



Research Article

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Board Composition and Cash Hoarding: Evidence from Jordanian Small- and Medium-Sized Enterprises

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Abstract

This study examines the influence of board composition on cash hoarding in Jordan. Based on a sample of 24 small and medium-sized enterprises (SMEs) between 2010 and 2020, the results show that board size has a positive impact on cash hoarding, whereas board independence has a significant negative influence on cash hoarding. Importantly, we note that cash hoarding is not affected by either chief executive officer (CEO) duality or female directors, contradicting the idea that women are risk-averse when making financing decisions. Regarding the other explanatory variables, the results reveal that firm size and operational risk have a significant and negative effect on cash hoarding, whereas growth opportunities have a positive and significant impact on cash hoarding. Finally, cash hoarding is not affected by cash flows. The results remain robust after addressing the endogeneity problem, and they enrich the literature with new evidence of the influence of female directors on cash hoarding in Jordan, where female board representation is low. Furthermore, the results provide evidence of the role of CEO duality on boards of directors, an issue that regulatory bodies in Jordan should consider when planning future governance reforms.

Subjects: Quantitative finance, corporate finance, business, management, and accounting

Keywords: cash holdings, corporate governance, small- and medium-sized enterprises, SMEs, Amman Stock Exchange

1. Introduction

Cash-hoarding choices have recently become a focus of attention in corporate finance studies because they critically affect a company's financial position (Minh et al., 2022). Nevertheless, a vast body of research has identified the well-known drivers of cash hoarding. For example, Bates et al. (2009), Chen (2008), D'Mello et al. (2008), Harford et al. (2008), and Opler et al. (1999) analysed the drivers of cash hoarding for United States (US) companies, while Al-Najjar and Belghitar (2011) and Ozkan and Ozkan (2004) gauged the drivers of cash hoarding for United Kingdom (UK) companies. The literature documents that the most well-known drivers of cash hoarding are leverage, firm size, cash flow, growth opportunities, and profitability.

Mixed theoretical estimations have considered the drivers of cash hoarding from the perspective of trade-off theory since highly leveraged companies typically have greater cash reserves (Arora, 2019; Kim et al., 2011; Martínez-Sola et al., 2018). However, highly leveraged companies that adopt hierarchical financing policies generally have low cash hoarding (Ferreira & Vilela, 2004). Larger firms are likely to distribute cash because they have easier access to external financing and are better able to handle financial distress than small firms.

Recently, there has been increasing debate about the drivers of cash hoarding (Bagh et al., 2021; La Rocca et al., 2018; Le et al., 2018). According to the literature, cash hoarding is a major internal source of financing, particularly during financial crises when external sources of financing become extremely costly. However, several studies have highlighted that cash hoarding is linked to board composition and agency problems because the choice to reserve cash depends on the degree of information asymmetry (Alim & Khan, 2014; Al-Najjar, 2015; Boubaker et al., 2015; Chen, 2008; Kusnadi, 2003).

Based on these studies, board size, non-executive directors, and chief executive officer (CEO) duality can be utilised as internal governance mechanisms to reduce agency problems that may influence cash hoarding. However, the empirical findings on the association between cash hoarding and board composition in developed markets have produced mixed results.

Various studies have considered cash hoarding in the Italian (Cambrea et al., 2021), Swiss (Drobetz & Gruninger, 2007), and French (Boubaker et al., 2015) contexts, but few have been devoted to developing countries. Other research has also noted the importance of firm size in the effect of board composition on cash hoarding, particularly in small- and medium-sized enterprises (SMEs) in developed corporate contexts (Al-Najjar, 2015; Chen, 2008; Kim et al., 2011; La Rocca et al., 2018; Magerakis et al., 2020). However, few studies have examined the effect of board composition on cash hoarding in SMEs in emerging markets (Mohd-Asshari & Faizal, 2018; Nafees et al., 2017; Shubita, 2019). Overall, these studies noted that small companies tend to reserve more cash than large companies because of the cost of external financing.

Gender diversity may be a way to reserve more cash (Cambrea et al., 2019; Faccio et al., 2016; Lins et al., 2010). For example, the Central Bank of Jordan (CBJ) has encouraged banks to improve female involvement by increasing their representation on boards of directors and top management positions by 20% and 25%, respectively, by 2024. As CBJ Governor Adel Sharkas stated, 'Women on boards of banks are still underrepresented'. According to a 2015 joint report published by the International Finance Corporation (IFC) and the Jordan Institute of Directors, women hold just 3.5% of corporate board seats in the country. However, in the Jordanian corporate context, only Noman et al. (2019) considered board composition as a driver of cash hoarding. Thus, we conduct this study to gauge whether board gender diversity affects cash hoarding in Jordan.

Furthermore, SMEs aspire to cash hoarding because they experience large financial constraints due to their inability to obtain financing from the capital market and their poor financial

¹ <https://www.amamventures.com/-allonboardjo>

management (e.g., Magerakis et al. 2020). Hence, this study provides evidence of the impact of board composition on cash hoarding among Jordanian-listed SMEs.

