Journal of Behavioral and Experimental Finance 30 (2021) 100496

Contents lists available at ScienceDirect

Journal of Behavioral and Experimental Finance

journal homepage: www.elsevier.com/locate/jbef

Full length article

Working capital management and CEO age

Robert B. Burney [a], Hui Liang James [b], Hongxia Wang [a,*]

[a] Coastal Carolina University, E. Craig Wall Sr. College of Business, Conway, SC 29528, United States of America
[b] University of Texas at Tyler, SCOB 350.06, 3900 University Blvd, Tyler, TX 75799, United States of America

ARTICLE INFO

Article history:
Received 7 March 2021
Accepted 10 March 2021
Available online 16 March 2021

JEL classification:
G30
G31
G35

Keywords:
CEO age
Level of career concerns
Net operating working capital
Aggressive strategy
Conservative strategy

ABSTRACT

The existing literature provides strong evidence that working capital management affects a firm's performance and value. In this paper, we examine how CEO age affects firms' working capital decisions. Using a sample of 28,243 firm-year observations of U.S. firms from 1993 to 2018, we find that net operating working capital increases with CEO age, and firms with younger CEOs hold lower levels of inventory and higher levels of payables. The results are robust to various model specifications and variable definitions, providing strong and robust evidence that younger CEOs tend to implement more aggressive working capital management policies (Aggressive strategy hypothesis). The findings provide important insights to the board of directors, investors, and various monitoring groups.

1. Introduction

The CEO of a firm plays a vital role in establishing the management team's general orientation towards policymaking, which in turn affects the firm's daily operations. In this study, we examine how CEO age affects a firm's working capital policies. Working capital management (WCM), simply speaking, is the management of a firm's current assets and current liabilities,[1] i.e., dealing with short-term investing and financing decisions that are essential to a firm's daily operations. However, short-term-focused working capital decisions have a long-term impact on a firm. WCM has direct links with cost control, productivity, firm growth, and, hence, firm performance.[2] WCM is a critical component of a firm's overall financial management and is an important risk management tool. Boisjoly et al. (2020) posit that WCM can create a competitive advantage for firms. For example, The Hackett Group posits that one of the essential strategies in response to financial crises is to free up cash flows from working capital.[3]

The benefits of efficient working capital management have been well documented. Reductions in working capital can generate balance sheet-benefits such as high cash flows and reduced investments in receivables, inventory, and long-term assets used to support the current accounts on a balance sheet (Boisjoly et al., 2020). Furthermore, efficient WCM allows firms to redeploy underutilized corporate resources to higher-valued use, enhancing stock value and operating performance (Aktas et al., 2015). Ma and Ma (2020) argue that trade credit granted by suppliers sends a signal to investors about a firm's trustworthiness and the quality of its investments, facilitating its future access to bank loans. Given the importance of working capital in a firm's daily operations and long-term value, CEOs should have strong incentives to watch WCM policies closely.

Gibbons and Murphy (1992) posit that career concern arises when the labor market (both internal and external) uses a person's current output to update its belief about his/her ability and then bases future compensation on the updated belief. Career concerns induce individuals to pay attention to the effects of current performance on contemporaneous and future benefits of

* Corresponding author.
E-mail addresses: robert@coastal.edu (R.B. Burney), hjames@uttyler.edu (H.L. James), hwang3@coastal.edu (H. Wang).

[1] A firm's WCM policy is typically described in terms of (1) the size of its working capital (measured with working capital, net working capital, or net operating working capital) (2) the way in which the firm's working capital is financed (with respect to what portion of this investment is funded with short-term sources of capital), and (3) how the firm's production process and vendor–customer relationships affect the level of working capital investment (typically measured with the firm's cash conversion cycle). Kieschnick et al. (2013) indicate that cash conversion cycle is not cash management but the management of net operating working capital.

[2] Studies show that working capital affects a firm's performance (Aktas et al., 2015; Lyngstadaas and Berg, 2016; Yazdanfar and Öhman, 2014; Deloof, 2003; Laghari and Chengang, 2019; Doan and Iskandar-Datta, 2021).

[3] See https://www.cfo.com/strategy/2008/01/preparing-your-company-for-recession/ for details.

https://doi.org/10.1016/j.jbef.2021.100496
2214-6350/

human capital such as compensation and general career prospects (Baginski et al., 2018; Fama, 1980; Pae et al., 2016). Managers face greater career concerns when the labor market has a weaker ex-ante belief about their abilities and places heavier weights on current firm performance in evaluating them. Fama (1980) posits that CEOs build up their reputation over their career through repeated dealings with capital market participants. Firms with more competent CEOs can secure funds with a better price, which facilitates their firms' growth and value-enhancement. Career concerns can create strong incentives for CEOs to take purposeful actions to signal their unknown abilities to the labor and capital markets.

The age of a CEO determines the level of his/her career concerns (Gibbons and Murphy, 1992; Prendergast and Stole, 1996; Holmström, 1999; Serfling, 2014; Li et al., 2017; Croci et al., 2017). Compared to older CEOs, younger CEOs face more intense pressure from the managerial labor market since they are usually in their early career stage and the market is still assessing their abilities. Consequently, they are more likely to be replaced due to perception of incompetence. Further, the effects of career concerns are stronger for younger CEOs due to higher returns to changing the market perception since they have a longer career ahead (Gibbons and Murphy, 1992). It is more likely that younger CEOs seek to build their reputation capital and secure their current job and future opportunities. Since working capital policies have long-term implications for both firms and their CEOs, we argue that CEO age affects a firm's working capital management policies through its impact on the CEO's career concerns.[4]

Working capital investment needs to be financed, thereby creating higher opportunity and financing costs for a firm (Kieschnick et al., 2013). Hence, younger CEOs may choose to manage working capital more aggressively by maintaining a lower level of working capital (*Aggressive strategy hypothesis*). Conversely, to avoid the potential negative impact on firm performance from the loss of sales due to stock-outs and/or tight credit policies, younger CEOs may choose to hold a higher level of working capital (*Conservative strategy hypothesis*).

Following Hill et al. (2010) and Aktas et al. (2015), we evaluate a firm's working capital management with net operating working capital, i.e., working capital requirement (*WCR*),[5] defined as the sum of accounts receivable and inventory net of accounts payable scaled by sales. Net operating working capital does not consider current assets primarily associated with liquidity such as cash and marketable securities or current portions of long-term debt. Instead, net operating working capital is more related to an overall concept of "leanness", which reflects a firm's relations with customers and suppliers through trade credit. Meanwhile, net operating working capital also reflects how firms manage and finance inventory. Kieschnick et al. (2013) note that a substantial portion of most firms' assets is tied up in net operating working capital. Hill et al. (2010) argue that investment in net operating working capital captures multiple dimensions of a firm's adjustments to operating and financing decisions. Specifically, we examine how CEO age affects the level of net operating working capital.

Using a sample of 28,243 firm-year observations for 2654 U.S. companies from 1993 to 2018, we find that CEO age is positively related to working capital requirement. We employ a propensity score matching approach, an instrumental variable regression, and various fixed effects regressions to alleviate the endogeneity arising from omitted variable bias, simultaneity, and model misspecification. Our results remain unchanged. Furthermore, the use of the lagged value of independent variables in our baseline regressions and the instrumental variable approach indicate that the causality runs from CEO age to net operating working capital investment. Further analyses show that firms with younger CEOs hold lower levels of inventory and higher levels of trade credit provided by suppliers. Collectively, the results support the *Aggressive strategy hypothesis* that firms with younger CEOs tend to maintain a lower level of net operating working capital than those with older CEOs.

Though the effects of CEO age on managerial decision making have been well studied, this paper is the first to assess the association between CEO age and net operating working capital investment strategies. We enrich the current literature in various ways. First, we add to the literature on the impact of human capital in general, and executive age in specific, on corporate decisions and outcomes (e.g., Huang et al., 2012; James, 2020; Serfling, 2014; Croci et al., 2017; Xie, 2015; Yim, 2013). Second, Li et al. (2017), Zhang et al. (2016), and Xie (2015) study the effects of CEO career concerns on long-term investments. We supplement their research by focusing on the impact of CEO career concerns on short-term working capital management decisions. Finally, we extend the study of Hill et al. (2010) by showing that CEO age is an important driving factor of WCM, incremental to the impact of a firm's operating conditions and financing ability documented in Hill et al. (2010), such as sales growth, sales volatility, internal financing capacity, and capital market access.

This study highlights the importance of CEO age and age-associated career concerns in working capital management, providing important implications to financial management practitioners, the board of directors, external financial analysts, and other market participants. The board of directors needs to make trade-offs between experience and age-related benefits in CEO-hiring decisions. Investors and external financial analysts should be sensitive to career-concern-based biases in CEOs' choices regarding WCM.

