of shareholders. In this sense, governance mechanisms are focused on guaranteeing the alignment of interests among all stakeholders. One of the alignment tools available to shareholders is the threat of replacing top peers. To maintain firm performance, this threat must be effective: the possibility that a CEO is replaced must be high when performance declines. Similarly, for CEO turnover to be result oriented, replacement decisions should result in better performance after the appointment of the new CEO. In this study, we extend our analysis to determine, first, whether CEO turnover is a credible and effective threat; and second, whether governance mechanisms influence the credibility and effectiveness of CEO turnover.

This study explores the power dynamics of CEO turnover in Saudi Arabia. Previous work of Boone et al. (2007), Fredrickson et al. (1988), and Linck et al. (2008) only focused on developed markets and may not represent the factors responsible for CEO turnover in Saudi Arabia, which is a transition economy since the last few decades. In Western economies, corporate performance falls under strict corporate governance laws and well-functioning corporate governance mechanisms. However, in Saudi Arabia, corporate governance reforms are relatively recent, introduced only after the stock market crash of 2006 (Al-Faryan, 2020). These have taken the form of internal corporate governance standards and codes, and till date, there are no studies exploring their effect on CEO turnover. Thus, this research in the field of CEO turnover is timely.

Further, this study posits that it is inappropriate to apply developed markets' corporate governance mechanisms in a country that has distinct features such as high ownership concentration, government intervention, weak legal protection, and negligible or under-developed corporate control. Thus, we need to assess and better understand the determinants of CEO turnover in the unique context of Saudi Arabia.

Additionally, several studies link CEO turnover either to board features or firm level characteristics. In contrast, our study considers board features *and* firm level characteristics jointly. From a methodological perspective, we conduct panel data analysis, use average marginal effects from a binary probit model, and the difference-in-differences (DID) method to control endogeneity and capture the determinants of CEO turnover and its sensitivity to firm performance. We also examine CEO ownership, retirement age, and CEO tenure as potential factors influencing turnover, thereby creating a new method to test robustness and investigate the exogenous effect of the 2009 Saudi regulatory changes regarding board composition.

Although the CEO position is critical, the relatively new corporate governance system in Saudi Arabia does not capture potential factors responsible for CEO dismissals. Thus, shareholders in Saudi Arabia are unaware if the factors behind a CEO's dismissal are legitimate. This study provides a better understanding of CEO dismissals in this context. For investor confidence, it is essential that we understand the determinants of CEO turnover to ensure that a CEO's actions are accountable and in the best interest of company shareholders.

2. Background of research

It should be noted that Saudi Arabia is still designated a developing economy and its legal system may be considered to be weak, such as of China (Chen et al., 2006). However, a critical difference between the Saudi and Chinese markets (or any other global market) is that Saudi Arabia is the largest oil-producing nation and its economy is predominantly driven by the price of oil and its exports. Therefore, Saudi Arabia plays a pivotal role globally, making its firms an interesting subject for study from a corporate governance perspective. Furthermore, Aramco is one of the world's largest oil companies and is in the process of being listed on the Saudi stock market. This development is likely to have a positive impact on Saudi corporate governance systems, bringing them on par with those of major firms in the G7 countries.

A feature of the Saudi stock market is that the ownership structure is highly concentrated, although a large portion of shares are owned by retail traders, as the largest group of market participants. Therefore, shareholders can be vulnerable if corporate governance systems are inadequate. The corporate governance mechanisms currently employed in Saudi Arabia are relatively new, and the nature of its market control mechanisms may be deemed uncertain. Comprehensive empirical research would aid our understanding and clarify the extent to which the rules and regulations affect the Saudi stock market. Furthermore, the uncertainty regarding external market mechanisms, culminate in some internal mechanisms having greater prominence in terms of monitoring and scrutinising CEOs, and effecting their dismissal due to poor performance.

Recently, Saudi Arabia opened its markets to foreign investment, in line with its future plans elaborated as "Vision 2030", a diversification strategy. As a part of this, Saudi firms are evolving from government or family businesses to larger public corporations with outside investment; however, family members often retain key roles, such as that of the CEO. For investor confidence, corporate governance needs to play an important role in monitoring these executives and ensuring effective firm performance going forward (Al-Faryan, 2020; Al-Faryan & Alokla, 2023; Ntim et al., 2019; Sun & Jiang, 2022).

In business, the separation of ownership and control can give rise to an agency problem inherent in any relationship, wherein one party is expected to act in the best interest of another. In the case of the CEO, the BOD is responsible for setting firm strategies, whereas the CEO, reporting to the BOD, is responsible for firm performance that benefits all shareholders. Logically, poor performance should have consequences for CEOs. However, in many cases, there are concerns regarding whether the board can exercise adequate control to ensure the CEO maximises shareholder wealth (Jensen & Meckling, 1976; Shleifer & Vishny, 1997). Notably, Fama (1980), Gentry et al. (2021), and Altarawneh et al. (2022) argue that the threat of dismissal is the main mechanism the board uses to control the actions of the CEO.

As an internal governance mechanism, CEO turnover is affected by many factors, including board, firm, and industry characteristics. Previous studies have examined CEO turnover in U.S. public companies as a consequence of poor performance relative to the industry average (Boone et al., 2007; Fredrickson

et al., 1988; Linck et al., 2008), wherein the CEO is ultimately held accountable (Berry et al., 2006). Others examined the influence of factors, such as ownership structure and board independence, on CEO turnover. Barkema and Gomez-Mejia (1998), Nelson (2005), Coles et al. (2008), and Gentry et al. (2021) all show that board size, structure, and firm characteristics are important variables in CEO turnover in listed U.S. firms. The above cited literature does not consider the policy matters introduced in Saudi Arabia in the context of corporate governance reforms. Thus, ignoring the validity of such policy related changes in terms of their effect on CEO turnover in Saudi Arabia can be misleading. Therefore, we enhance our study by additionally addressing this issue from the policy point of view.

3. Theoretical framework

Chief Executive Officer turnover has gained interest and attention from practitioners, researchers, academics, and policymakers across the world because of its potential effect on firm performance. Subsequently, CEO change because of poor firm performance is the main tool available to corporate governance to improve firm performance (Jenter & Kanaan, 2015; Weisbach, 1988). Furthermore, conflict of interest between the CEO, BOD, and corporate executives of the firm is responsible for CEO turnover.

The phenomenon of CEO turnover is covered under the managerial power theory and agency theory. According to the managerial power theory, powerful CEOs want to entrench their position even in times of declining firm performance (Jenter & Kanaan, 2015). They usually blame and remove other executives from key positions to protect their interests (Kaplan, 1994a). Conversely, the agency theory takes the optimal contract perspective, suggesting that BODs can challenge the CEO and become a leading force in CEO turnover (Ursel et al., 2023).

The following literature review focuses on firm performance and CEO turnover sensitivity separately. It also reviews the literature on corporate governance mechanisms. With regard to firm performance and CEO turnover, the literature review suggests that past performance is a prominent factor in gauging the probability of CEO turnover. Shleifer and Vishny's (1997) survey highlights that poor performance generally translates to CEO dismissal (Conyon & Murphy, 2000, Coughlan & Schmidt, 1985; Jenter & Kanaan, 2015; Kaplan & Minton, 2012; Murphy & Zimmerman, 1993; Parrino, 1997; Warner et al., 1988). Huson et al. (2001) and Weisbach (1988) argue that CEO turnover is generally induced by poor firm performance in the U.S. Other studies on developed countries also support this view, including in the U.K (Conyon & Florou, 2002). Germany (Kaplan, 1994b), and Japan (Abe, 1997; Kaplan, 1994a). Renneboog (2000), Suchard et al. (2001), and Lausten (2002) show similar findings for CEO turnover preceded by regressive firm performance in Belgium, Australia, and Denmark, respectively. Brickley (2003) agrees that performance is an important variable affecting CEO turnover but deems the magnitude of the estimated coefficients of the performance variables to be disappointing. Furthermore, Warner et al. (1988), and Conyon and Florou (2002) argue that, although there exists an inverse relationship, the probability of turnover is influenced by extremely good or bad performances. Farrell and Whidbee (2003) investigate the deviation between the earning expectations of analysts' forecasts and actual performance, and argue it has a significant impact on increasing the chances of CEO turnover.

Engel et al. (2003) use 25 years of data to show that accounting and market performance measures are significant factors for turnover likelihood. The authors show that accounting performance measures are more important than market ones, especially since the latter can be influenced by factors beyond the CEO's control. This finding is supported by Chang and Wong (2004), who studied CEO turnover in China and found evidence of negative performance and CEO dismissal, but no relationship between stock returns and CEO turnover. Therefore, CEO turnover can be sensitive to performance measures. The use of performance measures, such as return-on-assets (ROA), return-on-equity (ROE), stock returns, and Tobin's Q, to observe whether managers are replaced due to poor performance is widespread (DeFond & Hung, 2004; Kaplan, 1994b; Volpin, 2002). Meanwhile, Chen et al. (2006) evaluate firm performance using corporate governance variables and gauge its effectiveness.

La Porta et al (1998, 2000). study a large sample of developed and developing economies and argue that countries with poor investor protection laws have poor corporate governance. Volpin (2002) supports this finding and posits that countries with limited corporate governance, such as Italy, would

inevitably fail to motivate CEOs and entrench managers. DeFond and Hung (2004) corroborate this view in their study of 33 countries and conclude that the link between CEO turnover and firm performance is stronger in economies that have better law enforcement. Dahya et al. (2002) found that firms adopting the Cadbury Commission recommendations had increased sensitivity of CEO turnover to firm performance. However, the Cadbury Commission recommendations are voluntary and, thus, cannot be considered an exogenous impact. Chen et al. (2006) studied Chinese firms from 1999 to 2003 and, in addition to finding a relationship between CEO turnover and performance, also show that turnover increased after the enforcement of the China Securities Regulatory Commission, thereby confirming the important role of corporate governance in CEO turnover. Gibson (2003) studies CEO turnover and performance using data of more than 1,000 firms from transitional economies such as Thailand, Taiwan, Malaysia, Mexico, Korea, India, Chile, and Brazil, finding a greater likelihood of CEO turnover when firm performance is poor. Furthermore, Gibson (2003) demonstrated poor corporate governance systems in the analysed transitional economies.

Moreover, Machdar (2019) investigated whether CEO turnover affects the stock market performance of Indonesian listed firms in 103 manufacturing sectors from 2010 to 2015 using a logit regression approach. The study uses performance as the dependent variable and CEO turnover as an independent dummy variable, and finds CEO turnover to have a positive effect on the market performance of the firms in their sample. Altiok-Yilmaz and Akben-Selcuk (2016) also examined the CEO turnover and performance relationship using Turkish data. Focusing on non-financial firms between 2005 and 2014, the findings show that firm performance is negatively related to the likelihood of CEO turnover, which led them to conclude that corporate governance mechanisms are not effective in Turkey. Alabdullah et al. (2016) investigated the relationship between corporate governance and firm performance using CEO turnover as a moderator variable in a sample consisting of 109 non-financial listed firms from Jordan in 2011. In summary, they found that executive turnover has a significant and moderating effect on the relationship between corporate governance mechanisms and firm performance. Elbahar (2016), in his study of CEO turnover in Gulf Cooperation Council (GCC) banks over 2003–2012, included CEO turnover as a dummy control variable to represent the monitoring function of the bank's board and performance as the dependent variable. Using ordinary least squares (OLS), he found negative relationships between CEO turnover and performance in conventional banks, but no significant relationship for Islamic banks. The findings are mixed, which might be due to the sample focusing on the entire GCC instead of individual countries. However, CEO turnover is included as a governance control mechanism in an OLS regression on firm performance, which would suggest that the study did not focus on the impact of poor past performance on CEO turnover. Endogeneity issues were not considered in the study. Based on the above theoretical framework, this study addresses five issues:

1. ***There is a negative relationship between the performance of listed Saudi firms and CEO turnover.*** This is intuitive, since it has been previously argued that poor firm performance results in CEO turnover.
2. ***The board composition of listed Saudi firms should have a positive impact on the CEO turnover resulting from poor performance.*** The extensive literature on board independence indicates a positive relationship with firm performance, which investors perceive to be positively beneficial for the firm (Brunello et al., 2003; Fama 1980; Hwang and Kim 2009; Renneboog and Trojanowski 2003).
3. ***Ownership structure (family, foreign, and government firms) is likely to have a negative relationship with CEO turnover.*** In Saudi Arabia, family-owned firms are likely led by a CEO who is related to the founder or is the founder, whereas government-owned firms may have reduced CEO turnover owing to their prioritisation of social utility over shareholder wealth maximisation. Groves et al. (1995), and Hu and Leung (2012) found that CEO turnover in state-owned firms is inversely related to firm performance, whereas Denis and Serrano (1996) concluded that there is insufficient evidence to show that institutional shareholders contribute to greater CEO turnover via greater scrutiny. However, the fact that foreign firms in Saudi Arabia mainly consist of institutional shareholders because the market was not open prior to the reforms, meant that minimum investment requirements applied. Other studies have also failed to find evidence of significant relationships between ownership structure and CEO turnover.

4. ***A high share ownership of the CEOs of listed Saudi firms is likely to have a negative relationship with CEO turnover.*** This is because entrenchment issues are likely to be present in firms with high CEO ownership, as argued by DeAngelo and DeAngelo (1985), Morck et al. (1988), and Conyon and Florou (2002).
5. ***Natural turnover, such as retirement, is not expected to have any relationship with CEO turnover (as turnover decisions should be based on performance and not age).*** Literature suggests that events such as retirement should not be related to firm performance. However, in reality, results are mixed and the literature does not distinguish between voluntary and involuntary turnover (Billiger & Hallock, 2005; Coles et al., 2014; Denis & Denis, 1995).

We base our hypotheses of the determinants of CEO turnover in Saudi Arabia on the extant research in other countries. We begin by examining the literature on firm performance, CEO turnover sensitivity, and corporate governance mechanisms (Ali et al., 2022; Erena et al., 2022). Figure 1 illustrates our research model, depicting the factors tested as determinants of CEO turnover in Saudi listed firms.