This study contributes to the corporate finance and governance literature in several ways. First, it adds to the growing body of work on boards of directors by gauging cash-hoarding decisions in light of the boards' main characteristics. Boubaker et al. (2015) and Lee and Lee (2009) considered this issue in developed markets and reported that boards had a positive effect on companies' cash levels but not on Jordanian companies, which are characterised by concentrated ownership and poor minority shareholder protection.

The Jordanian context provides a unique setting for investigating these effects. Second, this study investigates the influence of board composition on cash management in Jordanian SMEs using different proxies for cash hoarding.

Based on a sample of 24 SMEs between 2010 and 2020, we note that board size positively affects cash hoarding, which is consistent with the argument that firms with large boards have more cash reserves because of ineffective monitoring activities. However, cash hoarding was not affected by female directors, which is inconsistent with the argument that women are risk averse. Furthermore, these findings can help Amman Stock Exchange (ASE) regulatory bodies consider this issue when planning future governance reforms. They also have significant implications for companies wishing to hold cash, encouraging them to pay more attention to gender diversity when appointing directors.

The remainder of this paper is organised as follows. In the next section, we describe our empirical work and develop our hypotheses. This is followed by the Methodology section. In the final two sections, we discuss the results and present our conclusions.

2. Previous Studies and Hypotheses Development

2.1 Board composition and cash hoarding: The background

This section documents the theoretical framework underpinning this research, beginning with agency theory and discussing the trade-off and pecking order theories of capital structure.

2.1.1 Agency theory

Agency theory assumes that companies with high levels of free cash flow can experience agency conflicts if cash is not used to invest in positive net present value (NPV) projects. Managers can serve their interests by reserving cash to acquire discretionary power, which leads to agency conflict (Jensen, 1986). Chen (2008), notes that managers have greater discretionary power in firms that stockpile high cash levels.

Similarly, Claessens et al. (2000) and Fama and Jensen (1983) stated that managers invest more in firms with high cash levels. Therefore, holding other things constant, managers in firms with high levels of cash can be seen as 'self-opportunistic', leading to higher agency costs. However, Jensen's (1986) theory of free cash flows states that significant cash hoarding can provide large investors with opportunities to obtain private benefits and increase their wealth. For instance, Dittmar et al. (2003) note that firms in countries with weak minority investor protection have twice as much cash hoarding as their counterparts in countries that provide good investor protection, emphasising the importance of agency costs associated with cash hoarding.

2.1.2 Pecking order theory

This theory anticipates that firms follow a pecking order of financing to reduce the costs associated with agency costs and use their cash reserves before issuing debt when their investments exceed internally generated funds. However, companies with internal cash surplus may reduce their debt. Free cash flow theory notes that agents need to increase the benefits to management because they

allow them to gain discretionary power over firms' investment decisions and decrease the probability of monitoring by capital markets (Jensen, 1986). Consequently, cash hoarding that exceeds the amount required to fund productive investments could lead to agency problems, as free cash flow gives managers more discretion to waste excess cash or invest it in unproductive investments.

Both Myers (1984) and Myers and Majluf (1984) noted that capital structure is affected by the cost of financing; therefore, reserved cash and liquid assets are used first. For example, Ferreira and Vilela (2004) and Opler et al. (1999) note that companies with high levels of internal cash flow are likely to stockpile cash. Therefore, we use cash flows, firm size, and growth opportunities in our model.

2.2 Board size and cash hoarding

The number of board members may affect the effectiveness of board-monitoring roles. The ability of a board to monitor insider behaviour largely depends on the number of directors. Larger boards will probably have a wider pool of knowledge and skills; thus, their organisational inefficiencies appear to be highly significant, leading to higher agency costs. For example, Lipton and Lorsch (1992) anticipated that small boards would exhibit more efficient coordination with fewer directors.

Many studies examine the effect of board size on cash hoarding (Cambrea et al., 2021; Kusnadi, 2003; Memon et al., 2021; Noman et al., 2019; Sheikh & Khan, 2015). Specifically, Boubaker et al. (2015) and Lee and Lee (2009) note a positive link between board size and cash holdings, noting that the larger the board size, the higher the companies' cash reserves because of ineffective monitoring. Similarly, Sheikh and Khan (2015) confirmed that corporations with large boards are likely to reserve cash to enable them to deal with unexpected financial distress.

However, Cambrea et al. (2021) document an inverse effect of board size on cash hoarding, noting that companies wishing to reduce agency problems may retain less cash. Furthermore, Alim and Khan (2016) indicate an inverse link between board size and cash hoarding because board size has a powerful effect on companies' financing policies. Thus, we formulate the following hypothesis (H):

H1: Board size does not influence cash hoarding.

2.3 Outside directors and cash hoarding

Independent external directors are assumed to monitor insider directors effectively because they have no financial interest in their companies (Rosenstein & Wyatt, 1990). According to Fama and Jensen (1983), independent directors concentrate on their human capital, which is largely associated with their reputation (Fama & Jensen, 1983).