We organize the remainder of this paper as follows. In Section 2, we review the literature and develop our hypotheses. We provide an overview of our sample and the data in Section 3. In Section 4, we present our empirical results. We conclude the paper in Section 5.

2. Literature review and hypothesis development

2.1. Conservative and aggressive working capital management (WCM)

In broad terms, conservative/aggressive WCM refers to a policy under which a firm holds a high/low level of current assets and a low/high level of current liabilities. In our setting, conservative/aggressive WCM refers to policies with high/low levels of net operating working capital. Adopting a conservative approach towards working capital investment and financing policies creates firm value. However, a high level of working capital suggests a high level of financing needs, and borrowing additional funds may increase a firm's risk and chances of bankruptcy (Kieschnick et al., 2013). Taking an aggressive working capital management approach can free up funds for alternate uses, generating other cash flow streams. Furthermore, today's working capital management differs significantly from the old-type WCM with the introduction of various new management practices such as TQM (Total quality management), Six Sigma, and lean program initiatives (Boisjoly et al., 2020). Many large firms have witnessed

[4] Studies have shown that career concerns affect various firm policies and outcomes such as timing of news disclosure (Baginski et al., 2018), innovation (Fu, 2019), information disclosed to the board and board effectiveness (Song and Thakor, 2006), risk taking and firm performance (McClelland et al., 2012), investment efficiency (Xie, 2015), managerial investment myopia (Narayanan, 1985), financial reporting practice (Graham et al., 2005), earnings guidance decisions (Pae et al., 2016), tax planning (James, 2020), and analyst expectations management (Alfonso et al., 2019).

[5] We use the level of net operating working capital, working capital requirement, and working capital investment interchangeably hereafter.

regular process improvements in working capital management and resultant profitability increases due to the success of these programs (Boisjoly et al., 2020).

Firms that minimize net working capital can improve profitability and hence firm value (e.g., Soenen, 1993; Shin and Soenen, 1998; Deloof, 2003; Garcia-Teruel and Martinez-Solano, 2007). The evidence that aggressive WCM can create value has been documented in many countries such as the U.S. (Kayani et al., 2019), China (Laghari and Chengang, 2019), Portugal (Pais and Gama, 2015), and Belgium (Deloof, 2003). Short cash cycles enable firms to invest more in R&D and participate in more acquisitions (Jalal and Khaksari, 2020). However, aggressive WCM may bring a firm various problems such as loss of customers, sales, and ability to raise additional capital, and hence increase firm risks.

Inventory is an essential component of operating working capital. Firms should carry enough inventory to secure sales and avoid stock-out problems. However, carrying too much inventory is very expensive. Lean practices in inventory management such as JIT (Just in Time) have become a part of the solution to this issue. If managed well, lean practices in inventory management can satisfy customers' needs and avoid waste of resources simultaneously. Importantly, inventory management should not be separated from the management of other working capital components (Kieschnick et al., 2013). A firm's credit policy and inventory management are fundamentally linked to each other (Schiff and Lieber, 1974). For example, Wu et al. (2019) find that, for financially healthy companies, inventory increases in trade credit offered by suppliers and decreases in the financial cost of inventory. It is the joint management of inventory and trade credit that affects firm value (Sartoris and Hill, 1983; Kim and Chung, 1990). Kieschnick et al. (2013) provide evidence that the incremental dollar invested in trade credit to customers has a much greater effect on shareholders' wealth than the incremental dollar invested in inventory for the average firm, suggesting that trade credit policies are critical in working capital management.

Trade credit received from suppliers (accounts payable) allows a firm to evaluate the quality of products purchased on credit. Moreover, trade credit from suppliers also grants deferred payments for a designated period, hence, provides significant funding to the firm's operations, serves as a sound financial buffer, and increases the firm's free cash flow. Hu et al. (2020) indicate that a firm's creditworthiness increases with trade credit granted by its suppliers, leading to higher debt capacity and lower levels of cash constraint. Levine et al. (2018) find that liquidity-dependent firms in high-trust countries obtain more trade credit and suffer smaller drops in profits and employment during banking crises than similar firms in low-trust economies, implying that trade credit from suppliers can help a firm survive through tough times. In addition, trade credit can be a powerful tool for large firms to bully their smaller suppliers given their significantly greater bargaining power (Giannetti et al., 2011; Murfin and Njoroge, 2015; Wilson and Summers, 2002). Such practices may further benefit these large firms. Non-financial firms extend substantial trade credit to their customers when bank credit is scarce (Garcia-Appendini and Montoriol-Garriga, 2013). Levine et al. (2018) show trade credit is an essential factor in corporate resilience during banking crises. Further, trade credit can make a firm more transparent (Hu et al., 2020), and thus more attractive to investors.

Trade credit granted by a firm (accounts receivable) can help its trading partners financially and allow the firm to exercise price discrimination, which may further help the firm build better customer relations and secure more future sales, and hence increase firm value. However, trade credit extended to customers increases the capital tied up to accounts receivable, which needs to be financed. Further, the default of credit customers can bring significant financial problems to a firm, especially defaults from its major customers, i.e., those whose sales account for a large percentage of the firm's sales. Studies show that major customer-dependent firms have higher cash flow risk because the loss of a major customer could lead to a sizable drop in a firm's cash flows (Hertzel et al., 2008; Dhaliwal et al., 2016, 2019; Campello and Gao, 2017). Furthermore, financial distress can spill over from customers to their suppliers (e.g., Jorion and Zhang, 2009; Helwege and Zhang, 2016; Lian, 2017) and create an up to two-year negative impact on their suppliers' financial soundness. Extending too much trade credit may not benefit a firm's shareholders.

Cosci et al. (2020) note that most firms in the U.S. and European countries have significant amount invested in accounts receivable and significant amount financed with accounts payable. According to Wang (2019), the average publicly listed U.S. firm's total working capital accounts for 27% to 42% of its total assets. Our sample shows that an average firm has more than 15% of credit sales and more than seven cents of each dollar of sales are supported by trade credit granted by suppliers. Studying the role of trade credit during banking crises on firms in 34 countries, Levine et al. (2018) document that trade credit accounts for 25% of the average firm's total debt financing, suggesting that the sample firms use lower-cost trade credit to finance their daily operations and possibly long-term investments as well.

2.2. CEO age, CEO career concerns, and firm policies

Unlike CEO compensation contracts, career concerns provide strong implicit incentives for CEOs to pursue certain policies that, they believe, can maximize their current and future benefits.[6] CEOs have a higher level of career concerns when they face greater risk of termination (Gillan et al., 2009). Gibbons and Murphy (1992) argue that managers with a longer explicit or implicit contract duration have more incentives to favorably influence the labor market's assessment of their abilities.

Theoretical and empirical studies indicate that CEO age is a primary determinant of career concerns (Gibbons and Murphy, 1992; Prendergast and Stole, 1996; Holmström, 1999; Serfling, 2014; Li et al., 2017; Croci et al., 2017; Alfonso et al., 2019). These studies note that implicit incentives from career concerns are stronger for early career stage CEOs because such incentives can affect the value that the labor market assigns to the CEOs' abilities and reputation over a longer period. On the contrary, CEOs with shorter career horizons, such as older CEOs, are more concerned with short-term benefits, and therefore, are more likely to participate in self-seeking behavior (Lee et al., 2018). Furthermore, the upper echelons theory states that organizational outcomes, strategic choices, and performance are partially predicted by managerial characteristics such as CEO age. For example, Cline and Yore (2016) find that CEO age is significantly and negatively related to firm value, operating performance, and corporate deal-making activities.

Higher levels of career concerns of younger CEOs may induce greater managerial risk-taking incentives (*Aggressive strategy hypothesis*). Younger CEOs have incentives to make bolder investment decisions to boost firm performance in order to influence the labor market perception favorably. Furthermore, Younger CEOs have a longer career horizon over which they can reap the benefits from risky investments. Corporate board members update their beliefs about a CEO's ability when new information

[6] For example, Graham et al. (2005) find that managers believe that repeated failure to meet earnings benchmarks can inhibit their upward or intra-industry mobility, suggesting the level of career concerns is the most important motivation for beating earnings benchmark.

is observed (Hermalin and Weisbach, 1998). The more able the board believes the CEO is, the lower the likelihood of termination the CEO faces. In their early career stage, younger CEOs are more motivated to impress the board to secure their current job and may even get rewarded with the chairman position on the board.[7] Lastly, biologically, young people are more likely to engage in risky activities because they are in an advantageous position to realize risks and take quick corrective actions. Hambrick and Mason (1984) argue that younger CEOs pursue risky strategies. Prendergast and Stole (1996) posit that younger CEOs tend to make more aggressive investment decisions to show their talents and abilities in value creation.