4. Empirical literature review and hypotheses development

4.1. Firm performance and CEO turnover

The literature suggests that past performance is a prominent factor in gauging the probability of CEO turnover. Shleifer and Vishny's (1997) literature survey highlighted that poor performance generally translates to CEO dismissal (Bhagat et al., 2010; Conyon & Murphy, 2000; Gentry et al., 2021; Jenter & Kanaan, 2015; Kaplan & Minton, 2012; Murphy & Zimmerman, 1993; Parrino, 1997; Rachpradit et al., 2012; Warner et al., 1988). Huson et al. (2001) and Weisbach (1988) argue that in the U.S., CEO turnover is generally

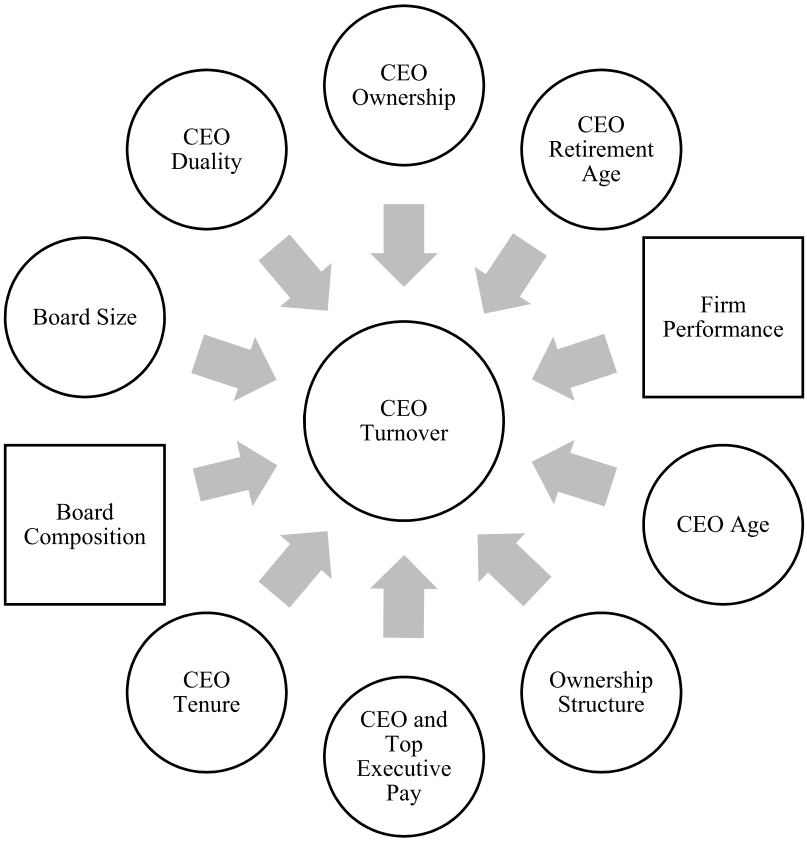

Figure 1. Research model: the factors influencing CEO turnover in Saudi listed firms. Here, the dependent variable is CEO turnover, while firm performance, board size, CEO duality, CEO ownership, retirement age of CEO, board composition, CEO tenure, CEO and top executive pay, ownership structure and CEO age are independent variables.

induced by poor firm performance. Other studies on developed countries support this view, such as Kaplan (1994a) and Abe (1997) in Japan, Kaplan (1994b) in Germany, and Conyon and Florou (2002) in the U.K. Renneboog (2000), Suchard et al. (2001), and Lausten (2002) show similar findings for CEO turnover preceded by deteriorating firm performance in Belgium, Australia, and Denmark, respectively. In France, Dardour et al. (2018) and Qiao (2023) found that a decline in firm performance increases the probability of CEO turnover. Suk et al. (2020) investigated the effect of earning persistence on the negative relationship between CEO turnover and earning performance, and found it to be the most dominant and direct variable explaining CEO turnover. Brickley (2003), and Khurana and Nohria (2000) agree that performance is an important variable affecting CEO turnover, but point out that the magnitude of the estimated coefficients of the performance variables is small. Jenter and Lewellen (2021) and Shahab et al. (2020) support this and argue that extant literature only finds modest effects of performance on CEO turnover. Pi and Lowe (2011), Ursel et al. (2023), and Shahab et al. (2020) studied CEO power and its effect on forced CEO turnover in Chinese firms using five power sources, determining that firm performance has a negative effect on CEO turnover in China.

Dardour et al. (2018) show that only accounting performance affects the probability of CEO turnover. As such, CEO turnover is sensitive to performance measures. The use of performance measures, such as return-on-assets (ROA), return-on-equity (ROE), stock returns, and Tobin's Q, to assess whether managers are being replaced because of poor firm performance has been widely applied (DeFond & Hung, 2004; Huson et al., 2004; Kaplan, 1994b; Volpin, 2002). Chen et al. (2006) evaluated firm performance using corporate governance variables to gauge their effectiveness.

Jenter and Lewellen (2021) adopted a performance-induced CEO turnover viewpoint that turnover would not occur if performance was better. They found a close link between turnover and performance, and estimated that about 38–55% of management turnover is performance-induced. In their review, the authors are critical of studies that classify turnovers as either voluntary or forced. They argue that turnovers classified as "voluntary" are significantly more frequent at low levels of performance, suggesting that they are actually performance-induced, and that such studies may be biased.

Minutti-Meza et al. (2022) investigated whether the likelihood of CEO turnover is affected by firms' past performance, prior to the CEO's appointment. They posit that shareholders update their expectations of the CEO based on past performance, and that CEO turnover—performance sensitivity increases based on the pre-appointment performance of the firm. This relationship is more evident when there are greater levels of uncertainty.

Fu et al. (2020) compare U.S. and China in their study of the effects of past performance and growth prospects on CEO turnover. Both countries show that CEO turnover is affected by poor past performance and growth prospects. They found a higher probability of turnover in China in firms with better growth prospects, indicating that Chinese firms are more aggressive than American ones in their turnover decisions. Ismail et al. (2020) examined the effect of performance on executive turnover in Malaysian listed firms between 2000 and 2015 and found that firms with negative performance have higher turnover.

In terms of other elements, Kim et al. (2021) studied workforce diversity and CEO turnover in Korean firms between 2010 and 2015, and found that firms with frequent CEO turnover show poorer performance. However, firms with greater diversity, such as in gender and education levels, offset or provide a buffer against the disruption caused by frequent CEO turnover on firm performance. Abdullahi and Tanko (2020) looked at Nigerian firms between 2011 and 2015 and found that poor ROA and few female directors on the board increase CEO turnover probability. Frye and Pham (2020) suggest that when poor firm performance results from economic policy uncertainty (EPU), the likelihood of CEO turnover reduces.

Pichard-Stamford (2000) and Alexandre and Paquerot (2000) argue that French corporate governance models are not effective and differ from Anglo-Saxon ones. However, Dardour et al. (2018) state that the shift in French corporate governance towards an Anglo-Saxon model has faced stiff resistance.

Finally, Dasgupta et al. (2018) indicate a greater chance of forced turnover in firms with weaker corporate governance systems. Li (2018) also suggests that CEO turnover—performance sensitivity increases when there is weak corporate governance, a lack of transparency, and entrenchment. Similarly, the recent study by Gentry et al. (2021), the authors explore the different causes behind CEO turnover by considering the S&P 1500 from 2000 to 2018. Their research extends the literature, first, by providing access to a full data set on CEO turnover; second, by coding the reasons behind different CEO dismissals; and

third, by analysing how differences in previous data sets affect the identification of factors responsible for CEO dismissals.

Our study builds on that of Gentry et al. (2021) by focusing on Saudi Arabia, an oil producing country that is gradually moving toward a market economy and increasing the size of its corporate sector. No other study has looked at Saudi Arabia in its current governance environment. With the gradual increase in corporate sector size, there is a need in Saudi Arabia to ensure CEOs are accountable for firm performance in the best interests of current and future shareholders. Thus, we posit the following.

Hypothesis 1: There is a negative relationship between listed Saudi firms' performance and CEO turnover.

4.2. Board of directors

As a pivotal internal governance mechanism (Miyamoto, 2020), the BOD monitors and evaluates the performance of senior management and takes responsibility for the firing and hiring of executives. Past studies on board characteristics indicate that CEO turnover and firm performance correlate with board characteristics. Many studies have analysed board characteristics and their effects on CEO turnover. For instance, Barkema and Gomez-Mejia (1998), and Padungsaksawasdi et al. (2022) argue that four main board characteristics—board composition, board size, board tenure, and leadership structure—influence CEO turnover. Coles et al. (2008) also show that board characteristics, such as structure and size, affect CEO turnover. Volpin (2002) and Gibson (2003) state that CEO turnover appears to be greater in firms with competent governance systems and increases with disappointing prior stock returns.

These studies indicate that boards are working to protect the rights and wealth of shareholders (Al-Matari, 2019; Bonnier & Bruner, 1989; Furtado & Rozeff, 1987; Weisbach, 1988). Lloyd (2001) asserts that the BOD's response to firm performance illustrates an indispensable corporate governance principle. The implication is that CEO turnover is pivotal to a firm's future development (Chang & Wong, 2009). Huson et al. (2001) state that a board's effective internal monitoring increases the probability of forced turnover. Pukthuanthong et al. (2018) studied the relationship between the board and conflict-induced CEO turnover on the strategic direction of the firm, and found that turnover is preceded by significant poor performance, which then improves after CEO replacement. Minutti-Meza et al. (2022) argue that the expectations of the board of its CEO increases prior to appointment. Hermalin (2005) further argues that the board is much more responsive to poor performance when the labour market can increase the supply of potential CEO candidates. Mobbs (2013) states that insiders increase the robustness of the monitoring function by serving as readily available replacements for the CEO. Krigman and Rivolta (2019) studied the roles of non-CEO inside directors (NCIDs) in selecting a new CEO after an unplanned CEO change. Inside directors help in the transitioning process and have valuable information that they pass to the new CEO. Further, the longer the NCIDs stay with the company, the longer is the new CEO's tenure. Additionally, NCIDs have a positive effect on the firm's performance.

Hermalin and Weisbach (1998) argue that CEOs with stronger bargaining capabilities have more passive boards, are more entrenched, and have more CEO-friendly compensation contracts. In a later study, Hermalin and Weisbach (2003) posited that the quality of decisions of the board should also be reviewed. Frye and Pham (2020) argue that board decisions are also influenced by EPU. Considering Russia from 2006–2015, Kim et al. (2020) found that female board representation is associated with a low CEO turnover—performance sensitivity.

4.2.1. Board size

Some studies argue that smaller boards are more effective firm monitors (Jensen, 1993). Yermack (1996) and Wu (2000) state that smaller boards equate to greater efficacy in terms of firm performance, and CEO turnover generally increases when firm performance decreases. Faleye (2003) finds a negative relationship between board size and the relationship between CEO turnover and performance sensitivity. Chakraborty and Sheikh (2008) find that board size has a marginally negative effect on performance-related turnover. However, Liu (2014) studied North American executives and directors and found that board size has a positive relationship with CEO turnover. In contrast, Hazarika et al. (2012) find no evidence that board size

affects CEO turnover. Supporting this, Abdullahi and Tanko (2020) do not find any evidence that larger boards in Nigeria are more effective in enhancing CEO monitoring. Lehn and Zhao (2006) argue that when the board size is appropriate for individual company circumstances, it is unlikely to be a factor in the impact of firm performance on CEO turnover. We test this in Saudi Arabia using the following hypothesis and posit that an increase in board size can reduce CEO turnover by improving firm performance.

Hypothesis 2: Board size negatively affects CEO turnover.

4.2.2. Board composition

External or independent directors are included on a board to monitor and evaluate internal directors (management) who may not hold themselves accountable for poor performance. Fama (1980) and Tahir et al. (2020) state that having independent directors ensures greater board oversight, which is preferred by shareholders and regulators. Other studies argue that independent directors are more effective at monitoring and scrutinising the CEO than grey or inside directors (Wang et al., 2019). Hwang and Kim (2009), and Vieira (2020) find that independent boards can minimise agency expense and managerial entrenchment. Further, Brunello et al. (2003) argue that the proportion of outside board directors increases the sensitivity of CEO turnover to firm performance. Weisbach (1988), Boeker (1992), Huson et al. (2001), and Suchard et al. (2001), all find a negative relationship between the proportion of non-executive directors on the board and CEO turnover.

There are many studies confirming the positive relationship between board independence and firm performance, which investors perceive as beneficial and helpful for firms (Brunello et al., 2003; Fama, 1980; Hwang & Kim, 2009; Renneboog & Trojanowski, 2003). Dardour et al. (2018), and Puffer and Weintrop (1991) support this, arguing that the increased independence of French and U.S. boards improves the monitoring effectiveness of CEOs. Renneboog and Trojanowski (2003) investigated a U.K. sample of 250 firms between 1988 and 1993, and argue that poor performance increases the probability of CEO turnover, whereas an increase in the percentage of non-executive directors decreases the duration of CEO tenure. They deployed a binomial model for CEO turnover and strengthened their results by incorporating duration analysis.

Several studies have investigated other significant factors influencing CEO turnover, including board composition in relation to its size (Yermack, 1996), and the insider and outsider ratio (Boeker & Goodstein, 1993). Weisbach (1988) finds a strong association between CEO turnover and firm performance when boards are composed mostly of external directors. However, other scholars argue that the monitoring costs incurred by independent directors decrease firm effectiveness and performance (Adams & Ferreira, 2007; Jensen, 1993; Masulis & Mobbs, 2011; Raheja, 2005). Harris and Raviv (2008) state that an excessive number of independent directors can exacerbate the free-rider problem that weakens their monitoring function further. Moreover, directors with links and affiliations to the CEO potentially contribute to governance issues and increase the probability of CEO entrenchment. Coles et al. (2014) showed that co-opted directors are less effective as monitors in such cases. Hermalin and Weisbach (2003) indicated that the turnover—performance relationship is weaker if the CEO controls and influences the board, since the co-option acts as a hindrance to the firing of the CEO. Mehran (1995), Jatana (2023), and Ryan and Wiggins (2004) find positive correlation between the number of external directors and the equity proportion in CEO contracts. Perry (1999) argues that, as an incentive, independent directors can hold shares in the firm to ensure effective monitoring and fulfilment of their roles and functions.

Considering the literature, we posit that an increase in the number of independent directors can reduce CEO turnover by improving firm performance.

Hypothesis 3: The board composition of listed Saudi firms have a positive effect on CEO turnover caused by poor performance.

4.3. Firm size

Firm size plays a vital role in the relationship between corporate governance and firm performance (Farooq et al., 2022). Specifically, larger firms show greater sensitivity to CEO turnover as they have a

larger replacement pool (Parrino, 1997). Hazarika et al. (2012) describe a positive relationship between CEO turnover and firm size. Whereas, Pukthuanthong et al. (2018) show that an increase in firm size and a decrease in CEO turnover can improve firm performance. Conversely, Firth et al. (2006) find a negative relationship between the log of firm size and the replacement of a management chairman in Chinese firms, concluding that large firms are more likely to keep their chairmen. One argument in favour of this is that large firms require many skilled managers, who are in short supply; thus, this reduces the likelihood of an executive being replaced. This is supported by Kato and Long (2006a), who also examined this issue in China and determined that larger firms have a lower likelihood of CEO turnover.

However, no study has looked at the impact of firm size on CEO turnover in Saudi Arabia, where firms are growing in size, requiring greater CEO diligence. As such, an increase in firm size may lead to the CEO's dismissal.

Hypothesis 4: Firm size has a negative impact on CEO turnover in Saudi Arabia.

4.4. CEO duality

Hampel (1998) and Cadbury (1992) advocate for the separation of the CEO and board chairman roles. Renneboog and Trojanowski (2003) find that such a role separation can reduce the tenure duration of the CEO. Jensen (1993), and Fama and Jensen (1983) assert that if the CEO is also the chair, then the monitoring ability of the firm decreases. Goyal and Park (2002) support this assertion, as CEO duality centralises power excessively in one person. Boeker (1992) and Dahya et al. (1998) find lower turnover when the CEO is the chair. Pi and Lowe (2011) show that the CEO's structural power reduces the likelihood of forced CEO turnover. Dardour et al. (2018) find CEO duality to have a negative relationship with CEO turnover, as such CEOs are rarely dismissed and likely entrenched, weakening the monitoring role of the board.

Hypothesis 5: CEO duality in listed Saudi firms has a negative effect on CEO turnover.

4.5. Ownership

The ownership structure of a firm also influences its performance (Khan, 2022). Hermalin and Weisbach (2003) argue that CEOs use their position and bargaining ability to appoint boards that are more favourable towards them while controlling the information provided to the board to entrench themselves. Some argue that large block shareholders (or the ownership structure) can limit this agency cost, as they can influence CEO turnover.