Prior studies examine the influence of independent directors on cash hoarding (Boubaker et al., 2015; Chen, 2008; Khan et al., 2016; Memon et al., 2021; Noman et al., 2019). Boubaker et al. (2015) detect an inverse impact of non-executive directors on cash hoarding, demonstrating that firms with larger numbers of non-executive directors tend to distribute cash because of their heavy involvement in monitoring activities compared with dependent directors.

Furthermore, Ahmed et al. (2018), Chen (2008), and Memon et al. (2021) note the inverse influence of non-executive directors on cash hoarding, stating that non-executive directors decrease agency costs owing to effective management and reduced agency problems, leading to lower cash reserves. Nevertheless, Khan et al. (2016) and Noman et al. (2019) note that board independence has a non-negative impact on cash hoarding. Hence, we formulate the following hypothesis:

H2: Board independence has no effect on cash hoarding.

2.4 CEO duality and cash hoarding

According to agency theory, CEO duality affects monitoring activities (Fama & Jensen, 1983; Jensen &

Meckling, 1976). CEOs are more efficient than other directors at obtaining important information about their companies (Daily & Dalton, 1997), but CEO duality can decrease board members' monitoring activities (Goyal & Park, 2002; Lipton & Lorsch, 1992).

A CEO working as the chairperson of the board of directors means that significant control is placed in the hands of a single person. Prior studies have examined the influence of CEO duality on cash hoarding (Basheer, 2014; Cambrea et al., 2021; Drobetz & Grüninger, 2007; Sheikh & Khan, 2015). Boubaker et al. (2015) and Drobetz and Grüninger (2007), note that CEO duality motivates companies to reserve cash for discretionary use. Sheikh and Khan (2015) documented the positive impact of CEO duality on cash hoarding for conservative purposes. However, Basheer (2014) and Cambrea et al. (2021) argued that firms with CEO duality tend to hoard less cash. Therefore, we formulated the following hypothesis:

H3: CEO duality has no effect on cash hoarding.

2.5 Female directors and cash hoarding

Female directors can serve as internal corporate governance mechanisms to reduce agency problems. For instance, one strand of literature has focused on the role of women's representation in firms' investment and financing decisions (e.g., Adams & Ferreira, 2009; Banerjee et al., 2018; Chen et al., 2019; Tosun et al., 2022). These researchers note that female board representation decreases CEOs' certainty about financing decisions, which can lead firms to increase their cash levels.

Previous studies have examined the influence of female directors on companies' financing choices (Faccio et al., 2016; Lins et al., 2010), noting that females tend to be more risk-averse and have less confidence. Therefore, female directors undertake fewer projects and make fewer essential decisions than their male counterparts. Nevertheless, Cambrea et al. (2019), note that the link between female board members and cash hoarding depends on their positions on the board. They show that females involved in monitoring activities governed by non-executive directors and female managers lead to diminished cash hoarding but that firms operated by female CEO shave more cash reserves. Thus, we propose the following hypothesis:

H4: Female directors have no effect on cash hoarding.

2.6 Growth opportunities and cash hoarding

We consider growth opportunities to be drivers of cash hoarding; companies' growth opportunities encourage them to reserve cash to overcome emergency costs (Aftab et al., 2018; La Rocca et al., 2018; Magerakis et al., 2020; Shah, 2011; Tayem, 2017). Bigelli and Sanchez-Vidal (2012) and Pastor and Gama (2013) document the inverse impact of growth opportunities on cash hoarding. Consequently, we formulate the following hypothesis:

H5: Growth opportunities have no effect on cash hoarding.

2.7 Cash flow and cash hoarding

We consider cash flow as the driver of cash hoarding. Some scholars have noted an inverse link between cash flow and cash hoarding (Al-Najjar, 2015; Gill & Shah, 2012), but others have found a positive link between cash flow and cash hoarding (Al-Khataybeh et al., 2022; Drobetz & Gruninger, 2007). Tayem (2017) finds a positive association between cash flow and cash hoarding according to the pecking order theory, revealing that companies choose internal sources of financing over external ones. Consequently, we formulate the following hypothesis:

H6: Cash flow has no effect on cash hoarding.

2.8 Firm size and cash hoarding

We consider firm size to be a driver of cash hoarding. Large companies tend to distribute cash because they have easier access to external financing and are better able to handle financial constraints than SMEs (Al-Najjar, 2015; Bigelli & Sanchez-Vidal, 2012; La Rocca et al., 2018). For example, Le et al. (2018) note that firm size is negatively linked to cash hoarding. Firms hold cash for two main purposes: first, transaction costs are linked to the sale of illiquid assets; and second, firms reserve cash as a precaution to capitalise on unanticipated financial distress. In addition, SMEs are less diversified and have a greater risk of bankruptcy than highly diversified large corporations.