Studies have shown that younger CEOs tend to engage in risk-taking activities such as more product or market innovation (Thomas et al., 1991), more acquisitions (Yim, 2013; Zhang et al., 2016), more aggressive tax planning (James, 2020), and higher entrepreneurial behavior (Lev, 2006). Moreover, firms headed by younger CEOs are also associated with greater R&D spending (Barker III and Mueller, 2002; Serfling, 2014), more advertising expenditures, and larger capital investment (Dechow and Sloan, 1991; Zhang et al., 2016). Younger CEOs are more likely to enter new lines of businesses (Li et al., 2017), make less diversifying acquisitions, and hold higher leverage (Serfling, 2014), and are less likely to use hedging strategies to reduce portfolio risk (Croci et al., 2017). In a similar vein, McClelland et al. (2012) find that CEOs with shorter career horizons adopt risk-averse strategies that, on average, adversely influence future firm performance. Firms experience lower investment, lower sales growth, and lower profitability, but a higher probability of survival as their CEOs age (Belenzon et al., 2019). Zhang et al. (2016) document that the stock market perceives acquisitions by younger CEOs to be of a higher quality.

Conversely, career concerns may undermine younger CEOs' risk-taking incentives (*Conversive strategy hypothesis*). Like any other professionals, younger CEOs have a learning curve. During their learning process, younger CEOs might be more cautious. Further, since younger CEOs are less known to the managerial labor market, they are more likely to be penalized or dismissed due to poor performance, creating reduced incentives for younger CEOs to engage in investments with high levels of uncertainty (Hirshleifer and Thakor, 1992; Scharfstein and Stein, 1990). Meanwhile, younger CEOs may avoid innovative projects to avoid being evaluated unfavorably by the labor market (Zwiebel, 1995; Holmstrom and Costa, 1986). Lastly, Hirshleifer and Thakor (1992) indicate that managers are concerned with the perceived value of their human capital, and the divergence in risk tolerance between shareholders and managers may lead to managerial conservatism.

Empirically, Chevalier and Ellison (1999) find higher termination-performance sensitivity for younger managers, which may motivate the younger managers to hold less unsystematic risk in their portfolios. Hong et al. (2000) show that the forecast dispersion is smaller in younger analysts than their older peers because inexperienced analysts are more likely to be terminated for bold forecasts that deviate from the consensus. Eckbo et al. (2016) show that the loss induced by firm bankruptcy is substantially higher for younger CEOs. Therefore, they might be reluctant to pursue more aggressive policies and prone to "play it safe". Gormley and Matsa (2016) find that younger CEOs tend to undertake safer investments due to high levels of career concerns. Alfonso et al. (2019) find that early career stage CEOs are less likely to engage in expectations management than late career-stage CEOs due to the market's perceived degree of opportunism pertaining to expectations management, which may damage their reputation capital. Pae et al. (2016) find that CEOs with a high level of career concerns have strong incentives to be conservative in their earnings guidance, i.e., guiding the market expectations of earnings downwards so as to increase the likelihood of meeting or beating the expectations. Xie (2015) finds that younger CEOs with longer career paths tend to consider their long-term profits and invest more efficiently than their older counterparts, suggesting younger CEOs are more cautious in their investment decisions.

2.3. CEO age and working capital management

The aforementioned literature has documented mixed evidence on younger CEOs' preference to firm risks, indicating that CEO perception of the benefits of risky vs. conservative policies may be policy-specific. CEOs in different age groups might engage in different management strategies based upon the level of career concerns and their beliefs about how the adoption of a specific firm policy benefits them in the long run. It follows that younger CEOs may implement either more aggressive or more conservative WCM strategies based on their perception of the potential outcome of these policies in affecting their current job security and compensation and/or future careers.

On the one hand, younger CEOs' greater career concerns may motivate them to build the reputation of being capable CEOs through improved firm performance, which is arguably achievable by reducing financing and opportunity costs with a lower level of net operating working capital. In addition, younger CEOs are less likely to be well-known and usually work in smaller firms. The higher financing costs in those firms further incentivize younger CEOs to purposely and aggressively pursue more trade credit from suppliers and/or reduce trade credit provided to customers. Collectively, we propose:

> *H_{1a}: Firms with younger CEOs tend to adopt more aggressive net operating working capital management policies than those with older CEOs (Aggressive strategy hypothesis).*

On the other hand, younger CEOs may be more cautious in their working capital policy selections. Due to fears of potential penalties from failed risky policies, younger CEOs are more likely to employ more conservative WCM strategies. Furthermore, older CEOs may be more capable of promoting aggressive WCM than their younger peers given their better understanding of investment opportunities accumulated in years of service. As such, we state our hypotheses in an alternative form as follows:

> *H_{1b}: Firms with younger CEOs tend to adopt more conservative net operating working capital management policies than those with older CEOs (Conservative strategy hypothesis).*

3. Variable construction and descriptive statistics

3.1. Sample

Our initial sample consists of firms listed in Compustat and Execucomp databases, excluding financial firms (SIC code 6000–6999). Following Hill et al. (2010), we delete firm-year observations with negative assets, negative sales, negative market value of equity, negative interest expenses, and missing financial data. Our final sample consists of 28,243 firm-year observations for 2654 U.S. companies from 1993 to 2018. All continuous variables are winsorized at the 1% and 99% levels to mitigate the influence of outliers.

[7] If the company performs well, the CEO can gain more control over the board. Most of the time, a CEO is not appointed as the chairman of the board at succession. When a firm performs well, its CEO can earn the title of the chairman, though a trend for increasing levels of separation of the two positions continues among large U.S. corporations, with less than half of S&P500 now have the CEO holding the board's chairman position (see 2017 Edition of the Annual Survey of Board Leadership, Korn Ferry Institute).

Table 1
Sample statistics. This table presents descriptive statistics. The sample is a merged sample of Compustat and Execucomp, excluding financial firms (SIC 6000–6999). The sample includes 28,876 firm-year observations from fiscal year 1993 to 2018. Refer to Appendix A for detailed variable definitions. All continuous variables are winsorized at the upper and the lower 1% of the sample distribution.

	N	Mean	Std. Dev.	P10	P25	Median	P75	P90
WCR	28,876	0.1808	0.1331	0.0354	0.0941	0.1647	0.2433	0.3362
INVT	28,876	0.1026	0.0918	0.0000	0.0254	0.0909	0.1502	0.2153
RECT	28,876	0.1503	0.0939	0.0344	0.0955	0.1442	0.1915	0.2476
AP	28,876	0.0747	0.0540	0.0254	0.0418	0.0643	0.0919	0.1273
IndAdj_WCR	28,876	−0.0006	0.1057	−0.1134	−0.0629	−0.0127	0.0447	0.1213
IndAdj_INVT	28,876	−0.0002	0.0647	−0.0672	−0.0345	−0.0110	0.0237	0.0768
IndAdj_RECT	28,876	−0.0004	0.0759	−0.0755	−0.0412	−0.0106	0.0263	0.0773
IndAdj_AP	28,876	−0.0004	0.0465	−0.0434	−0.0273	−0.0082	0.0148	0.0448
CEO_age	28,876	55.9222	7.2090	47.0000	51.0000	56.0000	60.0000	64.0000
CEO_tenure	28,876	7.6324	7.3909	1.0000	3.0000	5.0000	10.0000	17.0000
Female	28,876	0.0251	0.1563	0.0000	0.0000	0.0000	0.0000	0.0000
Vega/Tdc1	28,876	0.0292	0.1165	0.0000	0.0038	0.0161	0.0329	0.0574
SalesGrowth	28,876	0.0941	0.2325	−0.1231	−0.0113	0.0674	0.1645	0.3248
GPM	28,876	0.3872	0.2101	0.1483	0.2378	0.3567	0.5234	0.6879
OCF	28,876	0.1262	0.1322	0.0506	0.0863	0.1240	0.1724	0.2429
Ln(Mkval)	28,876	7.4936	1.7033	5.4650	6.3567	7.3907	8.5575	9.7222
Ln(At)	28,876	7.4635	1.6052	5.4954	6.3063	7.3602	8.5527	9.7128
Tobin's Q	28,876	2.0121	1.5365	1.0243	1.2104	1.5742	2.2526	3.3994
MktShare	28,876	0.0159	0.0332	0.0004	0.0011	0.0040	0.0139	0.0407
Distress	28,876	0.0163	0.1265	0.0000	0.0000	0.0000	0.0000	0.0000
SalesVol	28,876	0.2320	0.2391	0.0452	0.0848	0.1589	0.2870	0.4933