4.5.1. Firm ownership type

Ownership type has a bearing on turnover decisions, as different companies have different objectives. Family companies may hire a CEO related to the founder or the CEO could be the founder and have ownership rights, reducing the likelihood of coerced turnover and increasing entrenchment (Chatjuthamard et al., 2022). Dardour et al. (2018) found that in France, family-controlled firms show a reduced probability of CEO turnover. Nguyen (2011) supports this, showing that CEO changes in family firms are scarce, especially when the CEO is the founder or a founding family member. Li (2018) found that family entrenchment is exacerbated when the gap between controlling rights and cash flow rights widens. Investigating 717 firms in Taiwan between 1997 and 2011, the study showed that an increase in ownership by non-family investors in family-owned listed firms relates to increased CEO turnover—performance sensitivity that gets stronger as non-family ownership increases. Awanis and Nasih (2020) studied the probability of CEO turnover in Indonesian family firms between 2011 and 2017, considering the impact of short-term performance on CEO turnover.

Nationalised firms often have less CEO turnover owing to the prioritisation of social utility over shareholder wealth maximisation. Investigating 769 non-listed state-owned enterprises in China between 1980 and 1989, Groves et al. (1995) found that CEO turnover has an inverse relationship with firm performance. They also point to a greater sensitivity between CEO turnover and performance when there are

significant changes in the economy. Hu and Leung (2012) studied Chinese state-owned companies between 2001 and 2005, finding that the probability of CEO dismissal has an inverse relationship with firm performance. Kato and Long (2006a, 2006b) support this finding through their analysis of 638 listed Chinese firms between 1998 and 2002; they found that CEO turnover has a negative correlation with performance, and that this relationship is more sensitive in state-owned firms and private companies. Fu et al. (2020) determined that state-owned enterprises in China are only weakly related to growth and discipline-induced CEO turnover, whereas non-state-owned enterprises have greater growth and discipline-induced turnover. This suggests that state-owned enterprises are not always focused on specific performance or growth targets.

Regarding block shareholders, Kang and Shivdasani (1995), Denis et al. (1997), and Dahya et al. (1998) describe a positive link between large block shareholder presence and the likelihood of greater CEO turnover. In addition, Dardour et al. (2018) show that institutional shareholders affect the CEO turnover—performance relationship. Abdullahi and Tanko (2020) found that Nigerian firms dominated by foreign ownership are more effective in replacing poor-performing CEOs.

However, Chang and Wong (2009) find mixed results between ownership concentration and CEO turnover. Further, Denis and Serrano (1996), Nguyen (2011), and Diala and Houmes (2019) reported insufficient evidence that institutional shareholders contribute to greater CEO turnover via greater scrutiny. However, institutional investors are more active and monitor the firm more closely than other shareholders. Various other studies have failed to find evidence corroborating any significant ownership concentration relationship with turnover (Dahya et al., 2002; Franks et al., 2001; Goyal & Park, 2002; Parrino et al., 2003).

In Saudi Arabia, foreign firms consist mainly of institutional shareholders because the market was closed prior to the reforms, which meant that minimum investment requirements applied. As previously stated, most family-owned firms in Saudi Arabia are likely to include a CEO who is the founder or related to the founder, whereas government-owned firms may have reduced CEO turnover due to the prioritisation of social utility over shareholder wealth maximisation.

We posit that as ownership structures change, preferences for retaining or dismissing an existing CEO will also change. Since ownership structures are gradually transitioning in Saudi Arabia, from state-owned to private firms and from small family firms to larger corporations, these changes may have a negative effect on CEO turnover.

Hypothesis 6: Ownership structure (family, foreign, and government firms) have a negative relationship with CEO turnover.

4.5.2. CEO ownership

To encourage the alignment of CEO and shareholder interests, firms provide shares to management as an incentive. However, CEOs with large holdings can become excessively powerful (DeAngelo & DeAngelo, 1985). As argued by DeAngelo and DeAngelo (1985), Morck et al. (1988), and Conyon and Florou (2002), CEOs with high levels of ownership can also become highly entrenched. For example, Ismail et al. (2020) indicate that Malaysian executives have used their shareholdings to become entrenched and protect themselves from being replaced after poor firm performance. This finding is also supported in the Chinese market by Pi and Lowe (2011), who found that when the CEO is a representative of the largest shareholders, there is less probability of forced CEO turnover. Morck et al. (1988) indicate that managerial ownership is frequently linked to power and influence, which decrease the effectiveness of firm monitoring mechanisms. Denis et al. (1997) corroborate this, finding that the probability of top executives being replaced owing to performance is less when executives hold 5–25% of a firm's stock. Mikkelson and Partch (1997), Dahya et al. (1998), and Goyal and Park (2002) point to a negative relationship between executive turnover and manager shareholdings. Dedman (2003), and Conyon and Florou (2002) support this, showing that manager shareholdings reduce the probability of a change in managers in U.K. firms.

Here, we posit that an increase in CEO ownership provides a shield against dismissal.

Hypothesis 7: High CEO ownership in listed Saudi firms have a negative relationship with CEO turnover.

4.6. CEO characteristics

Several CEO-related factors, such as pay, age, and tenure, have been identified as having an effect on CEO turnover—performance sensitivity. We review these here and consider their impact in Saudi Arabia.

4.6.1. CEO pay and compensation

Chakraborty and Sheikh (2008), found a significant and negative relationship between CEO compensation and turnover. However, CEOs who earn high compensation are less likely to be dismissed because of the extra power they may wield. Several studies suggest that entrenched CEOs and those under weak monitoring systems receive high pay (Borokhovich et al., 1997; Core et al., 1999; Xia & De Beelde, 2020). In such cases, the board's ability to remove the CEO is questionable (Jensen, 1993; Lipton & Lorsch, 1992). Particularly, the board may fail in its role if there are few incentives to avoid attempts by the CEO to limit board influence. Some argue that a board can skew contracts in favour of the CEO disproportionately when CEOs have the ability to influence pay levels (Bebchuk & Fried, 2003). Thus, higher pay may imply greater CEO entrenchment and, with that, a lower likelihood of CEO turnover.

Chen et al. (2019) find that abnormal compensation has a negative effect on CEO turnover likelihood and reduces CEO turnover—performance sensitivity. However, in firms with institutional shareholders, there is less of an adverse effect from abnormal pay (Daryaei & Fattahi, 2020). Daryaei and Fattahi (2020) suggest that abnormal compensation is associated with cronyism and the agency problem. Further, Gao et al. (2012) found that in the U.S., when there is greater institutional ownership, the relationship between pay cuts and CEO turnover is stronger, and more pronounced with respect to poor firm performance. They posit that there is a substitutional relationship between pay cuts and CEO turnover. However, Nguyen (2011) and Dardour et al. (2018) found no evidence that a reduction in CEO compensation influences the likelihood of CEO turnover; that is, it does not affect the decision making behind a CEO change.

Dasgupta et al. (2018) reported that CEO incentive pay is greater in firms with strong governance, and that new outside CEOs receive high incentive levels. Further, firm performance improves after a forced CEO change. Pukthuanthong et al. (2018) found that increasing long-term incentives, and with that, decreasing CEO turnover, improves firm performance.

Here, we posit that as CEO pay increases, there is less CEO turnover and an improvement in firm performance.

Hypothesis 8: Higher CEO pay and compensation reduces the likeliness of CEO dismissal.

4.6.2. CEO age

Allgood and Farrell (2000) showed that older CEOs are less likely to confront turnover decisions than younger ones. Moreover, Jensen and Murphy (1990) report that the likelihood of CEOs being fired due to inadequate performance decreases as they approach retirement age. Kang and Shivdasani (1995), Huson et al. (2001), and Eduardo and Poole (2016) argue that age affects the decision to remove an executive or allow normal turnover through retirement; however, they indicate that age does not relate to forced turnover. Billiger and Hallock (2005) examined data from 1970 to 2000, and discovered a negligible increase in CEO turnover during this timeframe. They argue that 60–70% of the CEO turnover reported in the literature is linked to normal turnover, such as retirement. Coles et al. (2014), Denis and Denis (1995), and Tao and Zhao (2019), argue that it is difficult to classify forced versus voluntary CEO turnover, and forced turnover is often reported as voluntary. However, Huson et al. (2001) attempted to differentiate between voluntary and involuntary turnover in 1,316 cases of CEO succession between 1971 and 1994, thereby identifying an increase in forced turnover and external succession over time. Parrino (1997), looking at a sample period of 20 years, showed that the likelihood of forced turnover is significantly correlated with ROA. Dardour et al. (2018) found CEO age to be a significant factor in explaining differences in CEO turnover in French firms.

We posit that the age of the CEO will influence the decision regarding CEO dismissal related to firm performance.

Hypothesis 9: There is a positive relationship between the CEO's age and the likelihood of CEO turnover.

4.6.3. CEO tenure

Tenure has been linked to CEO turnover—performance sensitivity. On the one hand, as a proxy for CEO power over the board and shareholders, tenure is associated with a CEO's consolidated and entrenched power that solidifies under poor governance mechanisms once they assume office. On the other hand, tenure can also be associated with good governance and superior performance of the CEO in office. Goyal and Park (2002) show that CEOs who have held their positions for longer periods are more likely to have more influential relationships with board members, which can potentially be used to empower them and avoid turnover decisions. Allgood and Farrell (2000) found a negative relationship between firm performance and turnover, conditioned on CEO tenure. A later study by Allgood and Farrell (2003), analysing 1,388 turnover events in the U.S. between 1981 and 1993, reported that the likelihood of the CEO's dismissal increases up to their fifth year, thus implying that newer CEOs are scrutinised more.

Pi and Lowe (2011) found that longer tenure reduces the likelihood of forced CEO turnover. Dikolli et al. (2014) confirmed that, as tenure increases, the likelihood of performance-related dismissal decreases and the intensity with which CEOs are scrutinised declines. The literature also suggests that retirement should not be related to firm performance.

In the context of Saudi Arabia, personal attributes of the CEO, such as age, tenure, and compensation, are not generally studied. However, as they are closely linked with CEO turnover, they should not be ignored. In addition, as the age, tenure, and compensation of the CEO increases, these CEOs can become expensive organisational burdens; thus, they may be more likely to be removed. Accordingly, we posit the following hypothesis.

Hypothesis 10: CEO Tenure has a negative relationship with CEO turnover (and natural turnover, i.e., retirement, will have no relationship with CEO turnover).

5. Research design

5.1. Data and data sources

To investigate the relationship between CEO turnover and firm performance in listed Saudi firms, we collected data from the Saudi Capital Market Authority (CMA), Bloomberg, Mubasher, and the annual reports of firms from 2007–2014. In total, we examined 169 firms using panel data. Moreover, corporate governance reforms in Saudi Arabia were introduced in 2006. Therefore, to observe the immediate effects of these reforms, we used the data from 2007 to 2014 (Naif & Ali, 2020; Rizvi & Hussain, 2022).

By using a panel dataset, we improved on prior methodology that only used cross-sectional data. Murphy (1985), Wintoki et al. (2012), and Sewpersadh (2020) argue that cross-sectional models are inherently flawed and biased owing to omitted variables. However, if omitted variables do not change over time, then relationships can be evaluated more accurately by analysing time-series regressions. As this assumption of unchanging omitted variables is unlikely to hold, we used panel data that combined both cross-sectional and time-series data. This helped control for possible bias that that may have arose from the joint endogeneity of variables (Hermalin & Weisbach, 1988, 1991).

In our study, the dependent variable, CEO turnover, is a dummy variable, which takes the value of 1 when there is CEO turnover, and 0 otherwise. In cases like this, where the dependent variable is a dummy variable, probit models are appropriate (Brunello et al., 2003; Conyon & Florou, 2002; Hubbard et al., 2017). However, Pi and Lowe (2011) are critical of studies using pooled and panel data with logit or probit models, arguing that the between-subject and within-subject effects are omitted, leading to neglected heterogeneity. They recommend the generalised estimating equation (GEE), arguing that it is a more general approach appropriate for analysing panel data.

Furthermore, GEE is non-parametric and averages all the subjects of a population to determine the within-subject covariance structure. In other words, it does not assume that data are generated from a certain distribution but uses moment assumptions to iteratively choose the best coefficient or value to describe the relationship between the dependent variable and the covariates. It estimates the population average effects but not the subject-specific effects. However, it also has limitations and disadvantages. Particularly, as it does not specify a joint distribution or procedure of model selection, there is no

likelihood-based method for the usual statistical inferences, such as for comparing models, testing the goodness of fit, or conducting inferences of the parameters. Therefore, it is often criticised as not being a model but rather an estimation method. It is a quasi-likelihood method where the first mean and covariance assume more importance.

There are no subject-specific estimates needed to study CEO turnover. Thus, the probit model and DID method are more appropriate to control endogeneity, capture the determinants of CEO turnover and its sensitivity to firm performance. In a probit-based analysis, no variable-specific information is lost and, thus, individual relationships are better explained. However, in the GEE method, variable-specific information is lost when using averages, making it difficult to derive conclusions on the CEO turnover relationship.

A further advantage of the probit model is that studies on various aspects of corporate governance use models with specific explanatory variables, many of which overlap and have varying explanatory power. Therefore, we add value to the literature by recognising that heterogeneities exist, and highlight the importance of developing models and techniques that offer reliable conclusions.

5.2. Model presentation and estimation

To investigate CEO turnover, we employed a probit model (Gujarati, 2004), wherein a change in the CEO in a certain year is assigned a value of 1, otherwise 0.

The variables in our model were as follows. The dependent variable was *CEO turnover*, a dummy variable that, as stated above, assumes a value of 1 if the firm replaces its CEO during the year, and 0 otherwise. In other words, it is a categorical variable wherein if CEO turnover occurred in a year it can be categorised as 1 and termed a success, whereas if it did not, it is treated as 0.

The independent variables were denoted as follows. *PERF* refers to firm performance, which includes ROA, ROE, Stock Returns, and Tobin's Q. Furthermore, ROA is the firm's net profit over total assets annually, and ROE is the firm's net profit over total equity annually. Stock Returns are the arithmetic average of monthly stock returns over 12 months. Tobin's Q is the firm's total market capital over total assets. As in previous studies, $PERF_{t-1}$ refers to the firm performance in one lagged period.

We used four firm performance measures to help us assess whether the results were sensitive to specific measures and for robustness. Additionally, ROA and ROE are accounting-based performance measures that are backward looking (Shan & McIver, 2011), whereas Tobin's Q and Stock Returns are market-based measures that are forward looking and capture the value investors place on future firm prospects. Although these are related, they can reflect different results, especially if affected by other factors, such as corporate governance, liquidity, and share price (Demsetz & Villalonga, 2001; Morck et al., 1988). Scholars have argued that Tobin's Q is problematic in corporate governance studies because it is defined as a proxy for future growth opportunities, which is considered a cause rather than a consequence of corporate governance structures (Boone et al., 2007; Lehn et al., 2009; Linck et al., 2008). However, Morck et al. (1988) argue that Tobin's Q reflects firms' intangible assets better than operating performance, as the latter might not fully capture the market expectations of the reforms, especially when there are changes in corporate governance structure and regulations. Therefore, we included Tobin's Q for comparison and robustness.