Guney et al. (2007) documented a positive influence of firm size on cash hoarding in US and Japanese companies but a positive influence in German, French, and UK companies. Chen (2008) noted a positive influence of firm size on cash hoarding in ageing firms but a negative influence on new firms. Bagh et al. (2021) note the positive influence of firm size on cash hoarding, claiming that large companies face few agency problems and have ready access to external financing, enabling them to meet shareholder expectations and leading shareholders to hoard high levels of cash. In summary, we formulate the following hypothesis:

H7: Firm size has no effect on cash hoarding.

2.9 Operating risk and cash hoarding

We consider operating risk as a driver of cash hoarding. Belghitar and Khan (2013), Le et al. (2018), and Shah (2011) noted a positive association between operating risk and cash hoarding because external financing is costly for companies with high earnings volatility and SMEs have restricted access to external financing sources, thus tending to reserve cash rather than distribute it. However, Guney et al. (2007) and Paskelian et al. (2010) find an inverse link between operating risk and cash hoarding, indicating that when risk occurs, firms (especially those with high growth opportunities) tend to increase their investments instead of cash hoarding. Moreover, some firms respond to cash flow variability by discarding investments rather than changing their discretionary investment timing. Overall, we formulate the following hypothesis:

H8: Operating risk has no effect on cash hoarding.

3. Methodology

3.1 Study sample

We use a sample of non-financial firms listed on the Amman Stock Exchange (ASE) between 2010 and 2020 and exclude financial firms because they are subject to different regulations. The initial sample comprised 74 firms, but only 24 met the definition of SME². We classified firms according to the number of people employed. We used the ASE website to obtain financial and accounting data and sourced board characteristic data from firms' annual reports.

3.2 Estimation methods and research variables

To examine the research's hypotheses, we developed the following model:

$$\text{Cash Hoarding}_{it} = \beta_0 + \beta_1 \text{Board Size}_{it} + \beta_2 \text{Board Independence}_{it} + \beta_3 \text{CEODuality}_{it} + \beta_4 \text{Gender Diversity}_{it} + \beta_5 \text{Company Size}_{it} + \beta_6 \text{Growth Opportunities}_{it} + \beta_7 \text{Cash Flow}_{it} + \beta_8 \text{Operational Risk}_{it} + \varepsilon_{it} \quad (1)$$

Following previous literature (Al-Najjar, 2015; Harford et al., 2008; Tayem, 2017), we calculated

² *Entrepreneurship - enterprises by business size - OECD data (no date) the OECD. Available at: <https://data.oecd.org/entrepreneur/enterprises-by-business-size.htm>.*

cash hoarding as the ratio of cash and cash equivalents to total assets. We used four proxies to measure the independent variables for board composition: 1) female representation (gender diversity), defined as the portion of female directors to the total number of board members in firm *i* at time *t*; 2) board independence, defined as the ratio of independent directors to the total number of board members in firm *i* at time *t*; 3) CEO duality, defined as a dummy variable that took 1 if the CEO and the chairperson were the same and 0 otherwise; and 4) board size, defined as the total number of board members in firm *i* at time *t*. β_0 and ϵ_{it} in the model refer to firm- and time-fixed effects, respectively, and *i* and *t* refer to firm and time, respectively. A description of the variables used in this study is provided in the Appendix.

We control for several variables identified in prior studies that could affect cash hoarding, such as firm size, growth opportunities, operating risk, and cash flow (Al-Najjar, 2015; Harford et al., 2008; La Rocca et al., 2018; Shah, 2011; Tayem, 2017). We winsorise all continuous variables at the top and bottom percentiles, Appendix 1 defines these variables.

4. Results and Discussion

4.1 Descriptive statistics and collinearity tests

Table 1 presents the descriptive statistics of the research variables for the period 2010–2020. The mean value of cash hoarding is 6%, suggesting that listed SMEs in Jordan tend to hold less cash and depend on external financing sources. These results were similar to those reported by Al-Zoubi (2019). Regarding board size, Table 1 shows that the mean was approximately 8 board members, and the maximum was 13. The mean percentage of independent directors is 90%, indicating a far greater percentage of outside directors than executive directors on boards. The mean proportion of females on boards was 5%, indicating a relatively low involvement of women on boards among ASE-listed firms. The mean firm size was 7.20.

Table 1. Descriptive statistics

Variable	Mean	Median	Minimum	Maximum
Board Size	7.56	7	3	13
Board Independence	0.90	0.91	0.25	0.85
Gender Diversity	0.05	0.00	0.00	0.80
CEO Duality	0.23	0.00	0.00	1
Growth Opportunities	0.93	0.89	0.45	1.69
Firm size	7.20	7.14	5.67	8.44
Operational Risk	0.38	0.35	0.04	0.95
Cash Hoarding	0.06	0.01	0.00	0.34
Cash Flow	0.06	0.05	-1.04	0.64

Note: All variables are defined in Appendix 1 and were winsorised at 1% and 99%.