3.2. Variables

3.2.1. Net operating working capital

The level of net operating working capital is measured with working capital requirement (*WCR*), defined as the sum of receivables and inventory net of payables scaled by sales. *WCR* is a comprehensive measure as it reflects business practices that operating assets and liabilities ultimately are managed in a cohort. A positive *WCR* indicates a need for additional capital that firms can finance either internally or externally. A negative *WCR* suggests a firm uses working capital to provide financing for long-term assets. High/low *WCR* indicates a more conservative/aggressive working capital management policy. Hill et al. (2010) and Aktas et al. (2015) posit that industry characteristics play an important role in the level of net operating working capital. Therefore, our second measure of the level of net operating working capital is industry-mean adjusted *WCR* (*IndAdj_WCR*), constructed by subtracting the mean *WCR* of firms in the same industry in a given year from *WCR* of a focal firm, where the industry is defined using the Fama–French 49-industry classification.[8] A positive/negative *IndAdj_WCR* indicates that firms overinvest (underinvest) in net operating working capital compared to the average firm in the same industry, implying a more conservative/aggressive working capital policy.[9]

3.2.2. Independent variables

Our independent variables are variables related to CEO characteristics and risk-taking incentives. We also include various control variables that are shown to be economic determinants of a firm's working capital requirement (Love et al., 2007; Molina and Preve, 2009; Hill et al., 2010; Aktas et al., 2015). We employ one-year lagged values of all independent variables to alleviate the concern of reverse causality and simultaneity.

3.2.2.1. CEO characteristics variables. We measure CEO age with *Ln(CEO_age)*, constructed as the natural logarithm of the age of the CEO. As CEO age and tenure are likely to be positively correlated, we control CEO tenure to mitigate the concern that CEO age might pick up the tenure effect on working capital. *Ln(CEO_tenure)* is the natural logarithm of one plus the number of years for which a CEO has been in office (Serfling, 2014; Li et al., 2017).

The literature suggests that female managers are more risk-averse than their male peers and tend to undertake more conservative corporate investments (Farrell and Hersch, 2005; Croson and Gneezy, 2009; Levi et al., 2014; Faccio et al., 2016). We control for CEO gender effect with *Female*, an indicator variable that equals one for female CEOs and zero otherwise.

By tying CEO wealth to stock return volatility, option compensation motivates managers to make riskier financial and investment decisions (Guay, 1999; Himmelberg et al., 1999; Palia, 2001; Coles et al., 2006; Williams and Rao, 2006). To control for the risk-taking effect induced by option compensation on the aggressiveness of net operating working capital management, we include *Ln(Vega/tdc1)*, constructed as the natural logarithm of one plus the dollar change in CEO equity portfolio wealth for a 1% change in the annualized standard deviation of stock returns scaled by annual compensation.

3.2.2.2. Other control variables. We include a variety of control variables to mitigate the concern of omitted variable bias. The literature indicates that a firm's level of working capital is related to its operating conditions, cash flow availability, information asymmetry, firm value, market power, and financial distress (Hill et al., 2010; Aktas et al., 2015; Martínez-Sola et al., 2013; Molina and Preve, 2009; Jory et al., 2020).

A firm's operating conditions are measured with sales growth rate, gross profit margin, and sales volatility. Firms may adjust their credit, collection, and inventory policies according to the previous sales growth rate. *SalesGrowth* is the change in sales from the previous year scaled by sales in the previous year. Firms often finance materials necessary for production and/or merchandise to satisfy the demand with payables and offer credit sales to customers to increase sales. As the dollar value of receivables is usually higher than that of payables per unit of goods, a higher gross profit margin is expected to be associated with a higher level of working capital. *GPM* is defined as sales minus

[8] The results are quantitatively similar when the industry-median adjusted *WCR* is used.

[9] We also examine the effects of CEO age on the components of net operating working capital using our baseline model. We define inventory, accounts receivable, and accounts payable as each component scaled by total sales, respectively.

the cost of goods sold scaled by sales. Firms may optimally increase inventory to avoid potential interruption of production or stock-out due to sales volatility. Furthermore, firms may provide customers with more generous trade credit in response to decreased demand to stimulate sales (Long et al., 1993),[10] implying a positive relation between *WCR* and sales volatility. In contrast, firms may rely more on trade credit provided by their suppliers, i.e., accounts payable, in response to sales volatility, leading to a negative relation between *WCR* and the volatility in sales (Hill et al., 2010). *SalesVol* is the standard deviation of sales over a rolling five-year window scaled by net assets, where net assets is total assets net of the sum of cash and short-term investments. We require at least three observations in the five-year window for the calculation of sale volatility.

Firms may rely on internally generated cash flows to finance *WCR*. We control operating cash flows (*OCF*), defined as operating income before depreciation minus income taxes scaled by net sales. Alternatively, firms may access external capital markets to finance positive *WCR*. Larger firms are associated with a lower level of information asymmetry and thus incur lower costs of external financing. Firm size is measured with the natural logarithm of total assets (*Ln(At)*) and the natural logarithm of the market value of equity (*Ln(Mkval)*).[11] We measure market-perceived firm value with *Tobin's Q*, calculated as the sum of the market value of equity and total liabilities minus the book value of equity and then scaled by total assets.

Firms with more market power can negotiate better credit terms with their suppliers and customers, thereby affecting working capital levels (Chevalier and Scharfstein, 1996; Molina and Preve, 2009). Hill et al. (2010) argue that firms with greater negotiating power have more payables, fewer receivables, and less inventory, leading to reduced *WCR*. We measure market power with *MktShare*, constructed as the ratio of a firm's sales to the total sales in the industry (Fama–French 49-industry classifications) in which the firm operates.

Lastly, financially distressed firms have limited financial slack to finance receivables and inventory, resulting in lower investments in net operating working capital. Meanwhile, suppliers may be reluctant to extend trade credit to financially distressed customers, implying a lower level of payables for the financially troubled firms. As such, the effect of financial distress on *WCR* is unclear. Following Molina and Preve (2009) and Hill et al. (2010), we classify a firm to be financially distressed if it has an interest coverage ratio less than one for two consecutive years or less than 0.8 in any given year, and has a leverage ratio in the top two deciles of its industry's leverage ratio in a given year. *Distress* is an indicator variable that equals one for financially distressed firms and zero otherwise.

3.3. Descriptive statistics

Table 1 displays descriptive statistics of the variables. The average level of net operating working capital (*WCR*) is approximately 18.08%, indicating that more than 18 cents of each dollar in sales are tied up in net operating working capital for the average firm in our sample. The mean and median values of industry adjusted *WCR* are −0.06% and −1.27%, respectively. The average age of CEOs in our sample is around 56. On average, CEOs in our sample have a tenure of 7.63 years. Distributions of other variables are similar to those in existing studies (e.g. Molina and Preve, 2009; Hill et al., 2010; Aktas et al., 2015).

[10] This would be considered a more conservative working capital policy since it would, ceteris paribus, increase *WCR*.

[11] The results are unchanged when inflation-adjusted values are used.

Table 2
Univariate test. This table presents the results of univariate tests on the level of net operating working capital (*WCR*), *WCR* components, and control variables. Firms are classified as having Younger (Older) CEOs if CEO age is below (above) the sample median. The P-value is calculated using T-tests assuming unequal variance. Refer to Appendix A for detailed variable definitions. All continuous variables are winsorized at the upper and the lower 1% of the sample distribution.

	Younger CEOs	Older CEOs	Difference	(*P*-value)
WCR	0.1774	0.1842	−0.0068	0.0000
INVT	0.0979	0.1080	−0.0101	0.0000
RECT	0.1492	0.1513	−0.0021	0.0581
AP	0.0748	0.0747	0.0001	0.8946
IndAdj_WCR	−0.0035	0.0026	−0.0062	0.0000
IndAdj_INVT	−0.0017	0.0015	−0.0032	0.0000
IndAdj_RECT	−0.0013	0.0006	−0.0019	0.0316
IndAdj_AP	0.0006	−0.0015	0.0021	0.0001
CEO_tenure	5.5884	9.9991	−4.4107	0.0000
Female	0.0317	0.0175	0.0142	0.0000
Vega/Tdc1	0.0287	0.0298	−0.0010	0.4660
SalesGrowth	0.1038	0.0838	0.0200	0.0000
GPM	0.4007	0.3716	0.0291	0.0000
OCF	0.1250	0.1274	−0.0024	0.1263
Ln(Mkval)	7.3548	7.6374	−0.2826	0.0000
Ln(At)	7.2954	7.6468	−0.3514	0.0000
Tobin's Q	2.0851	1.9342	0.1509	0.0000
MktShare	0.0135	0.0187	−0.0052	0.0000
Distress	0.0182	0.0141	0.0041	0.0066
SalesVol	0.2499	0.2130	0.0369	0.0000

4. Results

4.1. Univariate

In Table 2, we use the median value of *CEO_age* to dissect our sample into firms with younger CEOs and those with older CEOs. The average level of net working capital (*WCR*) is 17.74% in firms with younger CEOs and 18.42% in firms with older CEOs, respectively. The difference of −0.68% is significant at the 1% level. Similarly, the average industry-adjusted net operating working capital (*IndAdj_WCR*) is significantly higher in firms with older CEOs than that in firms with younger CEOs, 0.26% vs. −0.35%, and the difference is significant at 1%. Furthermore, firms managed by older CEOs carry higher levels of inventory and accounts receivable than those led by younger CEOs, and the differences are significant. The univariate test results provide preliminary evidence that firms with younger CEOs tend to adopt more aggressive working capital management strategies.