The control variables included natural logarithms of total assets, leverage, volatility, board size, board composition, CEO duality, CEO ownership, CEO and top executive pay, CEO age, CEO retirement age, and CEO tenure. *Ln(Assets)* refers to the natural algorithm of firm total assets annually, and measures firm size. This is in line with the study of Kalbuana et al. (2023). *Lev* represents leverage, measured as a firm's total liabilities divided by total assets annually. *VOL* denotes volatility, measured using the annualised standard deviation of monthly stock returns. *BS* refers to board size, which is the number of directors on the board in a certain year. *%IB* denotes board composition, measured as the percentage of independent directors on the board in a certain year (number of independent directors divided by total number of directors). *CEO-Dual* denotes CEO duality, a dummy variable that equals 1 if the CEO is the chairperson, and 0 otherwise. *CEO-Shares* refers to the percentage of shares owned by the CEO (total CEO-Shares divided by total firm shares). *CEO-Ex-Pay* denotes the CEO and top executives' total compensation (Saudi Arabian Riyal—SAR), measured as the sum of CEO and senior executive salaries, allowances, in-kind

Table 1. Summary of variables.

Variables	Explanation	Measurement
$CEOturnover_{it}$	CEO turnover is a dummy variable, which takes the value of 1 when there is CEO turnover, and otherwise 0. It is our dependent variable.	1,0
PERF	is firm performance, which includes ROA, ROE, Stock Returns, and Tobin's Q. ROA is the firm's net profit over total assets annually. ROE is firm's net profit over total equity annually. Stock Returns is arithmetic average of monthly stock returns over 12 months. Tobin's Q is firm's total market capital over total assets.	Percentage
Ln(Assets)	is the natural algorithm of firm total assets annually, and measures firm size.	Natural Logarithm
Lev	is leverage, measured as a firm's total liabilities divided by total assets annually.	Percentage
VOL	is volatility, measured using the annualised standard deviation of monthly stock returns.	Standard Deviation
BS	is board size, which is the number of directors on the board in a certain year.	Number
%IB	is board composition, as the percentage of independent directors on the board in a certain year (number of independent directors divided by total number of directors).	Percentage
CEO-Dual	is CEO duality, a dummy variable that equals 1 if the CEO is the chairperson, and otherwise 0.	1,0
CEO-Shares	is the percentage of shares owned by the CEO. (total CEO-shares divided by total firm shares)	Percentage
CEO-Ex-Pay	is the CEO and top executive pay (Saudi Arabian Riyal - SAR), as the sum of CEO and senior executive salaries, allowances, in-kind benefits, and end of service bonuses, calculated annually.	Amount
CEO^{Age}	is the age of the CEO.	Number
CEO-Ten	is the CEO's tenure, as the number of years in office.	Number

benefits, and end of service bonuses, calculated annually. CEO^{Age} is the age of the CEO. *CEO-Ten* is the CEO's tenure, measured as the number of years in office. Z_{t-1} is the vector of control variables in one lagged period. The vector was lagged one period to mitigate endogeneity concerns, as firm performance in year y_{t-1} affects the turnover decision in year y_t. The summary of the variables is provided in the Table 1.

Control variables can influence and change according to CEO turnover because they are dependent, whereas firm performance is independent. This can improve estimates and eliminate the omitted variable bias of past studies (Baysinger & Butler, 1985; MacAvoy et al., 1983; McConnell & Servaes, 1990). Natural logarithms were used to aid in the interpretation of the results by reducing skewness in firm size distribution (Murphy, 1985) and transforming the data from bounded to unbounded (Al-Faryan, 2021; Demsetz & Lehn, 1985).

Y was assumed as a response variable that is binary and takes two possible outcomes that are denoted as 1 and 0. *Y* represented the presence or absence of a certain condition, such as success or failure of some device or a yes-or-no situation. Furthermore, *X* was taken as a vector of regressors believed to influence *Y*. To investigate CEO turnover, this study employed a probit model (Gujarati, 2004), where a change in the CEO in a certain year was taken as 1, and otherwise 0. We assumed that the turnover decision depended on an unobservable utility index I_i, also referred to as the latent variable, which is determined by one or more explanatory variables, expressed as

$$I_i = \alpha + \beta X_{it}, \tag{1}$$

where *X* is the explanatory variables vector. To understand how the index is related to the actual decision to change the CEO, let $Y = 1$ if the CEO is changed and $Y = 0$ if there is no change. Assuming a critical level of the index, I^*, such that if I_i exceeds I^* the CEO is changed, threshold I^*, like I_i, is not observable, but assumed to be normally distributed with the same mean and variance. It is possible to estimate the parameters of the given index as well as obtain information on the unobservable index itself. Given the assumption of normality, the probability that I^* is less than or equal to I_i can be computed from the standardised normal cumulative distribution function (CDF) as:

$$P_i = P(Y = 1|X) = P(I^* \le I_i) = P(Z_i \le \alpha + \beta X_{it}) = F(\alpha + \beta X_{it}), \tag{2}$$

where $P(Y = 1|X)$ is the probability that an event occurs given the values of the explanatory variables and Z_i is the standard normal variable, that is, $Z \sim N(0, \sigma^2)$. F is the standard normal CDF, which is written as:

$$F(I_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{I_i} e^{-z^2} dz \tag{3}$$

$$F(I_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\alpha+\beta X_{it}} e^{-z^2} dz. \tag{4}$$

Since P represents the probability that an event will occur, that is, the probability that the CEO will be changed, it is measured by the area of the standard normal curve, from $-\infty$ to I_i. Further, to obtain information on utility index I_i and on α and βX_{it}, the inverse of:

$$P_i = P(Y = 1 | X) = P(I^* \le I_i) = P(Z_i \le \alpha + \beta X_{it}) = F(\alpha + \beta X_{it}) \tag{5}$$

was taken to obtain

$$I_i = F^{-1}(I_i) = F^{-1}(P_i) = \alpha + \beta X_{it}, \tag{6}$$

where F^{-1} is the inverse of the normal distribution CDF.

The variables included in the model were as follows:

CEO turnover = dummy variable that equals 1 if the firm replaces its CEO during the year, and otherwise 0.

$PERF_{t-1}$ = firm performance in one lagged period. ROA, ROE, Stock Returns, and Tobin's Q were used.

Z_{t-1} = vector of control variables in one lagged period.

The control variables included natural logarithms of total assets, leverage, volatility, board size, board composition, CEO duality, CEO ownership, CEO and top executive pay, CEO age, retirement age of CEO, and CEO tenure. The vector of control variables was in one lagged period to mitigate endogeneity concerns, since firm performance in year y_{t-1} affects the turnover decision in year y_t. The following model was used for the baseline regression:

$$\begin{aligned} CEO\,turnover_{it} = {} & \beta_{it} PERF_{t-1} + \beta_{it} Ln\,Assets_{t-1} + \beta_{it} Lev_{t-1} + \beta_{it} VOL_{t-1} + \beta_{it} BS_{t-1} + \beta_{it} \%IB_{t-1} \\ & + \beta_{it} CEO - Dual_{t-1} + \beta_{it} CEO - Shares_{t-1} + \beta_{it} CEO - Ex - Pay_{t-1} \\ & + \beta_{it} CEO^{Age}{}_{t-1} + \beta_{it} CEO - Ten_{t-1} + \varepsilon_{it}, \end{aligned} \tag{7}$$

where

CEO turnover = dependent dummy variable that takes 1 if CEO was changed, and 0 otherwise.

The independent variables were as follows:

PERF = firm performance (ROA, ROE, Stock Returns, and Tobin's Q).

ROA = firm's net profit over total assets annually.

ROE = firm's net profit over total equity annually.

Stock Returns = arithmetic average of monthly stock returns over 12 months.

Tobin's Q = firm's total market capital over total assets.

Ln(Assets) = natural algorithm of firm total assets annually, measures firm size.

Lev = leverage, measured as firm's total liabilities divided by its total assets annually.

VOL = volatility, measured using annualised standard deviation of monthly stock returns.

BS = board size, which is the number of directors on the board in a certain year.

%IB = board composition, measured as the percentage of independent directors on the board in a certain year (number of independent directors divided by total number of directors).

CEO-Dual = CEO duality, as a dummy variable that equals 1 if the CEO is the chairperson, and 0 otherwise.

CEO-Shares = percentage of shares owned by the CEO (total CEO-shares divided by total firm shares).

CEO-Ex-Pay = CEO and top executives pay (SAR), as the sum of CEO and senior executive salaries, allowances, and in-kind benefits and end of service bonuses, calculated annually.

CEO^{Age} = age of CEO.

CEO-Ten = CEO tenure, as number of years in office.

We used the following model for our baseline regression.

$$CEO\,turnover_{it} = \beta_1 PERF_{it-1} + \beta_2 Ln\,Assets_{it-1} + \beta_3 Lev_{it-1} + \beta_4 VOL_{it-1} + \beta_5 BS_{it-1} + \beta_6 \%IB_{it-1} + \beta_7 CEO-Dual_{it-1} + \beta_8 CEO-Shares_{it-1} + \beta_9 CEO-Ex-Pay_{it-1} + \beta_{10} CEO^{Age}{}_{it-1} + \beta_{11} CEO-Ten_{it-1} + \varepsilon_{it} \quad (8)$$

5.3. Robustness tests

5.3.1. CEO turnover and firm loss performance (monitoring effect)

We estimated the following model to capture the effects of losses on CEO turnover:

$$CEO\,turnover_{it} = \beta_1 loss\ PERF_{it-1} + \beta_2 Ln\,Assets_{it-1} + \beta_3 Lev_{it-1} + \beta_4 VOL_{it-1} + \beta_5 BS_{it-1} + \beta_6 \%IB_{it-1} + \beta_7 CEO-Dual_{it-1} + \beta_8 CEO-Shares_{it-1} + \beta_9 CEO-Ex-Pay_{it-1} + \beta_{10} CEO^{Age}{}_{it-1} + \beta_{11} CEO-Ten_{it-1} + \varepsilon_{it} \quad (9)$$

where *loss PERF* is the negative performance based on ROA, ROE, and Stock Returns. This is a dummy variable that equals 1 if a firm has a negative performance, and otherwise 0.

5.3.2. Effect of board composition regulations on CEO turnover

In 2009, the Saudi CMA announced that listed Saudi firms must have at least two independent directors or one-third of the board represented by independent directors, whichever is greater. We tested this exogenous effect on CEO turnover—performance sensitivity using the DID method, which generates two variables. The first is the dummy variable *Post* that equals 1 for the years after the regulation from 2009 to 2014, and otherwise 0. The second dummy variable, *Treat*, equals 1 if the firm is compliant with the new regulations, and otherwise 0. We then generated interaction terms between *Treat* and *Post*; *Treat* and *Performance*; and *Treat*, *Post*, and *Performance*. The triple interaction captured individual effects. The DID method is widely used in finance and economics to tackle endogeneity issues (Bertrand & Mullainathan, 2003). This change in regulation in Saudi Arabia engenders a more desirable natural experiment to study board composition and the CEO turnover—performance relationship. The DID method requires that firms are also present in the sample prior to the exogenous shock or regulation change (by the end of 2008). Thus, we excluded 43 companies from the sample of 169. We estimated the following model using the DID method.

$$CEO\,turnover_{it} = \beta_1 (Treat * Post)_{it-1} + \beta_2 (Treat * PERF)_{it-1} + \beta_3 (Treat * Post * PERF)_{it-1} + \beta_4 Ln\,Aseets_{it-1} + \beta_5 Lev_{it-1} + \beta_6 VOL_{it-1} + \beta_7 BS_{it-1} + \beta_8 CEO-Dual_{it-1} + \beta_9 CEO-Shares_{it-1} + \beta_{10} CEO-Ex-Pay_{it-1} + \beta_{11} CEO^{Age}{}_{it-1} + \beta_{12} CEO-Ten_{it-1} + \varepsilon_{it} \quad (10)$$

5.3.3. Effect of ownership structure on CEO turnover

We tested for the various ownership structures by categorising whether firms are family-, government-, or foreign-owned.

$$CEO\,turnover_{it} = \beta_1 PERF_{it-1} + \beta_2 ownership\ structure_{it-1} + \beta_3 Ln\,Assets_{it-1} + \beta_4 Lev_{it-1} + \beta_5 VOL_{it-1} + \beta_6 BS_{it-1} + \beta_7 \%IB_{it-1} + \beta_8 CEO-Dual_{it-1} + \beta_9 CEO-Shares_{it-1} + \beta_{10} CEO-Ex-Pay_{it-1} + \beta_{11} CEO^{Age}{}_{it-1} + \beta_{12} CEO-Ten_{it-1} + \varepsilon_{it} \quad (11)$$

$$CEO\,turnover_{it} = \beta_1 PERF_{it-1} + \beta_2 ownership\ structure_{it-1} + \beta_3 (ownership\ structure * PERF)_{it-1} + \beta_4 Ln\,Assets_{it-1} + \beta_5 Lev_{it-1} + \beta_6 VOL_{it-1} + \beta_7 BS_{it-1} + \beta_8 \%IB_{it-1} + \beta_9 CEO-Dual_{it-1} + \beta_{10} CEO-Shares_{it-1} + \beta_{11} CEO-Ex-Pay_{it-1} + \beta_{12} CEO^{Age}{}_{it-1} + \beta_{13} CEO-Ten_{it-1} + \varepsilon_{it} \quad (12)$$

where ownership structure may either be family, government, or foreign. As in Berle and Means (1932), we used a 20% equity ownership stake as the basis for an investor to have enough equity in a particular

firm to render control. We then classified the firms as family-, government-, or foreign-owned firms (Al-Faryan & Dockery, 2017). Morck et al. (1988) and Sarpong-Danquah et al. (2022) consider the range of 20–30% as useful for effective, meaningful control. The dummy variable takes the value of 1 if more than 20% of the firm is family-, government-, or foreign-owned, and otherwise 0.