Table 2. Pairwise correlations

Variable	1	2	3	4	5	6	7	8
Board Size	1.00							
Board Independence	0.22*	1.00						
Gender Diversity	0.46*	0.08	1.00					
CEO Duality	-0.06	-0.41*	0.01	1.00				
Growth Opportunities	-0.30*	-0.20*	-0.20*	0.24*	1.00			
Cash Flow	-0.05	0.01	-0.01	-0.04	0.08	1.00		
Firm Size	0.46*	0.19*	-0.31*	-0.26*	-0.30*	0.30*	1.00	
Operational Risk	-0.12*	0.02	-0.21*	-0.12*	-0.15*	-0.36*	-0.36*	1.00

Note: * shows statistical significance at the 0.05 value and above.

The correlation analysis aimed to test the direction of associations between the study variables. The pairwise correlations in Table 2 show that none of the figures are sufficiently high to detect multicollinearity problems. Furthermore, the variance inflation factor (VIF) statistics in Table 3 show that all figures are below the threshold of 10, confirming the absence of multicollinearity.

Table 3. VIF statistics

Variable	VIF	1/VIF
Board Independence	1.48	0.067845
Board Size	1.22	0.067876
Firm Size	2.05	0.492298
CEO Duality	1.45	0.688606
Growth Opportunities	1.43	0.698961
Cash Flow	1.48	0.676883
Gender Diversity	1.06	0.939990
Operational Risk	1.48	0.675425
Mean VIF	1.33	

To better understand cash hoarding and board size during the study period, we present three figures representing cash hoarding, board size, and female representation. Figure 1 shows a significant fluctuation in cash hoarding over the years, with a maximum of 7%. Figure 2 shows that board size has steadily decreased from 7.73 in 2010 to 7.12 in 2020. Finally, Figure 3 shows that female representation on boards of directors is very low, with a mean of approximately 5%.



Figure 1: Trend of cash hoarding over the years (2010-2020)



Figure 2: Trend of board size over the years (2010-2020)

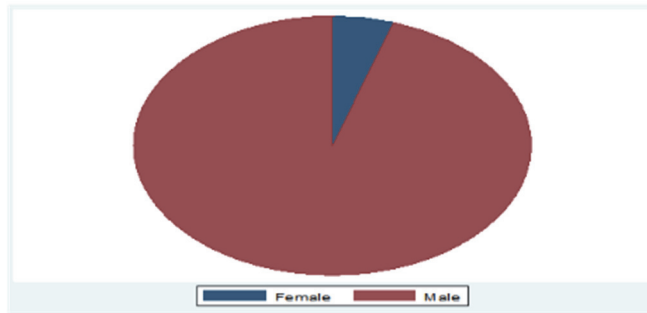


Figure 3: Male and female percentages over the years (2010–2020)

5. Regression Results

5.1 Regression results and discussion

The major issue addressed in this study is whether board composition influences cash hoarding. Specifically, this study examines the association between board composition (board size, board independence, CEO duality, and board diversity) and cash hoarding using a panel data regression. The findings on the direct impact of board composition on cash hoarding in Model 3 are presented in Table 4.

Board size has a positive and significant effect on cash hoarding. Hence, H₁ is rejected. This result is consistent with those of other scholars (e.g., Boubaker et al., 2015; Lee & Lee, 2009; Memon et al., 2021; Noman et al., 2019; Sheikh & Khan, 2015) who note that board size may be positively related to cash hoarding for different reasons. First, having many board members may improve the monitoring of financial decision-making, resulting in a more conservative approach to cash reservations. Second, a large board can enhance the decision-making processes and provide room for sharing skills and views to support conservative decisions, particularly under uncertain and risky conditions. Overall, the positive relationship with cash hoarding shows that large boards are more effective in supporting and implementing financial decisions, because of better supervision and control executed by the management. Nevertheless, Cambrea et al. (2021) and Alim and Khan (2016) find a negative impact of board size on cash hoarding, arguing that companies hold less cash when the board size is large to reduce the degree of information asymmetry between inside and outside investors and ensure their survival.

These findings further indicate that board independence has an inverse and significant effect on cash hoarding. Thus, H₂ was rejected. These results were similar to those of previous studies (e.g., Ahmed et al., 2018; Boubaker et al., 2015; Chen, 2008; Memon et al., 2021; Paskelian et al., 2010). These researchers detected an inverse impact of board independence on cash hoarding, arguing that companies with more independent directors tend to hold less cash because they strictly monitor managers and have no financial interests beyond their directorship fees. Furthermore, independent directors are not related to the firm or its management. Therefore, they are expected to act in the best interest of shareholders, as they can provide unbiased advice and oversight. Moreover, independent directors tend to demand responsibility from the management for their decisions and advocate strategies that increase firm value. However, weak independent directors may enhance cash hoarding because they conduct less monitoring to ensure that managers are acting in the best interests of the company and may also have limited expertise; thus, they may be more likely to hold cash.