In addition, Table 2 shows that firms with younger CEOs, on average, experience significantly higher sales growth rate, greater sales volatility, higher gross margin, higher Tobin's Q, and a higher likelihood of financial distress than those managed by older CEOs, reflecting the risk taking nature of younger CEOs. On average, younger CEOs run relatively smaller firms (in terms of assets and the market value) and firms with a smaller market share than older CEOs.

4.2. Regression analysis of the relation between CEO age and net operating working capital

We model the level of net operating working capital as a function of CEO age and other firm and CEO characteristics using an ordinary least squares (OLS) regression as in Cline and Yore (2016).[12] In addition, we include year fixed effects to control for changing economic and financing conditions through time. We include industry dummies to capture time-invariant industry effects. We conduct statistical tests using the standard errors

[12] In robustness tests, we control firm and year fixed effects, and the industry, year and the interaction between industry and year fixed effects. Our results are consistent.

Table 3
CEO age and the level of net operating working capital. This table presents the regression results of tests on the effect of CEO age on the level of net operating working capital (*WCR*). *WCR* is the sum of accounts receivable and inventory net of accounts payable, then scaled by sales. *IndAdj_WCR* is industry-mean adjusted WCR. All independent variables are lagged one period. All models control industry and year effects, where the industries are defined using Fama–French 49-industry classifications. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1) WCR	(2) IndAdj_WCR
Ln(CEO_age)	0.0429***	0.0414***
	(3.12)	(3.19)
Ln(CEO_tenure)	0.0002	0.0001
	(0.13)	(0.08)
Female	−0.0006	−0.0029
	(−0.06)	(−0.34)
Ln(Vega/Tdc1)	−0.0232	−0.0234
	(−1.41)	(−1.44)
SalesGrowth	−0.0002	−0.0001
	(−0.05)	(−0.02)
GPM	0.0655***	0.0608***
	(5.62)	(5.60)
OCF	−0.0536***	−0.0522***
	(−3.33)	(−3.61)
Ln(Mkval)	−0.0021	−0.0015
	(−0.70)	(−0.55)
Ln(At)	−0.0019	−0.0031
	(−0.50)	(−0.92)
Tobin's Q	−0.0029***	−0.0033***
	(−2.64)	(−3.24)
MktShare	−0.2067	−0.1873
	(−1.24)	(−1.36)
Distress	0.0118	0.0069
	(0.68)	(0.45)
SalesVol	−0.0774***	−0.0753***
	(−11.42)	(−11.96)
Constant	0.0767	−0.1030
	(1.12)	(−1.58)
Industry and year fixed effects	Yes	Yes
Observations	28,876	28,876
R-squared	0.313	0.051

Table 4
CEO age range and the level of net operating working capital. This table presents the regression results of tests on the effect of CEO age range on the level of working capital (*WCR*). *WCR* is the sum of accounts receivable and inventory net of accounts payable, then scaled by sales. *IndAdj_WCR* is industry-mean adjusted WCR. CEO age is classified with a categorical variable, which takes a value of zero if a CEO is 60 years old and above, one if a CEO is between 50 and 59 years old, and two if a CEO is 50 years old or younger. All independent variables are lagged one period. All models control industry and year effects, where the industries are defined using Fama–French 49-industry classifications. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1) WCR	(2) IndAdj_WCR
50 < CEO_age ≤ 59	−0.0038	−0.0041
	(−1.20)	(−1.36)
CEO_age ≤ 50	−0.0125***	−0.0121***
	(−2.68)	(−2.74)
Ln(CEO_tenure)	0.0012	0.0011
	(0.69)	(0.64)
Female	−0.0008	−0.0031
	(−0.09)	(−0.36)
Ln(Vega/Tdc1)	−0.0238	−0.0239
	(−1.44)	(−1.47)
SalesGrowth	−0.0008	−0.0006
	(−0.19)	(−0.16)
GPM	0.0647***	0.0600***
	(5.56)	(5.53)
OCF	−0.0532***	−0.0518***
	(−3.30)	(−3.59)
Ln(Mkval)	−0.0022	−0.0015
	(−0.71)	(−0.57)
Ln(At)	−0.0018	−0.0030
	(−0.47)	(−0.88)
Tobin's Q	−0.0030***	−0.0034***
	(−2.69)	(−3.29)
MktShare	−0.2057	−0.1863
	(−1.24)	(−1.36)
Distress	0.0116	0.0068
	(0.68)	(0.44)
SalesVol	−0.0778***	−0.0757***
	(−11.51)	(−12.04)
Constant	0.2104***	0.0385
	(5.25)	(1.16)
Industry and year fixed effects	Yes	Yes
Observations	28,876	28,876
R-squared	0.313	0.050

clustered at the firm level to control for heteroscedasticity and auto-correlation at the firm level (Petersen, 2009; Aktas et al., 2015).

We report the results in Table 3. The dependent variable is *WCR* in Model 1 and *IndAdj_WCR* in Model 2. The estimated coefficient of *Ln(CEO_age)* is positive and significant at the 1% level in both models, indicating a positive association between CEO age and the level of net operating working capital. The parameter estimate in Model (1) suggests that a one-standard-deviation increase in *Ln(CEO_age)* (0.133) is associated with a 0.006 (= 0.0429 ∗ 0.133) increase in *WCR*, equivalent to 3.16% of the mean *WCR* for sample firms (= 0.006/0.1808), indicating the effect of CEO age on working capital is also economically significant. Taken together, the results suggest that younger CEOs tend to engage in more aggressive working capital management strategies to either signal their super ability or to finance their long term investments.

In addition, consistent with Hill et al. (2010), we find that the level of net operating working capital increases in gross profit margin (*GPM*) and decreases in sales volatility (*SalesVol*). Firms with higher perceived values to market participants carry lower levels of net operating working capital, evidenced by the negative and significant coefficient on *Tobin's Q*. We document a negative relation between operating cash flow (*OCF*) and *WCR*. The possible explanation is that firms substitute long-term asset investment for net operating working capital investment when their operating cash flow increases.[13] Financial distress can incentivize a firm to provide more credit sales to its customers to stimulate sales (Molina and Preve, 2009). Conversely, financial distress can limit the firm's ability to provide trade credit to its customers and push the firm to tighten its credit terms and collect its receivables faster (Mian and Smith, 1992). The insignificant coefficient on *Distress* indicates that the two competing effects offset each other in our sample.

In additional tests, we show that the positive relation between CEO age and *WCR* is mainly driven by the positive association between CEO age and inventory. Moreover, older CEOs tend to obtain less trade credit from suppliers. Collectively, the results suggest that firms with younger CEOs tend to pursue more aggressive working capital management strategies.[14]

[13] This explanation is similar to the findings in Riddick and Whited (2009) that the propensity to save cash out of cash flow is reduced when firms generate more operating cash flows. They argue that positive cash flows are indictive for investment opportunities.

[14] The analysis on the components of *WCR* shows that the level of inventory significantly increases in CEO age while the level of accounts payable significantly decreases in CEO age. The results suggests that older CEOs tend to carry more inventory, but they are reluctant to use trade credit to finance their purchases, implying a more conservative working capital management policy.