5.3.4. Effect of high CEO ownership on CEO turnover

We tested for the effect of high CEO ownership on the CEO turnover—performance sensitivity, for which we generated a dummy variable for high CEO ownership that equals 1 if the CEO owns 5% or more of the firm's total shares, and otherwise 0. We then generated an interaction term between high CEO ownership and firm performance to estimate the following models.

$$\begin{aligned} CEO\ turnover_{it} &= \beta_1 PERF_{it-1} + \beta_2 High\ CEO\ Ownership_{it-1} + \beta_3 Ln\ Assets_{it-1} + \beta_4 Lev_{it-1} + \beta_5 VOL_{it-1} + \beta_6 BS_{it-1} \\ &\quad + \beta_7 \%IB_{it-1} + \beta_8 CEO-Dual_{it-1} + \beta_9 CEO-Ex-Pay_{it-1} + \beta_{10} CEO^{Age}{}_{it-1} + \beta_{11} CEO-Ten_{it-1} + \varepsilon_{it} \end{aligned} \tag{13}$$

$$\begin{aligned} CEO\ turnover_{it} &= \beta_1 PERF_{it-1} + \beta_2 High\ CEO\ Ownership_{it-1} + \beta_3 \left(High\ CEO\ Ownership * PERF\right)_{it-1} + \beta_4 Ln\ Assets_{it-1} + \beta_5 Lev_{it-1} \\ &\quad + \beta_6 VOL_{it-1} + \beta_7 BS_{it-1} + \beta_8 \%IB_{it-1} + \beta_9 CEO-Dual_{it-1} + \beta_{10} CEO-Ex-Pay_{it-1} + \beta_{11} CEO^{Age}{}_{it-1} + \beta_{12} CEO-Ten_{it-1} + \varepsilon_{it} \end{aligned} \tag{14}$$

5.3.5. Effect of retirement age and tenure on CEO turnover

Finally, we examined the effect of performance on CEO turnover after retirement age, and used the interaction between the performance variables and dummy variable of CEO retirement age (1 if the CEO is aged 60 or more, and otherwise 0). We estimated the following models.

$$\begin{aligned} CEO\ turnover_{it} &= \beta_1 PERF_{it-1} + \beta_2 RET^{Age}{}_{it-1} + \beta_3 Ln\ Assets_{it-1} + \beta_4 Lev_{it-1} + \beta_5 VOL_{it-1} + \beta_6 BS_{it-1} + \beta_7 \%IB_{it-1} \\ &\quad + \beta_8 CEO-Dual_{it-1} + \beta_9 CEO-Shares_{it-1} + \beta_{10} CEO-Ex-Pay_{it-1} + \beta_{11} CEO-Ten_{it-1} + \varepsilon_{it} \end{aligned} \tag{15}$$

$$\begin{aligned} CEO\ turnover_{it} &= \beta_1 PERF_{it-1} + \beta_2 RET^{Age}{}_{it-1} + \beta_3 \left(RET^{Age} * PERF\right)_{it-1} + \beta_4 Ln\ Assets_{it-1} + \beta_5 Lev_{it-1} + \beta_6 VOL_{it-1} + \beta_7 BS_{it-1} \\ &\quad + \beta_8 \%IB_{it-1} + \beta_9 CEO-Dual_{it-1} + \beta_{10} CEO-Shares_{it-1} + \beta_{11} CEO-Ex-Pay_{it-1} + \beta_{12} CEO-Ten_{it-1} + \varepsilon_{it} \end{aligned} \tag{16}$$

Further, we tested the effects of CEO tenure on turnover after retirement age and generated an interaction term between retirement age and tenure to estimate the following model.

$$\begin{aligned} CEO\ turnover_{it} &= \beta_1 PERF_{it-1} + \beta_2 RET^{Age}{}_{it-1} + \beta_3 \left(RET^{Age} * CEO-Ten\right)_{it-1} + \beta_4 Ln\ Assets_{it-1} + \beta_5 Lev_{it-1} + \beta_6 VOL_{it-1} + \beta_7 BS_{it-1} \\ &\quad + \beta_8 \%IB_{it-1} + \beta_9 CEO-Dual_{it-1} + \beta_{10} CEO-Shares_{it-1} + \beta_{11} CEO-Ex-Pay_{it-1} + \beta_{12} CEO-Ten_{it-1} + \varepsilon_{it} \end{aligned} \tag{17}$$

where RET^{Age} is the retirement age of the CEO. This approach improved on the methodology in Pi and Lowe (2011), which considers natural CEO retirement by simply including a dummy variable for CEO age. We used retirement age and CEO tenure to extend the existing methodologies.

6. Empirical results and discussion

6.1. General descriptive statistics

Table 2 provides descriptive statistics of CEO turnover in our sample. During the period, of the 1,159 CEOs in total, there were 213 changes; an average of 18.38% CEO turnovers over eight years. Furthermore, CEO turnover peaked at 20.74% in 2009 before the global financial crisis, declined to 16.67% in 2011, and peaked again at 20.86% in 2013. Overall, it stayed in the range of 15–21%.

Table 2. Data on Saudi CEOs 2007–2014.

	Number of CEOs	Number of changes	Percentage of CEO turnover
2007	111	19	17.12
2008	127	19	14.96
2009	135	28	20.74
2010	146	28	19.18
2011	150	25	16.67
2012	158	29	18.35
2013	163	34	20.86
2014	169	31	18.34
Total	1159	213	18.38

Table 3. Descriptive statistics.

Variables	Observations	Mean	Median	Minimum	Maximum	Standard Deviation
CEO Turnover	1153	0.185	0	0	1	0.388
ROA	1146	4.151	3.202	-77.54	43.98	10.587
ROE	1141	5.207	8.045	-983.941	56.586	37.005
Stock Returns	1152	1.089	1.103	-42.52	198.12	7.531
Tobin's Q	1146	2.039	1.331	0.131	16.927	2.228
Ln(Assets)	1148	21.359	21.133	17.2	26.798	2.06
Lev	1136	14.998	4.665	0	126.473	18.993
VOL	1144	11.859	9.639	0	280.184	11.672
BS	1153	8.447	9	4	13	1.62
%IB	1152	49.486	44.444	0	100	21.081
CEO-Dual	1153	0.032	0	0	1	0.176
CEO-Shares (%)	1123	0.918	0.001	0	45.501	3.738
CEO-Ex-Pay (SAR)	1060	7,654,556	4,789,461	0	72,095,000	8,471,274
CEO^{Age}	1153	50.887	51	32	80	7.265
RET^{Age}	1153	0.11	0	0	1	0.313
CEO-Ten	1153	5.875	4	1	39	6.477

Notes: ROA is return-on-assets, ROE is return-on-equity, Stock Returns, and Tobin's Q are performance measures. Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Shares (%) is the percentage of CEO owned shares, CEO-Ex-Pay is the CEO and top executive pay, and CEO^{Age} is the CEO's age, and CEO-Ten is the CEO tenure.

6.2. Descriptive statistics of key variables

Table 3 provides summary statistics of the key variables and the actual data used in the regression estimations. During this timeframe, among the boards, the mean of independent members was 49% and the median 44%. The average board size was eight to nine directors, with a minimum of four and a maximum of thirteen. The average of *CEO-Shares* was 0.92% with a standard deviation of 3.7%, which is quite dispersed across Saudi firms. The average CEO tenure was just under six years, whereas the median CEO tenure was four years, with a standard deviation of six years. The minimum and maximum CEO tenure were 1 year and 39 years, respectively. The average CEO age was 51 years old, with a standard deviation of 7 years. The dummy variable RET^{Age} had a mean value of 0.11 and standard deviation of 0.313. Of the variables,11 had standard deviations greater than the mean, which suggests the data were widely dispersed for these variables. Notably, the number of listed firms in Saudi Arabia was 111 in 2007 and reached 169 by the end of 2014; thus, the observations in each year differ.

In addition, there were missing observations in some years for some variables. One reason is that in certain years, some firm losses accounted for more than 50% of their capital, leading to the suspension of trading; in such cases, no data were available (Appendix 1). Additionally, the 2006 corporate governance code applied to all companies listed on the Saudi market on a comply-or-explain basis (Al-Faryan, 2020; Al-Faryan, 2021). Initially, the codes served as guidelines for listed companies; however, they became mandatory in 2009 and were extended to all variables in 2010. Thus, the required corporate governance information had to be disclosed by all listed companies.

In terms of the regressions, first, we did not winsorize to compress the distributions, such as for ROE, which had a range of −983.941 to 56.586. We avoided changing the data, preventing errors in measurement, and only dealt with outliers entailing missing data characteristics (Al-Faryan, 2021; Gujarati, 2004). Second, we did not use the time fixed effect because we did not want to increase the number of predictors with regard to the sample size; since there were missing observations for some firms and years,

adding time dummies (increasing explanatory variables) would have affected the significance of the estimates (Al-Faryan, 2021; Billiger & Hallock, 2005; Coles et al., 2014; Denis & Denis, 1995).

Table 4 provides the correlation matrix of the variables in the analysis. As expected, there was a strong correlation between *VOL* and *Stock Returns* (0.708), as the variables are related. The relationship between *Tobin's Q* and *Ln(Assets)* (−0.576) will always be negative, as Tobin's Q is calculated by dividing firm market capital by its total assets. As expected, *CEO-Ex-Pay* and *Ln(Assets)* were also positively correlated (0.606), since larger firms are more likely to pay their senior executives more. RET^{Age} and CEO^{Age} were positively correlated (0.644), as were ROA and ROE (0.647); therefore, they were not included in the same empirical model.

6.3. Empirical results

Table 5 presents the results of the analysis of firm performance and CEO turnover in Saudi Arabia, and provides an overview of the explanatory variables and their relationships with CEO turnover. The regressions showed a highly significant and negative relationship between the two operating performance measures, ROA and ROE, and CEO turnover at 1% confidence. The implication is that, as the operating performance of the firms in Saudi Arabia improves, the probability of CEO turnover reduces, thus supporting Hypothesis 1. The market performance measures, Stock Returns, and Tobin's Q also displayed a negative relationship with CEO turnover. In the ROA, Stock Returns, and Tobin's Q models, firm's leverage (*Lev*) displayed a significant and positive relationship with CEO turnover, and its stock volatility (*VOL*) displayed a positive relationship with CEO turnover in all models.

For robustness, we also analysed the effect of negative performance on CEO turnover (Table 6), for which we generated the dummy variable *Loss Performance*, based on the performance measures ROA, ROE, and Stock Returns, which equals 1 if the firm has a negative performance, and otherwise 0. We found that *Loss Performance* has a highly significant positive relationship with CEO turnover in the ROA and ROE models at 1% confidence as well, further supporting Hypothesis 1. As shown in Table 6, the results confirm that firm operating performance increases the likelihood of CEO turnover. However, the Stock Returns model displayed no significant relationship with loss performance. These results are consistent with our findings reported in Table 5. In the ROE model, the Lev coefficient is positively significant at 10% confidence, whereas in Table 5, it is not significant. For comparison, DeAngelo and DeAngelo (1985), Morck et al. (1988), Conyon and Florou (2002) and Firth et al. (2006) found that leverage does not affect CEO turnover, and Chakraborty and Sheikh (2008) showed that including the debt-to-equity ratio in their model did not impact the findings.

In terms of board size (*BS*), we found a positive relationship with CEO turnover in all models; however, it was not significant. In contrast, Chakraborty and Sheikh (2008) found that board size has a negative effect on CEO turnover, whereas Wu (2000) showed that smaller boards are better monitors of the CEO, and are more likely responsible for their dismissal. Thus, board size does not appear to be a factor in CEO turnover in Saudi Arabia; thus, Hypothesis 2 is rejected.

In terms of board composition (*%IB*), we found both positive and negative coefficients; however, none are significant. Probit models were used to model the cumulative standard normal distribution, whereas logit models were used to model the logistic distribution. For greater robustness, we also used a different methodology by presenting the average marginal effects from the logit estimation, and found that Appendix 2 has the same result as Table 5, and for monitoring effects, Appendix 3 has the same result as Table 6.

Table 7 presents the exogenous effect of the 2009 regulatory changes on the firm's board composition. As stated above, the regulatory change requires that listed firms in Saudi Arabia have one-third of the board or at least two independent directors on the board, whichever is greater.

The variable of most interest was the interaction term *Treat*Post*Performance*, which measures the change in CEO turnover—performance sensitivity in treatment firms relative to control firms, before and after the treatment. This had an unexpected significant and positive coefficient of 0.2775 at the 5% confidence level in Tobin's Q model, but no significant relationship in the ROA, ROE, and Stock Returns models. The interaction term *Treat*Post* had non-significant positive coefficients in the ROA, ROE, and Stock Returns models and a non-significant negative coefficient in Tobin's Q model. Moreover, the interaction term *Treat*Performance* had negative coefficients for all performance measures. Thus, CEO turnover—performance sensitivity is more

Table 4. Correlation matrix.

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	CEO Turnover	1															
2	ROA	−0.152***	1														
		(0.000)															
3	ROE	−0.154***	0.647***	1													
		(0.000)	(0.000)														
4	Stock Returns	−0.019	0.011	0.044	1												
		(0.550)	(0.733)	(0.171)													
5	Tobin's Q	0.058*	−0.116***	−0.112***	0.205***	1											
		(0.069)	(0.000)	(0.000)	(0.000)												
6	Ln(Assets)	−0.088***	0.157***	0.180***	−0.047	−0.576***	1										
		(0.006)	(0.000)	(0.000)	(0.146)	(0.000)											
7	Lev	− 0.001	0.017	0.021	−0.051	−0.336***	0.367***	1									
		(0.973)	(0.606)	(0.508)	(0.110)	(0.000)	(0.000)										
8	VOL	0.035	−0.187***	−0.070**	0.708***	0.279***	−0.231***	−0.126***	1								
		(0.279)	(0.000)	(0.029)	(0.000)	(0.000)	(0.000)	(0.000)									
9	BS	0.018	−0.046	−0.036	0.022	−0.086***	0.310***	−0.016	−0.010	1							
		(0.573)	(0.156)	(0.266)	(0.484)	(0.007)	(0.000)	(0.616)	(0.752)								
10	%IB	0.017	0.039	0.066**	−0.005	−0.019	−0.021	−0.064**	−0.003	−0.015	1						
		(0.604)	(0.221)	(0.040)	(0.877)	(0.562)	(0.523)	(0.045)	(0.931)	(0.650)							
11	CEO-Dual	0.025	0.052	0.015	−0.011	−0.009	−0.080**	−0.010	−0.008	−0.131***	0.023	1					
		(0.426)	(0.103)	(0.632)	(0.724)	(0.775)	(0.012)	(0.765)	(0.801)	(0.000)	(0.468)						
12	CEO-Shares (%)	−0.076**	0.175***	0.101***	−0.009	0.012	−0.086***	−0.009	−0.054*	−0.081**	−0.054*	0.249***	1				
		(0.019)	(0.000)	(0.002)	(0.775)	(0.712)	(0.008)	(0.789)	(0.096)	(0.013)	(0.097)	(0.000)					
13	CEO-Ex-Pay	−0.061*	0.082**	0.125***	0.024	−0.217***	0.606***	0.022	−0.174***	0.300***	−0.001	−0.101***	0.010	1			
		(0.067)	(0.015)	(0.000)	(0.467)	(0.000)	(0.000)	(0.521)	(0.000)	(0.000)	(0.977)	(0.003)	(0.771)				
14	CEO^{Age}	−0.021	0.066**	0.040	−0.042	−0.092***	0.188***	−0.015	−0.078**	0.155***	−0.061***	0.121***	0.294***	0.160***	1		
		(0.513)	(0.040)	(0.217)	(0.186)	(0.004)	(0.000)	(0.637)	(0.015)	(0.000)	(0.058)	(0.000)	(0.000)	(0.000)			
15	RET^{Age}	0.042	0.023	0.030	0.014	0.009	0.044	0.020	0.008	0.051	−0.085***	0.227***	0.359***	0.050	0.644***	1	
		(0.193)	(0.473)	(0.358)	(0.663)	(0.769)	(0.168)	(0.545)	(0.810)	(0.110)	(0.008)	(0.000)	(0.000)	(0.140)	(0.000)		
16	CEO-Ten	−0.098***	0.230***	0.119***	−0.008	−0.120***	0.085***	0.183***	−0.050	−0.101***	−0.081**	0.122***	0.283***	0.107***	0.363***	0.358***	1
		(0.002)	(0.000)	(0.000)	(0.802)	(0.000)	(0.008)	(0.000)	(0.116)	(0.002)	(0.012)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	

Notes: ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively; *p* values are in parentheses. All variables are in y_{t-1} except CEO turnover, which is in y_t.

Table 5. CEO turnover and firm performance in listed Saudi firms (2007–2014).