CEO duality has no statistically significant effect on cash hoarding. Thus, H₄ is rejected. This finding is consistent with those of other studies (e.g., Basheer, 2014; Cambrea et al., 2021; Gill & Shah, 2012). For instance, Cambrea et al. (2021) argue that firms with CEO duality tend to have lower levels

of cash, and Basheer (2014) detects an inverse link between CEO duality and cash hoarding. Various factors influence cash holdings, including a company's financial well-being, available investment opportunities, and risk-management strategies. The effect of CEO duality on cash hoarding may be weakened by other more significant drivers of cash hoarding. For example, a firm's financial value, industry dynamics, and profitability may have stronger effects on cash hoarding than CEO duality.

The results also indicate that board gender diversity has no statistically significant effect on cash hoarding. Therefore, H4 is rejected. These results are consistent with the work of Tosun et al. (2022), while Bona-Sanchez et al. (2023) found a negative association between board gender diversity and cash hoarding, confirming that independent female directors provide valuable resources which help reduce a firm's need to reserve cash to deal with unexpected events. The absence of a statistically significant association between board gender diversity and cash hoarding does not imply a relationship between them. Nevertheless, this suggests that female representation on the boards of Jordanian SMEs was not sufficient to establish a significant and consistent relationship between these variables.

The effect of firm size on cash hoarding is negative and significant, confirming the findings of other studies (Aftab et al., 2018; Al-Najjar, 2015; La Rocca et al., 2018; Memon et al., 2021; Mohd-Asshari & Faizal, 2018; Ngatno & Youlianto, 2021; Pastor & Gama, 2013). These researchers documented that small firms tend to hold more cash because they find it difficult to access external financing due to high information asymmetry and the inability to access capital markets. Thus, our findings suggest that smaller firms are more likely to reserve cash. However, Guney et al. (2007), Chen (2008), and Bagh et al. (2021) found a positive effect of firm size on cash hoarding, noting that large companies face low information asymmetry and high accessibility to external financing, which leads to fulfilling shareholder's interests, thus leading shareholders to hoard high levels of cash.

Operational risk has a negative and significant effect on cash hoarding, consistent with the findings of Guney et al. (2007) and Paskelian et al. (2010), who noted a negative link between operating risk and cash hoarding, showing that when the risk occurs, companies tend to increase their investments, especially those with high growth opportunities. Moreover, some companies act on cash flow volatility by postponing investment. Moreover, the inverse relationship between operational risk and cash holdings indicates that when operational risk increases, companies tend to possess reduced levels of cash. This is due to the need to allocate more resources to mitigate and manage risks, which results in a decrease in available cash.

On the other hand, lower operational risk enables companies to allocate more resources to maintain higher cash reserves. Hence, a negative correlation demonstrates the balance between managing risk and preserving liquidity. On the other hand, Le et al. (2018), Belghitar and Khan (2013), and Shah et al. (2011) noted a positive relationship between operating risk and cash hoarding since SMEs' accessibility to external financing is costly, and firms with fluctuating earnings tend to hold more cash.

The association between growth opportunities and cash hoarding is positive and significant, suggesting that firms with high growth opportunities tend to have higher cash hoarding than those with low growth opportunities. This result is in agreement with those of Ferreira and Vilela (2004), Kim et al. (1998), Opler et al. (1999), and Ozkan and Ozkan (2004). A possible explanation for this positive result is that companies with promising growth prospects tend to maintain higher cash reserves, which are associated with their potential for growth. This enables them to allocate funds for R&D, cover capital expenditure, and pursue strategic acquisitions without relying heavily on external funding sources.

However, they contradict those who find a negative association (Bigelli & Sanchez-Vidal, (2012); Pastor & Gama, (2013)). The finding regarding growth opportunities is consistent with the precautionary motive argument that the higher the growth opportunities of a firm, the higher the financial distress costs, and the greater the need to hold high levels of cash to overcome the costs. Moreover, as they mature, companies must reserve cash to compensate for cash spent on growth opportunities.

Nevertheless, cash flows had no statistically significant effect on cash hoarding. This result implies that cash flows from a firm's operations do not depend on cash hoarding. Nevertheless, this

finding contradicts those of Al-Khataybeh et al. (2022), Gracia-Teruel and Solano (2008), and Tayem (2017). The authors found a positive and significant association between cash flows and cash hoarding. Notably, they observed a positive effect of cash flow on cash hoarding, arguing that profitability (high cash flow) is no substitute for cash and that firms are likely to reserve high levels of cash when they have high cash flows, consistent with the pecking order theory.