Table 5
CEO age and the level of net operating working capital _ Propensity score matching. This table presents the results of the robustness test on the effect of CEO age on the level of net operating working capital using the propensity score matching approach. *Under50* (corresponds to the first quartile of CEO age distribution) equals one if a CEO is 50 years old or younger and zero otherwise. In the first stage, logit regressions with *Under50* as the dependent variable and the same set of control variables as those in the baseline regression are used to estimate the likelihood (propensity score) that a firm is managed by a CEO of 50 years old or younger. In the second stage, each firm-year observation with a CEO of 50 or younger is then matched to another firm-year observation with a CEO more than 50 years old with the closest propensity score. Panel A presents the univariate test results on the difference in working capital requirement and the matching variables between treated subsample (Under50 = 1) and control subsample (Under50 = 0). Panel B presents regression results using the matched sample. All independent variables are lagged one period. All models control industry and year effects, where the industries are defined using Fama–French 49-industry classifications. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Univariate test

	Under50 = 1	Under50 = 0	Difference	(*P*-value)
NWC variables				
WCR	0.1860	0.1731	0.0128	0.0000
IndAdj_WCR	0.0039	−0.0070	0.0109	0.0000
Matching variables				
Ln(CEO_tenure)	5.7183	5.7246	−0.0063	0.9453
Female	0.0281	0.0290	−0.0009	0.7530
Vega/Tdc1	0.0269	0.0281	−0.0012	0.3320
SalesGrowth	0.1317	0.1355	−0.0038	0.4393
GPM	0.4124	0.4140	−0.0016	0.6800
OCF	0.1278	0.1270	0.0007	0.7860
Ln(Mkval)	7.0781	7.0860	−0.0079	0.7744
Ln(At)	6.9454	6.9316	0.0138	0.6045
Tobin's Q	2.1812	2.2327	−0.0514	0.1181
MktShare	0.0101	0.0101	−0.0001	0.9012
Distress	0.0192	0.0185	0.0008	0.7481
SalesVol	0.2737	0.2817	−0.0081	0.1893

Panel B. Regressions using PSM matched sample

	(1) WCR	(2) IndAdj_WCR
Under50	−0.0112***	−0.0102***
	(−3.17)	(−3.08)
Ln(CEO_tenure)	0.0000	0.0001
	(0.02)	(0.05)
Female	−0.0003	−0.0031
	(−0.03)	(−0.31)
Ln(Vega/Tdc1)	−0.0000	−0.0015
	(−0.00)	(−0.08)
SalesGrowth	0.0022	0.0024
	(0.38)	(0.46)
GPM	0.0557***	0.0500***
	(4.17)	(3.99)
OCF	−0.0411**	−0.0419***
	(−2.42)	(−2.71)
Ln(Mkval)	−0.0059*	−0.0047
	(−1.75)	(−1.55)
Ln(At)	0.0010	−0.0009
	(0.25)	(−0.24)
Tobin's Q	−0.0014	−0.0018
	(−1.09)	(−1.51)
MktShare	−0.2668	−0.2166
	(−1.34)	(−1.31)
Distress	0.0123	0.0082
	(0.73)	(0.53)
SalesVol	−0.0770***	−0.0757***
	(−10.13)	(−10.76)
Constant	0.4461***	0.1324*
	(3.23)	(1.81)
Industry and year fixed effects	Yes	Yes
Observations	13,104	13,104
R-squared	0.293	0.057

Table 6
CEO age and the level of net operating working capital _ instrumental variable approach. This table presents the results of the robustness tests on the effect of CEO age on working capital requirement using the instrumental variable approach. In the first-stage, we instrument *Ln(CEO_age)* with the natural logarithm of the consumer price index (*CPI*) in the CEO birth year and the annual mean value of *Ln(CEO_age)* for firms, excluding focal firm itself, in the same two-digit SIC code and same size quartiles. The results are present in Panel A. In the second-stage regression, the predicted *Ln(CEO_age)* is used to replace its original value. The results are presented in Panel B. The tests for the validity of the instruments are reported at the bottom of Panel B. All independent variables are lagged one period. All models control industry and year effects, where the industries are defined using Fama–French 49-industry classifications. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. First-stage of instrumental variable approach

	(1) Ln(CEO_age)
Ln(CPI)	−0.4622***
	(−152.36)
Ind_Size_Ln(CEO_age)	−0.0044
	(−0.48)
Female	−0.0060**
	(−2.29)
Ln(Vega/Tdc1)	0.0040
	(0.29)
SalesGrowth	−0.0103***
	(−4.49)
GPM	−0.0171***
	(−5.15)
OCF	0.0087*
	(1.93)
Ln(Mkval)	0.0010
	(0.99)
Ln(At)	0.0030***
	(2.91)
Tobin's Q	−0.0014**
	(−2.55)
MktShare	−0.0130
	(−0.57)
Distress	−0.0017
	(−0.34)
SalesVol	−0.0159***
	(−6.27)
Constant	5.6744***
	(103.58)
Industry and year fixed effects	Yes
Observations	27,100
R-squared	0.618

Panel B. Second-stage of instrumental variable approach

	(1) WCR	(2) IndAdj_WCR
Pre_Ln(CEO_age)	0.0455***	0.0464***
	(6.64)	(7.28)
Female	−0.0019	−0.0038
	(−0.44)	(−0.95)
Ln(Vega/Tdc1)	−0.0267**	−0.0275***
	(−2.53)	(−2.64)
SalesGrowth	−0.0009	−0.0011
	(−0.24)	(−0.33)
GPM	0.0603***	0.0570***
	(11.39)	(11.72)
OCF	−0.0460***	−0.0467***
	(−5.40)	(−6.15)
Ln(Mkval)	−0.0025*	−0.0018
	(−1.94)	(−1.52)
Ln(At)	−0.0015	−0.0027**
	(−1.02)	(−2.09)
Tobin's Q	−0.0029***	−0.0033***
	(−4.65)	(−5.58)
MktShare	−0.2021***	−0.1873***
	(−4.36)	(−4.78)

(*continued on next page*)

Furthermore, as it is more difficult for younger CEOs to raise external funds from lenders and trade credit from suppliers serves an easy way for them to raise funds needed. Refer to Appendix B for detailed results.

Table 6 (*continued*).

Panel B. Second-stage of instrumental variable approach		
	(1) WCR	(2) IndAdj_WCR
Distress	0.0096	0.0038
	(1.07)	(0.47)
SalesVol	−0.0780***	−0.0760***
	(−20.77)	(−22.12)
Constant	0.0232	−0.1405***
	(0.70)	(−4.64)
Industry and year fixed effects	Yes	Yes
Observations	27,100	27,100
R-squared	0.321	0.052
1st-stage statistics		
Sanderson–Windmeijer Chi-sq for underidentification	23 314.55	23 314.55
Kleibergen–Paap F test for weak identification	11 621.57	11 621.57
2st-Stage test statistics:		
Hansen J statistic	0.009	0.003
Hansen J statistic *P*-value	0.9248	0.9582

Table 7
CEO age and the level of net operating working capital _ newly hired CEOs and CEOs near retirement. This table presents the results of robustness tests on the effect of CEO age on working capital requirement. We control the CEO retirement effect on the CEO age-WCR relation with *Last_year*, an indicator variable that equals one if a CEO is in his/her last year in office and zero otherwise. We control the effect of newly hired CEOs on the CEO age-WCR relation with *Tenure3*, an indicator variable that equals one if a CEO has a tenure equal to or less than three years and zero otherwise. All independent variables are lagged one period. All models control industry and year effects, where the industries are defined using Fama–French 49-industry classifications. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1) WCR	(2) IndAdj_WCR
Ln(CEO_age)	0.0446***	0.0429***
	(3.20)	(3.26)
Ln(CEO_tenure)	−0.0004	−0.0004
	(−0.19)	(−0.21)
Last_year	−0.0033*	−0.0029*
	(−1.82)	(−1.72)
Tenure3	−0.0016	−0.0014
	(−0.85)	(−0.80)
Female	−0.0006	−0.0029
	(−0.07)	(−0.34)
Ln(Vega/Tdc1)	−0.0232	−0.0234
	(−1.41)	(−1.44)
SalesGrowth	−0.0003	−0.0002
	(−0.08)	(−0.04)
GPM	0.0658***	0.0611***
	(5.65)	(5.62)
OCF	−0.0539***	−0.0525***
	(−3.34)	(−3.62)
Ln(Mkval)	−0.0023	−0.0017
	(−0.75)	(−0.61)
Ln(At)	−0.0018	−0.0030
	(−0.46)	(−0.88)
Tobin's Q	−0.0029***	−0.0033***
	(−2.61)	(−3.21)
MktShare	−0.2068	−0.1874
	(−1.25)	(−1.36)
Distress	0.0119	0.0071
	(0.69)	(0.46)
SalesVol	−0.0772***	−0.0751***
	(−11.39)	(−11.93)
Constant	0.0798	−0.0999
	(1.17)	(−1.53)
Industry and year fixed effects	Yes	Yes
Observations	28,876	28,876
R-squared	0.313	0.051