Variables	ROA	ROE	Stock Returns	Tobin's Q
Performance	-0.0202***	-0.0082***	-0.0079	-0.0150
	(0.0053)	(0.0023)	(0.0109)	(0.0308)
Ln(Assets)	-0.0704*	-0.0653	-0.1052***	-0.1161**
	(0.0393)	(0.0401)	(0.0403)	(0.0471)
Lev	0.0055*	0.0050	0.0072**	0.0072**
	(0.0031)	(0.0032)	(0.0032)	(0.0032)
VOL	0.0035	0.0046	0.0080	0.0068
	(0.0062)	(0.0061)	(0.0065)	(0.0062)
BS	0.0183	0.0077	0.0290	0.0307
	(0.0335)	(0.0338)	(0.0345)	(0.0350)
%IB	0.0005	0.0004	-0.0001	-0.0001
	(0.0024)	(0.0024)	(0.0024)	(0.0025)
CEO-Dual	0.4040	0.3911	0.4668	0.4691
	(0.3395)	(0.3405)	(0.3451)	(0.3475)
CEO-Shares (%)	-0.0466**	-0.0464**	-0.0565**	-0.0569**
	(0.0229)	(0.0229)	(0.0237)	(0.0239)
CEO-Ex-Pay	-3.94e-09	-2.03e-09	-6.61e-10	1.52e-10
	(9.39e-09)	(9.23e-09)	(9.24e-09)	(9.42e-09)
CEO^{Age}	0.0156*	0.0154*	0.0167**	0.0163*
	(0.0081)	(0.0082)	(0.0084)	(0.0085)
CEO-Ten	-0.0218**	-0.0228**	-0.0261**	-0.0261**
	(0.0097)	(0.0098)	(0.0102)	(0.0103)
Likelihood ratio	43.74***	46.01***	29.46***	28.15***

Notes: This table presents the average marginal effects from the probit estimation, where ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses. ROA, ROE, Stock Returns, and Tobin's Q are performance measures. Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Shares (%) is the percentage of CEO owned shares, CEO-Ex-Pay is the CEO and top executive pay, and CEO^{Age} is the CEO's age, and CEO-Ten is the CEO tenure.

Table 6. CEO turnover and firm Loss performance (monitoring effect).

Variables	ROA	ROE	Stock Returns
Loss Performance	0.4867***	0.5006***	0.1012
	(0.1226)	(0.1229)	(0.1068)
Ln(Assets)	−0.0578	−0.0629	−0.1047***
	(0.0402)	(0.0404)	(0.0403)
Lev	0.0052*	0.0052*	0.0071**
	(0.0031)	(0.0031)	(0.0032)
VOL	0.0038	0.0027	0.0067
	(0.0062)	(0.0063)	(0.0061)
BS	0.0186	0.0151	0.0279
	(0.0333)	(0.0335)	(0.0346)
%IB	0.0007	0.0008	−0.0002
	(0.0024)	(0.0024)	(0.0024)
CEO-Dual	0.4379	0.4334	0.4675
	(0.3373)	(0.3376)	(0.3456)
CEO-Shares (%)	−0.0455**	−0.0466**	−0.0566**
	(0.0225)	(0.0225)	(0.0238)
CEO-Ex-Pay	−2.84e-09	−2.56e-09	−6.17e-10
	(9.16e-09)	(9.17e-09)	(9.26e-09)
CEO^{Age}	0.0149*	0.0157*	0.0167**
	(0.0081)	(0.0081)	(0.0084)
CEO-Ten	−0.0212**	−0.0217**	−0.0259**
	(0.0096)	(0.0097)	(0.0102)
Likelihood ratio	44.42***	46.09***	29.84***

Notes: This table presents the average marginal effects from the probit estimation, where ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses. ROA, ROE, and Stock Returns are performance measures. Loss Performance equates to negative performance values, Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Shares (%) is the percentage of CEO owned shares, CEO-Ex-Pay is the CEO and top executive pay, and CEO^{Age} is the CEO age, and CEO-Ten is the CEO tenure.

significant in the treatment firms than in the control firms, in the pre-treatment period. The results were significant and negative in the ROE and Tobin's Q models at the 10% and 5% confidence levels, respectively. The non-significant positive coefficient on composition with regulatory changes indicates that average CEO turnover increases in the treatment firms relative to the control firms post treatment (acting on board regulatory changes). However, the non-significant negative relationship in Tobin's Q model indicates that the average CEO turnover rate decreases in treatment firms relative to control firms post treatment. The implication is that the interaction term can be affected by other factors apart from performance.

Table 7. Effect of board composition regulation (DID) on CEO turnover.

Variables	ROA	ROE	Stock Returns	Tobin's Q
Treat*Post	0.0514	0.0105	0.0715	−0.1782
	(0.1325)	(0.1317)	(0.1496)	(0.1609)
Treat*Performance	−0.0179	−0.0105*	−0.0095	−0.2656**
	(0.0110)	(0.0055)	(0.0200)	(0.1341)
Treat*Post*Performance	−0.0049	0.0017	−0.0044	0.2775**
	(0.0132)	(0.0063)	(0.0271)	(0.1352)
Ln(Assets)	−0.0501	−0.0473	−0.0741*	−0.0801*
	(0.0423)	(0.0434)	(0.0415)	(0.0471)
Lev	0.0049	0.0050	0.0067**	0.0069**
	(0.0033)	(0.0034)	(0.0033)	(0.0033)
VOL	0.0061	0.0065	0.0122	0.0104
	(0.0071)	(0.0071)	(0.0080)	(0.0070)
BS	0.0111	0.0035	0.0118	0.0169
	(0.0360)	(0.0360)	(0.0356)	(0.0367)
CEO-Dual	0.4004	0.3896	0.4552	0.4875
	(0.3427)	(0.3437)	(0.3402)	(0.3448)
CEO-Shares (%)	−0.0440*	−0.0433*	−0.0512**	−0.0507**
	(0.0242)	(0.0244)	(0.0243)	(0.0247)
CEO-Ex-Pay	−8.20e-09	−6.58e-09	−5.20e-09	−4.87e-09
	(1.03e-08)	(1.01e-08)	(9.78e-09)	(9.96e-09)
CEO^{Age}	0.0116	0.0111	0.0131	0.0109
	(0.0087)	(0.0088)	(0.0087)	(0.0088)
CEO-Ten	−0.0180*	−0.0187*	−0.0231**	−0.0222**
	(0.0102)	(0.0102)	(0.0100)	(0.0107)
Likelihood ratio	34.01***	34.57***	22.93**	27.89***

Notes: This table presents the average marginal effects from the probit estimation, where ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses. ROA, ROE, Stock Returns, and Tobin's Q are performance measures. Treat*Post, Treat*Performance, and Treat*Post*Performance are the interactive terms among the treated group, post regulation and performance. Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Shares (%) is the percentage of CEO owned shares, CEO-Ex-Pay is the CEO and top executive pay, CEO^{Age} is the CEO age, and CEO-Ten is the CEO tenure.

The results indicate that firms that are complying with the board regulations would have a significantly higher impact on CEO turnover—performance sensitivity. Therefore, CEOs were replaced if performance was poor for the entire sample period, which supports Hypothesis 3. This indicates that after the regulatory changes in 2009, firm operating performance has had a larger effect on CEO turnover.

In terms of firm size, measured by *Ln(Assets)*, we found a negative relationship with *CEO turnover* in the ROA, Stock Returns, and Tobin's Q models, supporting Hypothesis 4. The ROE model also displayed a negative relationship between the two which was not significant. The implication is that improvement in firm performance and increased firm size will reduce CEO turnover, although insignificantly. This coincides with the findings of Kato and Long (2006a), and Qiao (2023), who showed a lower likelihood of turnover in larger firms in China. In contrast, Chakraborty and Sheikh (2008) found the opposite result in the U.S., wherein larger firms display greater likelihood of performance-related CEO turnovers.

In terms of dual roles (*CEO-Dual*), we found positive coefficients, although not significant, since the corporate governance rule in Saudi Arabia now states that the CEO cannot also be the chair. Thus, Hypothesis 5 is rejected. Therefore, we found that CEO duality does not affect CEO turnover in Saudi Arabia. This differs from many studies that show significant negative relationships between CEO duality and CEO turnover (Chakraborty & Sheikh, 2008; Firth et al., 2006; Kato & Long, 2006a; Sun & Jiang, 2022). Table 8 displays the results relating to the effect of ownership structure on the likelihood of CEO turnover.

The data for ownership structure were taken from 2008 to 2014, since the governance code requiring disclosure and transparency began in 2008, prior to which this information was not available in Saudi Arabia (Al-Faryan, 2021; Naif & Ali, 2020; Rizvi & Hussain, 2022). As shown in Table 8, the ownership structure in Saudi family and foreign-owned firms had no effect on CEO turnover and thus can be considered irrelevant. Thus, Hypothesis 6 is rejected. As family interests are strong in Saudi firms, CEO dismissals may also be low in such firms owing to family pressures.

In terms of CEO ownership, the results in Table 8 show that the extent of CEO ownership (*CEO-Shares*) has a significant negative relationship with CEO turnover. These results are inconsistent with Dahya et al. (2002), Franks et al. (2001), Goyal and Park (2002), and Parrino et al. (2003). The implication is that as the CEO's shareholding increases, the probability of turnover decreases. Thus, Hypothesis 7 is supported. This suggests that a sizable shareholding by the CEO provides protection against dismissal in Saudi Arabia.

Table 8. Effect of ownership structure on CEO turnover, 2008–2014.

	ROA		ROE		Stock Returns		Tobin's Q	
Variables	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)
Performance	−0.0217***	−0.0207***	−0.0082***	−0.0090***	−0.0064	−0.0029	−0.0020	−0.0042
	(0.0056)	(0.0067)	(0.0023)	(0.0028)	(0.0109)	(0.0139)	(0.0319)	(0.0340)
Family	−0.1665	−0.2695	−0.1528	−0.3187	−0.1983	−0.1881	−0.2018	−0.1637
	(0.1773)	(0.2010)	(0.1775)	(0.2130)	(0.1776)	(0.1790)	(0.1775)	(0.2690)
Family*Performance		0.0200		0.0162		−0.0204		−0.0070
		(0.0193)		(0.0107)		(0.0484)		(0.1568)
Government	0.0335	0.1410	−0.0188	0.2060	−0.0382	−0.0492	−0.0339	0.1233
	(0.1764)	(0.2050)	(0.1744)	(0.2120)	(0.1726)	(0.1742)	(0.1790)	(0.2434)
Government*Performance		−0.0154		−0.0191*		0.0040		−0.0936
		(0.0174)		(0.0111)		(0.0253)		(0.1147)
Foreign	−0.1751	−0.2456	−0.1314	−0.1378	−0.0951	−0.0594	−0.1263	−0.2482
	(0.1857)	(0.1977)	(0.1850)	(0.1877)	(0.1836)	(0.1871)	(0.1863)	(0.2658)
Foreign*Performance		−0.0224		0.0029		−0.0362		0.0386
		(0.0232)		(0.0061)		(0.0341)		(0.0710)
Ln(Assets)	−0.0684	−0.0672	−0.0580	−0.0581	−0.0931**	−0.0897**	−0.0941*	−0.1009*
	(0.0451)	(0.0468)	(0.0461)	(0.0476)	(0.0445)	(0.0447)	(0.0535)	(0.0543)
Lev	0.0054*	0.0051	0.0049	0.0039	0.0072**	0.0072**	0.0072**	0.0071**
	(0.0032)	(0.0033)	(0.0033)	(0.0034)	(0.0032)	(0.0032)	(0.0032)	(0.0032)
VOL	0.0050	0.0052	0.0064	0.0058	0.0094	0.0101	0.0083	0.0080
	(0.0065)	(0.0065)	(0.0065)	(0.0066)	(0.0068)	(0.0070)	(0.0065)	(0.0065)
BS	0.0282	0.0267	0.0133	0.0185	0.0303	0.0270	0.0313	0.0322
	(0.0353)	(0.0356)	(0.0356)	(0.0359)	(0.0349)	(0.0350)	(0.0352)	(0.0356)
%IB	0.0007	0.0009	0.0005	0.0008	−0.0001	0.0001	−6.00e-06	0.0002
	(0.0026)	(0.0026)	(0.0026)	(0.0026)	(0.0025)	(0.0025)	(0.0025)	(0.0025)
CEO-Dual	0.4029	0.4352	0.3952	0.4343	0.4736	0.4766	0.4823	0.4725
	(0.3437)	(0.3456)	(0.3447)	(0.3489)	(0.3439)	(0.3440)	(0.3443)	(0.3460)
CEO-Shares (%)	−0.0359	−0.0404*	−0.0373	−0.0440*	−0.0445*	−0.0447*	−0.0438*	−0.0451*
	(0.0236)	(0.0242)	(0.0239)	(0.0251)	(0.0242)	(0.0244)	(0.0242)	(0.0245)
CEO-Ex-Pay	−4.25e-09	−4.45e-09	−2.50e-09	−2.47e-09	−1.43e-09	−1.29e-09	−1.12e-09	−1.56e-09
	(9.83e-09)	(1.05e-08)	(9.68e-09)	(1.02e-08)	(9.45e-09)	(9.49e-09)	(9.65e-09)	(9.83e-09)
CEO^{Age}	0.0128	0.0142*	0.0131	0.0136	0.0138*	0.0142*	0.0128	0.0131
	(0.0083)	(0.0084)	(0.0084)	(0.0084)	(0.0083)	(0.0083)	(0.0083)	(0.0084)
CEO-Ten	−0.0190*	−0.0207**	−0.0206**	−0.0219**	−0.0245**	−0.0249**	−0.0243**	−0.0246**
	(0.0101)	(0.0101)	(0.0101)	(0.0101)	(0.0099)	(0.0099)	(0.0099)	(0.0100)
Likelihood ratio	46.37***	49.60***	47.14***	53.77***	31.07***	32.42**	29.94***	31.07**

Notes: This table presents the average marginal effects from the probit estimation, where ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses. ROA, ROE, Stock Returns, and Tobin's Q are performance measures. Family, Government, and Foreign are firms that are classified as family-, government-, and foreign-owned, respectively, Family*Performance, Government*Performance, and Foreign*Performance are the interaction terms between the respective firm ownership and performance, Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Shares (%) is the percentage of CEO owned shares, CEO-Ex-Pay is the CEO and top executive pay, CEO^{Age} is the CEO age, and CEO-Ten is the CEO tenure.

The table also presents the results of the average marginal effect of CEO ownership on the performance—turnover relationship. Table 9 presents the effect of high CEO ownership on CEO turnover.

The dummy variable *High CEO Ownership* takes the value 1 for CEO ownership of 5% shareholding or more, and otherwise 0. Thus, the interaction term *High CEO Ownership*Performance* captures the average marginal effect of performance for High CEO ownership—turnover sensitivity and the effect of the excluded category of low ownership, that is, CEO ownership of less than 5%. In all models, the interaction term *High CEO Ownership*Performance* had a non-significant coefficient. However, *High CEO Ownership* displayed a significant negative relation with CEO turnover in the Stock Returns (−0.5730) model and in Tobin's Q (−0.5770) in model 1. Thus, Hypothesis 7 is supported. Interestingly, in Tobin's Q model 2, the inclusion of the interaction term caused the significant negative coefficient (−0.5770) of *High CEO Ownership* in model 1 to no longer be significant, suggesting that when the performance-related likelihood of CEO turnover is considered, the negative impact of high ownership on the likelihood of CEO turnover is no longer significant. This lends support to high ownership not always saving the CEO from dismissal when performance is considered. However, it does not imply dismissal either, as we only find non-significant negative estimates for the interaction term *High CEO Ownership*Performance*.