Table 4. The effect of board composition on cash hoarding

Variable	Ordinary Least Squares	Fixed-Effects Panel	Random-Effects Panel
Board Size	0.01*** (3.1)	0.01** (2.33)	0.01** (2.03)
Board Independence	-0.07 (-1.51)	-0.08 (-1.68)*	-0.08 (1.69)*
CEO Duality	-0.01 (-0.73)	-0.01 (0.41)	-0.01 (0.42)
Gender Diversity	0.01 (0.78)	-0.03 (-0.43)	-0.03 (0.42)
Growth Opportunities	0.09 (5.24)***	0.06 (3.07)***	0.05 (2.43)**
Firm Size	-0.04 (-2.86)***	-0.04 (-1.88)*	-0.03 (-1.16)*
Operational Risk	0.06 (-1.97)*	-0.07 (2.07)**	-0.07 (-1.89)*
Cash Flow	-0.00 (-0.08)	0.02 (0.46)	0.01 (0.37)
Constant	0.25 (2.47)**	0.30 (2.01)**	0.26 (1.25)
Adjusted R ²	0.16	0.15	0.17

Note: *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels (two-tailed), respectively.

5.2 Robustness tests

We assess the robustness of the effect of board composition on cash hoarding using 1) alternative measures of cash holdings and 2) an alternative econometric method.

5.2.1 Alternative econometric method: Board composition and cash hoarding using logit and Tobit models

Table 5 presents the results of the two further analyses. The first model is a logit model, where the dependent variable is dichotomous, taking 1 and zero otherwise, The other two models are Tobit. We employed a Tobit analysis because cash hoarding values would always be zero or positive; therefore, Tobit models seemed more appropriate for the data. Overall, the results provide evidence of a positive link between board size and cash hoarding, consistent with the main analysis. Moreover, in the random-effects (xtlogit) model, there is a significant inverse relationship between board independence and cash hoarding. Finally, for women on boards, as shown in Table 5, there is a positive association between female directors and cash hoarding. Female executives hold more cash for liquidity purposes to prevent negative outcomes from essential financing choices and protect their firms' day-to-day operations (Cambrea et al., 2019).

Table 5. The effect of board composition on cash hoarding using logit and Tobit models

Variable	Logit	xtlogit	Tobit	xttobit
Board Size	0.27 (3.41)***	0.63 (2.48)**	0.01 (3.16)***	0.01 (2.43)**
Board Independence	0.26 (0.18)	-2.17 (-0.78)	-0.07 (-1.54)	-0.08 (-1.69)*
CEO Duality	0.00 (0.00)	-0.13 (-0.12)	-0.01 (-0.74)	-0.01 (-0.43)
Gender Diversity	2.01 (1.84)*	-0.18 (-0.07)	0.01 (0.28)	-0.02 (-0.38)
Growth Opportunities	2.56 (4.69)***	1.84 (2.07)**	0.09 (5.33)***	0.06 (3.27)***
Firm Size	-0.65 (-1.73)*	-1.02 (-1.10)	-0.03 (-2.91)***	-0.04 (-2.05)**
Operational Risk	-0.42 (-0.47)	-0.80 (-0.45)	-0.06 (-2.00)**	-0.07 (-2.12)**
Cash Flow	1.30 (1.23)	2.29 (1.20)	-0.00 (-0.08)	0.01 (0.45)
Constant	-0.93 (-0.30)	1.32 (0.19)	0.25 (2.51)**	0.30 (2.16)**
Pseudo R ²	0.14	0.18	0.10	0.12

Note: *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels (two-tailed), respectively.

5.2.2 *Alternative econometric method: Board composition and cash hoarding using two-stage least squares (2SLS) analysis*

Following Al Najjar and Clark (2017), we employed a 2SLS approach. The models in Table 4 do not account for the endogeneity between board composition and cash hoarding. To address this concern, we ran again the models in Table 6 using the instrumental variables generated by the 2SLS procedure. The results shown in Table 6 support the positive association between board size and cash hoarding. Moreover, they confirm a negative association between board independence and cash hoarding.

Interestingly, as Table 6 shows, the associations between CEO duality, female directors, and cash hoarding become positive and significant. Hence, regarding board composition, this study supports the findings of previous studies (Al-Najjar & Belghitar, 2011; Al Najjar & Clark, 2017; Gul et al., 2020). Regarding the control factors, large companies are known to hold more cash. This result contradicts earlier findings but aligns with previous research conducted in developed markets (Al-Najjar & Belghitar, 2011; Al Najjar & Clark, 2017). The latter studies note that SMEs are less diversified and face greater bankruptcy risk; thus, they tend to hold more cash as a precautionary measure to offset their restricted access to external financing. Finally, the results in Table 6 provide evidence of a negative and significant association between cash flow and cash hoarding.

Table 6. Regression of the relationship between board composition and cash hoarding using 2SLS

Variable	1	2
Board Size	0.02 (0.91)	0.01 (3.10)***
Board Independence	-1.76 (-2.09)**	3.30 (2.82)***
CEO Duality		0.68 (2.14)**
Gender Diversity		5.11 (5.61)***
Growth Opportunities		-0.79 (-1.96)*
Firm Size		1.72 (6.32)***
Operational Risk		0.23 (0.33)
Cash Flow		-2.19 (-2.18)***
Constant	1.52 (2.36)**	-7.46 (-3.05)***
Year Dummies	Yes	Yes
R ²	0.19	0.37

Note: *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels (two-tailed), respectively.