Table 8
CEO age and the level of net operating working capital _fixed effects. This table presents the results of tests on the effect of CEO age on working capital requirement controlling for firm and year fixed effects, and the interactions of industry and year fixed effects. L1. Models (1) and (2) present regression results that include firm and year fixed effects. Models (3) and (4) present regression results that include the interactions of industry and year fixed effects. All independent variables are lagged one period. All models control industry and year effects, where the industries are defined using Fama–French 49-industry classifications. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1) WCR	(2) IndAdj_WCR	(3) WCR	(4) IndAdj_WCR
Ln(CEO_age)	0.0133**	0.0120**	0.0434***	0.0438***
	(2.57)	(2.48)	(7.53)	(7.97)
Ln(CEO_tenure)	0.0004	0.0001	0.0000	0.0001
	(0.64)	(0.23)	(0.05)	(0.09)
Female	−0.0001	−0.0019	−0.0030	−0.0029
	(−0.05)	(−0.73)	(−0.68)	(−0.72)
Ln(Vega/Tdc1)	0.0052	0.0024	−0.0242**	−0.0217**
	(0.81)	(0.40)	(−2.34)	(−2.13)
SalesGrowth	−0.0054*	−0.0046*	−0.0006	−0.0004
	(−1.91)	(−1.85)	(−0.17)	(−0.12)
GPM	0.0323***	0.0322***	0.0702***	0.0635***
	(3.94)	(4.55)	(12.98)	(12.71)
OCF	−0.0338***	−0.0350***	−0.0561***	−0.0542***
	(−4.17)	(−4.86)	(−6.64)	(−7.05)
Ln(Mkval)	0.0002	−0.0002	−0.0022*	−0.0017
	(0.19)	(−0.19)	(−1.68)	(−1.35)
Ln(At)	0.0059***	0.0044***	−0.0025*	−0.0033**
	(3.56)	(2.91)	(−1.68)	(−2.44)
Tobin's Q	0.0003	−0.0005	−0.0038***	−0.0037***
	(0.69)	(−1.02)	(−5.74)	(−5.81)
MktShare	−0.1902***	−0.1934***	−0.1721***	−0.1868***
	(−3.62)	(−4.14)	(−3.90)	(−4.83)
Distress	0.0093	0.0041	0.0055	0.0058
	(1.46)	(0.69)	(0.59)	(0.66)
SalesVol	−0.0094***	−0.0095***	−0.0812***	−0.0797***
	(−2.78)	(−3.17)	(−21.96)	(−23.19)
Constant	0.0778***	−0.0661***	0.0519**	−0.1272***
	(3.23)	(−2.93)	(2.26)	(−5.83)
Industry fixed effects			Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry * year fixed effects			Yes	Yes
Firm fixed effects	Yes	Yes		
Observations	28,876	28,876	28,876	28,876
R-squared	0.828	0.765	0.340	0.054

4.3. CEO age range and working capital requirement

We recognize that the relation between CEO age and working capital may be non-linear and evolving (Baginski et al., 2018).[15] As such, we re-estimate our baseline regression by replacing the continuous variable of CEO age (*CEO_age*) with an indicator variable for age cohorts (Li et al., 2017; James, 2020). The indicator variable equals zero for CEOs of 60 years old or above, one for CEOs aged between 50 and 59 ($50 < CEO\_age \leq 59$), and two for CEOs of 50 years old or younger ($CEO\_age \leq 50$). We use 50 and 60 years old as cutoff points because they correspond to the first and third quartiles of the distribution of *CEO_age* in our sample.

[15] Baginski et al. (2018) note the possibility that newly-hired young CEOs could have a low level of career concerns due to the ability to blame their predecessors for any negative outcomes. After the initial period, they would have a high level of career concerns, which would then decline as they approach retirement. But, CEOs just before retirement might again experience a high level of career concerns. Thus, the relation between CEO age and the level of career concerns might be low for new CEOs, high for young CEOs, low for "non-young" CEOs, and high for retiring CEOs, i.e., a non-linear relation.

The group where *CEO_age* is over 60 years is used as the reference group to ensure that the model is non-singular. The coefficient of $50 < CEO\_age \leq 59$ /$CEO\_age \leq 50$ can be interpreted as the difference in the net operating working capital for firms with CEOs between 50 to 59/CEOs of 50 or younger relative to that of firms with CEOs of 60 or older. The results are displayed in Table 4.

In Model 1, the estimated coefficient on $CEO\_age \leq 50$ is negative and significant at the 1% level. The estimated coefficient of $50 < CEO\_age \leq 59$ is negative, but not significant. Firms with CEOs of 50 or younger tend to have a lower *WRC* compared to those with CEOs of 60 or older. The parameter estimate indicates that firms led by CEOs under 50 years old are associated with a 1.25 percentage point reduction in *WCR* relative to those led by CEOs over 60, suggesting that younger CEOs tend to adopt more aggressive working capital management strategies. The results are similar when the industry-adjusted net operating working capital is used in Model (2).

4.4. Robustness check

4.4.1. Propensity score matching (PSM)

The univariate tests in Table 2 show substantial differences in working capital managment between firms headed by younger CEOs and those managed by older CEOs. Hence, *CEO_age* might pick up the impact of non-linear firm characteristics on *WCR* if the linear control variables in our baseline regression fail to capture these differences adequately. We address this concern with the propensity score matching (PSM) approach (Rosenbaum and Rubin, 1983).[16] PSM isolates a control sample of firms managed by older CEOs from a treated sample of firms managed by younger CEOs in a way that the control sample exhibits no observable difference from the treated sample other than the CEO's age.

Using the first quartile of CEO age distribution (corresponding to 50 years old), we split the sample into firms with younger CEOs and those with older ones. *Under50* equals one for firms with the CEO under 50 years old and zero otherwise. In the first stage, we use logistic regression to estimate the likelihood (propensity score) of a firm to be managed by a CEO under 50 years old using the same set of control variables as those in the baseline regression. The first stage results are presented in Model (1) of Appendix C. Model (2) presents the regression results using the propensity-score-matched sample. The insignificant coefficients on the independent variables suggest that firms with younger CEOs are not systematically different from those with older CEOs in the post-matched sample.

In the second stage, each firm-year observation with the CEO under 50 years old is matched to a firm-year observation with the CEO above 50 years old with the closest propensity score. In Panel A of Table 5, we present the univariate test results on the level of net operating working capital (*WCR* and *IndAdj_WCR)* and the matching variables between the treated subsample ($Under50 = 1$) and the control subsample ($Under50 = 0$). On average, firms with CEOs under 50 years old have lower *WCR* and lower *IndAdj_WCR* than those with CEOs above 50. The mean differences are significant at the 1% level. The regression results using the matched sample in Panel B show that the coefficient estimate on *Under50* is negative and significant at 1% in both models. Collectively, the results suggest that firms managed by younger CEOs tend to implement more aggressive working capital management policies than those managed by older CEOs, further validating our baseline results.

[16] Existing literature employs the propensity score matching algorithm (PSM) in studies on the association between CEO age and the riskiness of corporate policies (e.g. Serfling, 2014; Cline and Yore, 2016).

4.4.2. Instrumental variable approach

If firms carrying low levels of net operating working capital are more likely to hire younger CEOs, *Ln(CEO_age)* will not be exogenous in our baseline regression. Furthermore, there may be some latent variables affecting both CEO age and the level of net operating working capital, resulting in the observed relation between the two in our baseline regressions. We mitigate these endogeneity concerns with the instrumental variable approach. To implement this methodology, we need to identify instrument variables that are exogenous to *WCR* (exclusion restriction) but significantly correlated to CEO age (relevance restriction). Following the recommendation of Serfling (2014), Cline and Yore (2016), and Croci et al. (2017), we use the logarithm of the Consumer Price Index (CPI) in the CEO's birth year as an instrumental variable (*Ln(CPI)*). CPI in the CEO birth year satisfies the relevance condition because older CEOs were born in earlier years when CPIs were low, implying a negative relation between the CEO's current age and the CPI in the birth year. Furthermore, there is no theory connecting the CPI in the year when a CEO was born to current working capital management strategies implemented by the CEO, satisfying the exclusion condition. In addition, we employ the annual mean value of *Ln(CEO_age)* for firms, excluding the focal firm itself, in the same two-digit SIC code and same size quartiles (*Ind_Size_Ln(CEO_age)*) as another instrumental variable. The CEO age in firms of similar size and operating in similar industries should not be related to the focal firms' *WCR*.