In model 2, *High CEO Ownership* was only significant and negative in the Stock Returns (−0.6699) model, supporting Hypothesis 7. Therefore, larger CEO ownership reduces the likelihood of a CEO change. This also means that CEOs with less than 5% share are more likely to be replaced because of poor performance relative to CEOs with more than 5% share. The *High CEO Ownership* estimates in the ROA and ROE models were negative, but not significant.

Table 9. Effect of high CEO ownership on CEO turnover.

	ROA		ROE		Stock Returns		Tobin's Q	
Variables	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)	Model (1)	Model (2)
Performance	−0.0204***	−0.0204***	−0.0084***	−0.0084***	−0.0077	−0.0092	−0.0132	−0.0118
	(0.0053)	(0.0053)	(0.0023)	(0.0023)	(0.0109)	(0.0110)	(0.0309)	(0.0311)
High CEO	−0.4039	−0.3910	−0.4147	−0.4314	−0.5730*	−0.6699**	−0.5770*	−0.3870
Ownership	(0.2966)	(0.4791)	(0.2959)	(0.4908)	(0.2979)	(0.3256)	(0.3002)	(0.5600)
High CEO		−0.0014		0.0009		0.0807		−0.1140
Ownership*		(0.0404)		(0.0218)		(0.0861)		(0.2932)
Performance								
Ln(Assets)	−0.0678*	−0.0679*	−0.0623	−0.0622	−0.1046***	−0.1043**	−0.1140**	−0.1133**
	(0.0394)	(0.0395)	(0.0403)	(0.0403)	(0.0406)	(0.0406)	(0.0475)	(0.0475)
Lev	0.0055*	0.0055*	0.0050	0.0050	0.0073**	0.0073**	0.0074**	0.0073**
	(0.0031)	(0.0031)	(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0032)
VOL	0.0039	0.0039	0.0050	0.0050	0.0083	0.0084	0.0071	0.0071
	(0.0061)	(0.0061)	(0.0061)	(0.0061)	(0.0065)	(0.0066)	(0.0062)	(0.0062)
BS	0.0210	0.0210	0.0101	0.0100	0.0320	0.0320	0.0335	0.0339
	(0.0334)	(0.0334)	(0.0337)	(0.0338)	(0.0346)	(0.0346)	(0.0351)	(0.0351)
%IB	0.0006	0.0006	0.0005	0.0005	0.0000	5.26e-07	0.0000	0.0001
	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0024)	(0.0025)	(0.0025)
CEO-Dual	0.3067	0.3035	0.2995	0.3050	0.3977	0.3562	0.4026	0.3926
	(0.3323)	(0.3448)	(0.3332)	(0.3571)	(0.3380)	(0.3450)	(0.3403)	(0.3410)
CEO-Ex-Pay	−4.22e-09	−4.21e-09	−2.29e-09	−2.31e-09	−7.42e-10	−1.05e-09	−2.12e-11	7.19e-11
	(9.40e-09)	(9.40e-09)	(9.24e-09)	(9.26e-09)	(9.30e-09)	(9.32e-09)	(9.49e-09)	(9.49e-09)
CEO^{Age}	0.0138*	0.0138*	0.0137*	A 0.0138*	0.0155*	0.0160*	0.0149*	0.0147*
	(0.0081)	(0.0082)	(0.0082)	(0.0084)	(0.0085)	(0.0085)	(0.0086)	(0.0086)
CEO-Ten	−0.0212**	−0.0211**	−0.0223**	−0.0225**	B -0.0258**	−0.0260***	−0.0257**	−0.0249**
	(0.0097)	(0.0100)	(0.0097)	(0.0101)	(0.0100)	(0.0100)	(0.0102)	(0.0104)
Likelihood ratio	40.32***	40.33***	42.81***	42.81***	25.83***	26.83***	24.55**	24.71**

Notes: This table presents the average marginal effect is from the probit estimation. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses. (A) means the coefficient is 0.0137975 and the standard error is 0.0083648; (B) means the coefficient is -0.0257643, and the standard error is 0.010207. ROA, ROE, Stock returns, and Tobin's Q are performance measures, High CEO Ownership is the CEO ownership of firm shares of 5% or more, High CEO Ownership*Performance is the interactive term between high CEO ownership and firm performance, Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Ex-Pay is the CEO and top executive pay, CEO^{Age} is the CEO age, and CEO-Ten is the CEO tenure.

Table 10 presents the results on CEO and executive pay, retirement age, and CEO tenure. For *CEO-Ex-Pay*, we found a non-significant negative relationship with the likelihood of CEO turnover, thereby rejecting Hypothesis 8. Thus, we can confirm the non-involvement of pay in the dismissals of CEOs in Saudi Arabia. In contrast, Chakraborty and Sheikh (2008), among others, found a significant negative relationship between CEO compensation and turnover. Notably, there was no significant positive coefficient in model 2 for Tobin's Q.

However, CEO age (CEO^{Age}) shows a significant positive relationship with CEO turnover, as seen in Table 9, supporting Hypothesis 9. Namely, an increase in the CEO's age increases the likelihood of CEO dismissal. Thus, we confirm that the CEO's age is a factor affecting CEO turnover in Saudi Arabia. However, forced and voluntary turnover could not be distinguished in our dataset, as in other extant studies (Denis et al., 1997; Gentry et al., 2021; Mikkelson & Partch, 1997; Weisbach, 1988). Therefore, in Table 10 we present further details on retirement age (RET^{Age}), tenure (*CEO-Ten*), and the likelihood of CEO turnover. The models controlled for age of the CEO to minimise the effect of normal retirement. As shown in the table, in models 1 and 2, RET^{Age} displays a significantly positive relationship with CEO turnover.

In model 2, we added the interaction term RET^{Age}*Performance* to test for the effect of performance on RET^{Age} and distinguish it from turnover because of poor performance. The result indicated a significant and positive relationship between RET^{Age}*Performance*, as measured by stock returns (0.0782), and the likelihood of CEO turnover at the 5% confidence level. The implication is that the combined effect of retirement age and firm performance also results in CEO turnover. In the ROA, ROE, and Tobin's Q models, the coefficient of the interaction term was positive and not significant, indicating that the CEO turnover relationship with RET^{Age} is due to CEO retirement and not forced because of poor performance. However, the Stock Returns model displayed a significantly positive relationship at the 5% level between RET^{Age}*Performance* and CEO turnover.

In terms of CEO tenure, *CEO-Ten* showed a significant and negative relationship with CEO turnover. Namely, the longer the CEO remains in office, the less likely they are to be dismissed, thus supporting Hypothesis 10. We also tested for the effect of tenure post-retirement age (RET^{Age}) by generating the

Table 10. Effect of pay, retirement age, and tenure on CEO turnover.

Variables	ROA			ROE			Stock Returns			Tobin's Q		
	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)
Performance	−0.0193***	−0.0209***	−0.0184***	−0.0079***	−0.0084***	−0.0075***	−0.0086	−0.0173	−0.0092	−0.0237	−0.0346	−0.0209
	(0.0053)	(0.0054)	(0.0053)	(0.0023)	(0.0023)	(0.0023)	(0.0111)	(0.0117)	(0.0113)	(0.0318)	(0.0346)	(0.0303)
RET^{Age}	0.5869***	0.4869**	0.2058	0.6021***	0.5609***	0.2059	0.6585***	0.5223**	0.2164	0.6779***	0.5644**	0.2314
	(0.1843)	(0.1977)	(0.2485)	(0.1912)	(0.1898)	(0.2487)	(0.1943)	(0.2066)	(0.2483)	(0.1974)	(0.2346)	(0.2490)
RET^{Age*} Performance		0.0345			0.0090			0.0782**			0.0533	
		(0.0224)			(0.0090)			(0.0361)			(0.0611)	
RET^{Age*} CEO-Ten			0.0465**			0.0484**			0.0503**			0.0501**
			(0.0202)			(0.0203)			(0.0199)			(0.0200)
Ln(Assets)	−0.0672*	−0.0661*	−0.0653*	−0.0616	−0.0635	−0.0600	−0.1025**	−0.1015**	−0.0951**	−0.1205**	−0.1199**	−0.1105**
	(0.0393)	(0.0394)	(0.0397)	(0.0408)	(0.0402)	(0.0405)	(0.0409)	(0.0408)	(0.0388)	(0.0481)	(0.0480)	(0.0449)
Lev	0.0056*	0.0057*	0.0053*	0.0051	0.0052	0.0049	0.0073**	0.0073**	0.0067**	0.0074**	0.0072**	0.0068**
	(0.0031)	(0.0031)	(0.0031)	(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0031)	(0.0032)	(0.0032)	(0.0031)
VOL	0.0027	0.0025	0.0032	0.0039	0.0037	0.0044	0.0072	0.0076	0.0080	0.0061	0.0063	0.0068
	(0.0063)	(0.0063)	(0.0064)	(0.0063)	(0.0063)	(0.0064)	(0.0067)	(0.0068)	(0.0068)	(0.0064)	(0.0064)	(0.0063)
BS	0.0206	0.0192	0.0171	0.0100	0.0088	0.0065	0.0317	0.0301	0.0246	0.0337	0.0338	0.0255
	(0.0332)	(0.0332)	(0.0333)	(0.0340)	(0.0335)	(0.0336)	(0.0348)	(0.0349)	(0.0329)	(0.0355)	(0.0354)	(0.0331)
%IB	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0004	0.0003	0.0003	0.0004	0.0004	0.0003
	(0.0024)	(0.0025)	(0.0025)	(0.0025)	(0.0024)	(0.0025)	(0.0025)	(0.0025)	(0.0024)	(0.0025)	(0.0025)	(0.0024)
CEO-Dual	0.3071	0.3731	0.1763	0.2894	0.3499	0.1582	0.3528	0.3922	0.2212	0.3479	0.3627	0.2222
	(0.3407)	(0.3424)	(0.3421)	(0.3420)	(0.3449)	(0.3422)	(0.3484)	(0.3545)	(0.3412)	(0.3519)	(0.3520)	(0.3420)
CEO-Shares (%)	−0.0514**	−0.0584**	−0.0446**	−0.0517**	−0.0549**	−0.0451**	−0.0621***	−0.0600**	−0.0538**	−0.0635***	−0.0635***	−0.0547**
	(0.0228)	(0.0234)	(0.0222)	(0.0229)	(0.0229)	(0.0222)	(0.0237)	(0.0238)	(0.0224)	(0.0240)	(0.0239)	(0.0225)
CEO-Ex-Pay	−4.76e-09	−4.93e-09	−3.37e-09	−3.00e-09	−3.14e-09	−1.56e-09	−1.47e-09	−1.40e-09	−3.05e-10	−1.64e-10	−2.67e-10	7.90e-10
	(9.56e-09)	(9.61e-09)	(9.68e-09)	(9.45e-09)	(9.46e-09)	(9.54e-09)	(9.55e-09)	(9.58e-09)	(9.34e-09)	(9.74e-09)	(9.71e-09)	(9.42e-09)
CEO-Ten	−0.0265***	−0.0282***	−0.0505***	−0.0277***	−0.0284***	−0.0527***	−0.0306***	−0.0309***	−0.0575***	−0.0313***	−0.0304***	−0.0585***
	(0.0099)	(0.0100)	(0.0153)	(0.0102)	(0.0099)	(0.0154)	(0.0104)	(0.0105)	(0.0150)	(0.0105)	(0.0106)	(0.0151)
Likelihood ratio	50.02***	52.32***	55.47***	52.86***	53.86***	58.75***	37.32***	42.55***	43.66***	36.71***	37.49***	42.80***

Notes: This table presents the average marginal effects from the probit estimation, where ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses. ROA, ROE, stock returns and Tobin's Q are performance measures, RET^{Age} is the retirement age of CEOs, RET^{Age*}Performance and RET^{Age*}CEO-Ten are the interactive terms between the CEO retirement age and performance and CEO retirement age and CEO tenure, respectively. Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Shares (%) is the percentage of CEO owned shares, CEO-Ex-Pay is the CEO and top executive pay, and CEO-Ten is the CEO tenure.

interaction term *RET^{Age}*CEO-Ten*, finding all four performance measures to have significant and positive relationships between *RET^{Age}*CEO-Ten* and CEO turnover, as shown in Table 10, model 3. In model 3, the coefficient on *RET^{Age}* was no longer significant as a result of including the interaction term *RET^{Age}*CEO-Ten*, providing evidence that the relationship is because CEOs are working past *RET^{Age}* and positively affecting the relationship with CEO turnover. This does not necessarily mean a forced turnover. In other words, the significant positive relationship of the interaction term *RET^{Age}*CEO-Ten* with the likelihood of CEO turnover confirms that post *RET^{Age}* turnover is not because of poor performance; that is, the turnover is not forced, but voluntary, and an inevitable outcome of retirement.

6.4. Discussion of results

Our results confirm that in Saudi Arabia, poor-performing firms have a greater likelihood of replacing their CEOs, which aligns with the literature and the inverse relationship theory underlying turnover (Kato & Long, 2006a, b; Chakraborty & Sheikh, 2008). Similarly, we find that firms with higher leverage are more likely to change CEOs. The ROE model shows a positive relationship with CEO turnover, although not significant. This supports the notion that firms under financial distress likely face additional pressures that affect CEO turnover. These results support those of Hazarika et al. (2012) for U.S. markets. However, our results which suggest that high volatility increases CEO turnover, differ from the U.S.-based stock market studies of Hazarika et al. (2012) and Guo and Masulis (2015), although not significantly.

Ultimately, we can assume that poor operating performance will trigger CEO dismissals in Saudi firms. In other words, as in other countries, poor performance is a major factor influencing CEO turnover in Saudi Arabia, which can build investor confidence.

In terms of board size, we find no significant positive relationship with CEO turnover and can confirm that, currently, this is not a factor influencing CEO turnover in Saudi Arabia. One likely reason is the predominant family structure of most firms, wherein boards are composed largely of family members.

In terms of board composition, the mixed results may be the result of the changes in the governance regulation during the studied period. However, our results are consistent with those of Firth et al. (2006) and Kato and Long (2006a, b) on China. Further, we can assume based on our results that the regulatory changes introduced by the Saudi government do influence the negative relationship between CEO turnover and firm performance. These results further suggest that the board regulatory requirement in recent years has increased CEO turnover. Comparing our triple action term *Treat*Post*Performance* to that in Guo and Masulis (2015), we found a negative relationship for their triple interaction term. The results suggest that increased monitoring by the board through such regulation can improve CEO efforts. Yet, Guo and Masulis (2015) also point out that, although an increase in CEO turnover—performance sensitivity should generally increase CEO turnover, other factors beyond performance may have an impact. Ultimately, the positive results from the Saudi regulatory change should build investor confidence.

In terms of firm size, as in Kato and Long's (2006a) study of China, the results imply that larger firms are actually less likely to change CEOs than smaller ones in Saudi Arabia, suggesting that the CEOs at larger firms are more secure from dismissal than those at smaller ones, possibly because of the power that comes with scale in Saudi Arabia.