5.2.3 *Alternative measures of cash hoarding*

Cash Hoarding₁ is used to measure cash hoarding in the main analysis to examine the effect of board composition on cash hoarding. However, in this section, we explain alternative proxies for cash hoarding. Based on Minh et al. (2022), we employ two alternative measures of cash hoarding and re-estimate Equation 1. The alternative measures of cash holding were calculated as follows: 1) Cash Hoarding₂ is the ratio of total cash and cash equivalents to total assets, and 2) Cash Hoarding₃ is the ratio of total cash and cash equivalents to total assets minus total cash and cash equivalents plus short-term investment.

Table 7 documents the regression findings for the effects of board composition on cash hoarding based on alternative measures of cash hoarding. The results showed that the coefficients for board size (board independence) remained positive (or negative) and statistically significant at the 1% level. However, for gender diversity, as shown in Table 7, the coefficients for female directors were negative and statistically significant at the 5% level. Generally, our results were robust when we used alternative measures of cash holding.

Table 7. Regressions of the relationship between board composition and cash hoarding using alternative measures of cash hoarding

Variable	Cash Hoarding 2	Cash Hoarding 3
Board Size	0.01 (1.52)	0.01 (1.19)
Board Independence	-0.02 (-0.30)	-0.03 (-0.30)
CEO Duality	0.02 (1.06)	0.03 (1.42)
Gender Diversity	-0.14 (-2.28)**	-0.14 (-2.32)**
Growth Opportunities	0.03 (1.34)	0.03 (0.98)
Firm Size	0.06 (3.46)***	0.05 (2.51)**
Operational Risk	0.14 (3.34)***	0.12 (2.45)**
Cash Flow	-0.01 (-0.11)	-0.01 (-0.12)
Constant	-0.48 (3.34)***	-0.43 (-2.38)**
Adjusted R ²	0.09	0.05

Note: *, **, and *** indicate statistical significance at the 0.10, 0.05, and 0.01 levels (two-tailed), respectively.

6. Conclusion

This study investigated the influence of board composition on cash hoarding, using a sample of 24 SMEs between 2010 and 2020. We observed that CEO duality and female directors do not affect cash hoarding. Consequently, the results contradicted the idea that women are risk-averse when making financing decisions. Regarding the other explanatory variables, the results reveal that growth opportunities (operational risk) have a significant positive (or negative) effect on cash hoarding. Finally, we discovered that cash hoarding is not affected by company size or cash flows. These results are robust when alternative proxies for cash hoarding are used.

These findings support the agency theory argument that companies with more board members hold more cash. This study has implications for managers regarding cash hoarding in companies with high levels of board independence. Specifically, the results reveal an inverse influence of board independence on cash hoarding because independent directors, having no financial interests beyond their director fees, strictly monitor managers. However, independent directors who lack financial management expertise may support their cash holdings.

This study adds a fruitful contribution to the literature and has implications for other scholars and policymakers regarding cash hoarding and corporate governance. Specifically, the results complement the mixed results of previous studies examining the influence of board composition, particularly gender diversity, on financing decisions. Therefore, regulators should seriously consider this issue when planning future governance reforms, especially when female representation on the board of directors is optional. Furthermore, the results have significant implications for SMEs eager to maintain cash hoarding. More specifically, SMEs are characterised by large financial constraints due to their inability to obtain financing from the capital market and poor financial management (e.g., Magerakis et al. 2020). For instance, scholars and policymakers can use this study to develop guidelines for controlling cash hoarding by SMEs. Moreover, this research can add a corporate governance area to increase female representation in Jordanian SMEs, where women's board representation is low.

This study has limitations. First, the research was conducted in Jordan, which limits the generalisability of the results to underdeveloped countries where women are often restricted to family duties. However, considering developed countries in future work would be beneficial for advising on diverse policy decisions in different corporate governance environments. Second, this study employed board composition as an independent variable. Future work could include other CEO demographic data, such as CEO age, tenure, and education, as well as macroeconomic factors, such as inflation and the unemployment rate.

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Appendix 1. Variable definitions

Variables	Definitions
Cash Hoarding 1	The ratio of cash and cash equivalents to total assets.
Cash Hoarding 2	The ratio of cash, cash equivalents, and short-term investments to total assets.
Cash Hoarding 3	The ratio of cash, cash equivalents, and short-term investments to total assets minus cash equivalents and short-term investments.
Board Size	The total number of members on the board.
Board Independence	The proportion of independent directors over total board directors.
CEO Duality	A dummy variable taking 1 if the CEO and the chair are the same and 0 otherwise.
Board Gender Diversity	Portion of female directors to the total number of board members
Firm Size	The natural logarithm of the total assets of a company.
Growth Opportunities	The ratio of liabilities plus market capitalisation to total assets.
Cash Flow	The ratio of earnings before interest dividends and taxes plus depreciation to net total assets.
Operating Risk	The ratio of the standard deviation of operating income to total assets.