In terms of firm structure, listed family firms did not show the same results as government-owned firms, as the former are less likely to remove poor-performing CEOs (since most CEOs are family members). Generally, government-owned firms show no significant relationship with the likelihood of CEO turnover. However, when the interaction term *Government*Performance* was included, the ROE model showed a significant negative relationship. This finding implies that CEOs at government-owned firms face a high likelihood of poor performance-related CEO turnover. The finding also aligns with Kato and Long (2006a, b), who showed that state-controlled firms in China have a weaker turnover—performance relationship than non-state-controlled ones. However, for family- and foreign-owned firms, there was no significant relationship found between the performance-related likelihood of CEO turnover in any of the models, indicating that family and foreign firm ownership structures do not affect performance—turnover sensitivity. Thus, the factors behind CEO turnover in firms of Saudi Arabia are consistent with those in centralised structured economies.

In terms of ownership, if CEOs own a significant share of the firm, the likelihood of change decreases, implying CEO entrenchment and the power to stop the board from dismissing them for performance issues. Here too, the prevailing family ownership structure of Saudi firms, where the CEO may be a family member, is a likely driver. These findings align with those of Chakraborty and Sheikh (2008), and DeAngelo and DeAngelo (1985) who also considered family businesses. Thus, CEO ownership in a Saudi firm brings with it greater power and reduces chances of CEO turnover.

We did not find evidence that performance affects the CEO ownership—turnover relationship. Our results imply that a CEO shareholding below 5% only increases the likelihood of replacement in the case of poor firm performance. Similar results were reported by Puffer and Weintrop (1991) in U.S. markets.

Overall, our findings support those of Chakraborty and Sheikh (2008), who also found the marginal effect of CEO-Shares to be negatively associated with turnover, and that higher ownership reduces performance—turnover sensitivity. This further supports similar results in Goyal and Park (2002) and Denis et al. (1997), who identified that extensive ownership negatively affects turnover—performance sensitivity. Moreover, our findings are in line with managerial entrenchment theory and agency theory.

The results on CEO age show that the likelihood of CEO change increases with age. As in other countries, this is naturally expected. In their study of China, Kato and Long (2006a) found that the retirement group has significantly higher turnover compared with younger groups. However, Chakraborty and Sheikh (2008) identified a negative relationship between CEOs over 60 years, as they are already near retirement, and performance-related changes. Nevertheless, turnover is usually high around the age of 60 (Jensen & Murphy, 1990). The results of CEO turnover post RET^{Age} are due to the CEOs being past the age of retirement, whereby their increasing age increases the likelihood of CEO turnover. Our results suggest that as the CEO reaches (or crosses) retirement age, their chances of dismissal increase in Saudi Arabia. These results are in line with the study of Tao and Zhao (2019) in U.S. markets, but contrast with those of Rachpradit et al. (2012) for Thailand.

Overall, we find that older CEO turnover in Saudi Arabia is largely because of retirement age and not the inefficient use of firm resources (poor performance). Additionally, a change in CEO because of retirement can be seen by investors as a positive sign, wherein new thinking may bring with it better future returns.

In terms of CEO tenure, we find a significant and negative relationship with CEO turnover, which suggests that the CEO's experience is valued and they have developed a strong relationship with the board. This aligns with the results of Chakraborty and Sheikh (2008) but differs from those in the study of U.S. markets by Huson et al. (2004).

We found that CEO tenure has a significant negative relationship with all four performance measures, which is expected since the CEOs have been in office longer and are less likely to be dismissed. One reason for this may be the long-lasting relationship they have cultivated with board members. The implication here is that CEO turnover in most Saudi firms is because of natural events rather than other factors discussed in studies conducted in developed nations. These finding are consistent with Gentry et al. (2021).

Thus, after reaching a certain age, CEOs tend to retire on a voluntary basis at Saudi firms, in line with the family business model in the country. These findings support those of Goyal and Park (2002), and Khurana and Nohria (2000), who found similar relationships between the likelihood of turnover and RET^{Age}, tenure, and even age.

7. Summary and conclusions

This study contributes to literature on CEO turnover for transition economies by exploring the determinants of CEO turnover in the context of Saudi Arabia. Previous studies dealt mainly with Western economies, wherein corporate performance falls under strict corporate governance laws and well-functioning corporate governance mechanisms. However, in Saudi Arabia, corporate governance reforms are relatively new, introduced only after the stock market crash of 2006 (Al-Faryan, 2020). These have taken the form of internal corporate governance standards and codes. Yet, no studies till date have explored their effect on CEO turnover. Thus, this research is a timely addition to the field of CEO turnover. Further, this study addresses a gap by investigating the performance-related likelihood of CEO turnover in Saudi Arabia. To

tackle the endogeneity problem stressed in literature, we employed panel data analysis using probit, logit and DID methods. Four performance measures—ROA, ROE, Stock Returns, and Tobin's Q—were used to control outcome sensitivity. We also used a wide range of explanatory and control variables from the literature for robustness and depth.

The results showed that the likelihood of CEO turnover negatively relates to firm performance. The findings are robust only for CEO turnover with firm losses, since it is difficult to differentiate between voluntary or forced changes, a common issue in this field. In investigating the effect of board composition on CEO turnover, we took advantage of the 2009 exogenous shock in the market using a DID approach. The results showed that, although poor firm performance leads to the replacement of CEOs, for firms compliant with the new regulatory changes in board composition, an unexpected sign appeared under the Tobin's Q model and non-significant relationships under the ROA, ROE, and Stock Returns models.

Regarding the investigation of the effect of firm ownership structures on turnover—performance sensitivity, we found that CEOs in government-owned firms face a higher likelihood of poor performance-related turnover. We found no evidence of any significant relationship with performance-related CEO turnover in family- or foreign-owned firms. Our findings generally support those in the literature, which leads us to conclude that Saudi firms are beginning to observe the rules and procedures of the corporate governance framework, broadly in line with those of industrialised economies. Further, CEOs with lower share ownership are more likely to be dismissed owing to poor performance than CEOs with more than 5% shares. However, although larger ownership reduces the likelihood of change, it does not always save the CEO from dismissal. We can conclude that Saudi CEOs should increase their focus on firm performance and their shareholdings to avoid dismissal.

Finally, the effect of performance post-retirement age was also investigated, with the results showing that the CEO turnover relationship with retirement age is due to CEOs retiring naturally, and not poor performance. To extend this, we also analysed CEO tenure post-retirement age and found that CEO turnover after retirement age is the result of natural aging, thus providing further evidence that post-retirement age turnover is not because of poor performance but rather an inevitable outcome.

7.1. Implications

In Saudi Arabia, the instituted corporate governance codes and other longer-term development plans have proven to be generally successful, although firm structures continue to influence the practices and performance. We show that CEOs with smaller shareholdings are more likely to be dismissed because of poor performance; this is an element of entrenchment that will need to be addressed. However, we imply that one reason may be the family structure of many businesses in Saudi Arabia. As such, Saudi policymakers need to address family firm structures, where poor performance is less important than family interests, because the resulting low turnover works against the fundamentals of a market driven economy. Future regulation should also target the disparity between CEO turnover and varying degrees of shareholdings. Regulations that are more objective and follow a market-wide standard can be established to hold CEOs accountable for their performance, which would require further improvements in disclosure and transparency for shareholders to use this information.

The CMA could also impose mandatory disclosures as opposed to the comply-or-explain principle, and actively promote corporate control of mergers and acquisitions, which is now virtually non-existent. The Saudi regulators should request data from firms to create a database of firm governance provisions, such as that of the Investor Responsibility Research Centre in the U.S. Studies on entrenchment could be conducted using this data, as in Gompers et al. (2003).

Our study has implications for domestic and foreign investors, including institutional investors. We find evidence that Saudi Arabia has attempted to improve the efficiency of its stock market, and strengthened the link between stock market performance and CEOs at listed firms to ensure they are accountable for firm performance. This depends on the effective functioning of the BOD. Domestic investors should see this as a positive sign, and invest in Saudi stocks at a time when the economy is diversifying and expanding. Foreign investors can diversify their portfolios by investing in Saudi Arabia, which has now opened its market and economy in line with the overriding Vision 2030 strategy.

7.2. Limitations

While this study conducts an in-depth analysis on corporate governance, it is not without limitations. First, a major limitation is the lack of data available on the Saudi market. The data had to be sourced from the CMA and Mubasher, constituting a unique database not previously available. Additionally, time and financial restrictions exacerbated the data limitations. Despite this, we believe the study addressed the gap in the literature on corporate governance in Saudi Arabia, and should have benefits for managers, investors, market practitioners, and regulators.

Second, is the existence of other endogenous factors that influence the underlying relationships and are difficult to model. This issue is further exacerbated by the lack of readily available Saudi data. However, the study found significant results that are robust in the face of endogeneity issues. Third, this research is based on internal factors and forces responsible for the CEO turnover, and does not consider external factors, such as technological changes and market competition.

As this is a pioneering study on the Saudi market regarding its corporate governance, it is difficult to find corresponding studies on the Saudi market or even Middle East and North Africa (MENA) countries for direct comparisons. Nonetheless, we have made comparisons with other markets, such as China and Thailand.

7.3. Future research

Listed family firms do not show the same results as government-owned firms, as the former do not necessarily remove poor-performing CEOs, who are often members of the founding family. It is important that investors and regulators are able to observe such differences and make informed decisions, especially when investing and monitoring corporate governance. This is a key difference between Saudi Arabia, and the U.S. and U.K.; however, when compared with China, for example, all companies are, to a large extent, influenced by the state. Saudi Arabia is an economy that exists between two extremes. As its markets develop, it will be interesting to see which way the country moves. We know that Saudi Arabia is influenced by the price of oil and its revenue, which has a knock-on effect on the economy. With reduced global oil demand and prices, it is important to monitor and analyse which way the market turns in response—towards a freer market, such as that in the West, or a more regulated and controlled one, such as that in China. Further, whether family-owned firm structures will evolve based on the Saudi economy and global market trends will be useful to observe. Moreover, we also intend to use the latest data to capture the power dynamics of CEO turnover in Saudi Arabia in the future. These points reinforce the need to study the Saudi market further to provide a better understanding of its economy and financial issues to managers and investors, as the market remains in a stage of evolution. Lastly, this research is based only on the firm level characteristics responsible for the CEO turnover; however, to make it more dynamic in the future, we intend to add external factors like technological changes, and market pressure and competition to enhance the scope of our research.

Acknowledgments

I thank the editor, Professor Collins G. Ntim, and the reviewers for the helpful comments and suggestions that significantly enhanced this work. I also express my gratitude to the Saudi Arabia Capital Market Authority, Tadawul, and Mubasher for providing the data. The usual disclaimer applies.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Funding

This research received no external funding.

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Appendix 1. The Missing Observations of the Saudi Listed Firms 2007–2014

Variables	Missing Observations	Available Observations
CEO Turnover	0	1153
ROA	7	1146
ROE	12	1141
Stock Returns	1	1152
Tobin's Q	7	1146
Ln(Assets)	5	1148
Lev	17	1136
VOL	9	1144
BS	0	1153
%IB	1	1152
CEO-Dual	0	1153
CEO-Shares (%)	30	1123
CEO-Ex-Pay (SAR)	93	1060
CEO^{Age}	0	1153
RET^{Age}	0	1153
CEO-Ten	0	1153

Notes: ROA is return-on-assets, ROE is return-on-equity, Stock Returns, and Tobin's Q are performance measures. Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Shares (%) is the percentage of CEO owned shares, CEO-Ex-Pay is the CEO and top executive pay, and CEO^{Age} is the CEO's age, and CEO-Ten is the CEO tenure.

Appendix 2. CEO Turnover and Firm Performance in Listed Saudi Firms (2007–2014)

Variables	ROA	ROE	Stock Returns	Tobin's Q
Performance	−0.0342***	−0.0135***	−0.0259	−0.0140
	(0.0093)	(0.0039)	(0.0529)	(0.0189)
Ln(Assets)	−0.1259*	−0.1171	−0.2076***	−0.1876**
	(0.0705)	(0.0723)	(0.0838)	(0.0715)
Lev	0.0104*	0.0095*	0.0135**	0.0133**
	(0.0055)	(0.0056)	(0.0056)	(0.0056)
VOL	0.0059	0.0077	0.0115	0.0135
	(0.0106)	(0.0105)	(0.0105)	(0.0112)
BS	0.0345	0.0133	0.0528	0.0497
	(0.0590)	(0.0597)	(0.0609)	(0.0599)
%IB	0.0007	0.0005	−0.0005	−0.0005
	(0.0043)	(0.0043)	(0.0043)	(0.0043)
CEO-Dual	0.8239	0.7992	0.9088	0.9091
	(0.5881)	(0.5889)	(0.5968)	(0.5934)
CEO-Shares (%)	−0.0909**	−0.0926**	−0.1075**	−0.1068**
	(0.0456)	(0.0461)	(0.0475)	(0.0471)
CEO-Ex-Pay	−8.26e-09	−5.77e-09	−1.03e-09	−2.28e-09
	(1.77e-08)	(1.75e-08)	(1.73e-08)	(1.71e-08)
CEO^{Age}	0.0274*	0.0275*	0.0279*	0.0287**
	(0.0144)	(0.0144)	(0.0148)	(0.0146)
CEO-Ten	−0.0412**	−0.0430**	−0.0492**	−0.0497***
	(0.0184)	(0.0184)	(0.0192)	(0.0191)
Likelihood ratio	43.87***	46.12***	28.70***	30.09***

Notes: This table presents the average marginal effects from the logit estimation, where ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses. ROA, ROE, Stock Returns, and Tobin's Q are performance measures. Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Shares (%) is the percentage of CEO owned shares, CEO-Ex-Pay is the CEO and top executive pay, and CEO^{Age} is the CEO's age, and CEO-Ten is the CEO tenure.

Appendix 3. CEO Turnover and Firm Loss Performance (Monitoring Effect)

Variables	ROA	ROE	Stock Returns
Loss Performance	0.8319***	0.8553***	0.1662
	(0.2109)	(0.2109)	(0.1873)
Ln(Assets)	−0.1025	−0.1123	−0.1866***
	(0.0720)	(0.0725)	(0.0717)
Lev	0.0098*	0.0099*	0.0132**
	(0.0056)	(0.0056)	(0.0056)
VOL	0.0058	0.0036	0.0110
	(0.0107)	(0.0110)	(0.0104)
BS	0.0332	0.0268	0.0488
	(0.0584)	(0.0585)	(0.0600)
%IB	0.0012	0.0013	−0.0006
	(0.0044)	(0.0044)	(0.0043)
CEO-Dual	0.8732	0.8661	0.9125
	(0.5862)	(0.5869)	(0.5939)
CEO-Shares (%)	−0.0881**	−0.0902**	−0.1068**
	(0.0449)	(0.0451)	(0.0473)
CEO-Ex-Pay	−6.30e-09	−5.95e-09	−2.32e-09
	(1.72e-08)	(1.72e-08)	(1.71e-08)
CEO^{Age}	0.0262*	0.0277*	0.0286*
	(0.0143)	(0.0144)	(0.0146)
CEO-Ten	−0.0398**	−0.0408**	−0.0490**
	(0.0182)	(0.0182)	(0.0191)
Likelihood ratio	44.72***	46.46***	30.34***

Notes: This table presents the average marginal effects from the logit estimation, where ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. Standard errors are in parentheses. ROA, ROE, and Stock Returns are performance measures. Loss Performance equates to negative performance values, Ln(Assets) is the natural logarithm of total assets, Lev is leverage, VOL is volatility, BS is board size, %IB is the board composition, CEO-Dual is CEO duality, CEO-Shares (%) is the percentage of CEO owned shares, CEO-Ex-Pay is the CEO and top executive pay, and CEO^{Age} is the CEO age, and CEO-Ten is the CEO tenure.