In the first stage, we regress *Ln(CEO_age)* on *Ln(CPI)*), *Ind_Size_Ln(CEO_age),* and the same set of control variables as those in Table 3. The results are presented in Panel A of Table 6. As expected, the CPI in a CEO's birth year is negatively and significantly related to CEO age. In the second stage, we use predicted CEO age (*Pre_Ln(CEO_age)*) obtained from the first-stage regression to replace *Ln(CEO_age)* and present the results in Panel B of Table 6. The coefficient of *Pre_Ln(CEO_age)* is positive and significant at the 1% level in both models, echoing our main finding that net operating working capital investment increases with CEO age. The Kleibergen–Paap Chi ^{2} and F tests of the first-stage reveal that the model does not suffer from under-identification nor weak instruments. The insignificant Hansen J-statistic in the second-stage indicates that our instruments are unrelated to the error term. Collectively, the results further confirm that the causal link runs from CEO age to the level of net operating working capital (*WCR*).

4.4.3. Controlling the impact of newly hired CEOs and those approaching retirement

Holmström (1999) argues that career concerns are greater during the early years of managers' service because the market is still assessing their abilities.[17] The positive association between CEO age and the level of net operating working capital may be driven by newly hired CEOs. New hires may have strong incentives to impress the board and the external market with good performance by implementing aggressive working capital management. It is also possible that the positive CEO age-*WCR* relation is driven by firms with CEOs approaching retirement age. CEOs near retirement age may have reduced risk-taking incentives due to increased desire for a "quiet life" (Hambrick and Mason, 1984; Bertrand and Schoar, 2003; Yim, 2013), resulting in more conservative WCM strategies.

[17] For example, Ali and Zhang (2015) find that earnings overstatement is greater in the early years than in the later years of CEOs' service, and this relation is less pronounced in the presence of greater external and internal monitoring, suggesting that new CEOs try to favorably influence the market's perception of their abilities in their early years in office.

We control the effect of newly hired CEOs with *Tenure3*, an indicator variable that equals one for CEOs with a tenure equal to or less than three years and zero otherwise. We control the retirement effect with *Last_year*, an indicator variable equal to one for CEOs in their last year in office and zero otherwise. The results are displayed in Table 7. The estimated coefficient on *Ln(CEO_age)* remains positive and significant in both models, indicating our results are robust to these additional controls. Furthermore, the coefficient of *Last_year* is negative and significant, implying conservatism in working capital management is mitigated in firms with CEOs approaching retirement.

4.4.4. Fixed effects

Unobservable time-invariant firm heterogeneity may be related to a firm's working capital management and its CEO's age simultaneously, thereby driving the positive association between the two in our baseline regression. To alleviate this concern, we include firm fixed effects and present the results in Models (1) and (2) of Table 8. Gormley and Matsa (2016) and Serfling (2014) posit that this methodology is equivalent to demeaning all variables in the regressions with respect to their average values by firms. The corresponding regression results reflect the effects of within-firm changes in CEO age on the within-firm changes in working capital investment. We find that our results continue to hold, suggesting that time-invariant firm heterogeneity is unlikely to drive our results.

It is also possible that industry-specific effects in particular years drive our results. To mitigate this endogeneity, we control the interactions of year and industry fixed effects in addition to year and industry effects alone, and report the results in Models (3) and (4) of Table 8. This methodology is equivalent to demeaning all variables in the regressions with respect to their average values by industry each year (Gormley and Matsa, 2016; Serfling, 2014). The results are consistent with those from our baseline regressions, indicating that it is unlikely that an industry-year effect drives our baseline results.

To mitigate the concern that some latent industry characteristics drive our baseline results, we use industry-adjusted *Ln(CEO_age)*, i.e., *Ind_Ln(CEO_age)*, calculated by subtracting the median value of *Ln(CEO_age)* in the same two-digit SIC industry as the focal firm in a given year. Similarly, to mitigate the bias arising from the firm fixed effects, we employ firm-adjusted *Ln(CEO_age)*, i.e., *Firm_Ln(CEO_age)*, calculated by subtracting the median value of *Ln(CEO_age)* for the firm over the sample period (Serfling, 2014). The results are displayed in Appendix D. The results are quantitatively similar to those from our baseline analysis.

5. Conclusion

Working capital management is an essential function of a firm. Efficient working capital management can benefit both the management and shareholders through value creation. In this paper, we seek a better understanding of the determinants of firms' net operating working capital investment behavior. Specifically, we argue that managers may use working capital management as an effective tool to distinguish themselves. Younger CEOs have a longer career horizon, and hence a higher level of career concerns, which may motivate them to take purposeful actions to secure their current job and increase their competitiveness in the labor and capital markets. They may pursue either an aggressive or a conservative strategy in working capital management depending on the perceived outcomes that they believe, leaving the association between CEO age and net operating working capital investment an empirical question.

Using a large sample of U.S. firms over the period of 1993 to 2018, we document strong and robust empirical evidence that younger CEOs tend to adopt more aggressive WCM strategies. Firms with younger CEOs use higher levels of trade-credit financing and carry lower levels of inventory. The results are robust to industry effects and various model specifications. The results are consistent with the embedded risk-taking traits of younger age and the *Aggressive strategy hypothesis* that younger CEOs tend to take risky actions to signal their abilities due to higher levels of career concerns. We show that implicit incentives arising from career horizon affects a manager's choice of working capital policies, adding to the literature on the associations between CEO career concerns and various corporate decisions. Given that CEO age is an important determinant of a firm's working capital policies, investors and various internal or external monitoring groups need to factor CEO age into their investing, hiring, compensating, and monitoring mechanisms, respectively.

Data availability statement

All data used in this study are publicly available from the sources indicated in the paper.

Appendix A. Variable definitions

See Table A.9.

Appendix B. CEO age and components of net operating working capital

Table B.10 presents the regression results of tests on the effects of CEO age on the levels of working capital components, including inventory (*INVT*), accounts receivable (*RECT*) and accounts payable (*AP*). *INVT/RECT/AP* is inventory/accounts receivable/accounts payable scaled by sales. *IndAdj_INVT/RECT/AP* is industry-mean adjusted *INVT/RECT/AP*. All independent variables are lagged one period. All models control industry and year effects, where the industries are defined using Fama–French 49-industry classifications. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Appendix C. First-stage results of propensity score matching

Table C.11 presents the first-stage results of the propensity score matching. *Under50* (corresponds to the first quartile of CEO age distribution) equals one if a CEO is 50 years old or younger and zero otherwise. In the first stage, logit regressions with *Under50* as the dependent variable and the same set of control variables as those in the baseline regression are used to estimate the likelihood (propensity score) that a firm is managed by a CEO of 50 years old or younger. In the second stage, each firm-year observation with a CEO of 50 or younger is then matched to another firm-year observation with a CEO more than 50 years old with the closest propensity score. Models (1) and (2) present the regression results using the pre-matched sample and post-matched sample, respectively. All independent variables are lagged one period. All models control industry and year effects, where the industries are defined using Fama–French 49-industry classifications. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table A.9

Dependent variables	
WCR	The sum of accounts receivable and inventory net of accounts payable scaled by sales Data source: COMPUSTAT
IndAdj_WCR	The difference between WCR of a focal firm and the industry average WCR in a given year, where the industry is defined using the Fama–French 49-industry classification Data source: COMPUSTAT
INVT	Inventory scaled by sales Data source: COMPUSTAT
IndAdj_INVT	The difference between INVT of a focal firm and the industry average INVT in a given year, where the industry is defined using the Fama–French 49-industry classification Data source: COMPUSTAT
RECT	Accounts receivables scaled by sales Data source: COMPUSTAT
IndAdj_RECT	The difference between RECT of a focal firm and the industry average RECT in a given year, where the industry is defined using the Fama–French 49-industry classification Data source: COMPUSTAT
AP	Accounts payable scaled by sales Data source: COMPUSTAT
IndAdj_AP	The difference between AP of a focal firm and the industry average AP in a given year, where the industry is defined using the Fama–French 49-industry classification Data source: COMPUSTAT
Primary variables of interest	
Ln(CEO_age)	Natural logarithm of the CEO age Data source: Execucomp
Other control variables	
Ln(CEO_tenure)	Natural logarithm of one plus the number of years a CEO has served as the CEO Data source: Execucomp
Female	An indicator variable that equals 1 for female CEOs and 0 for male CEOs Data source: Execucomp
Ln(Vega/tdc1)	Natural logarithm of one plus the dollar change in CEO equity portfolio wealth for a 1% change in the annualized standard deviation of stock returns scaled by annual compensation. Data source: Execucomp
SalesGrowth	The change in sales from year t-1 to year t scaled by the sales in year t-1. Data source: COMPUSTAT
GPM	Sales minus cost of goods sold scaled by sales Data source: COMPUSTAT
SalesVol	The standard deviation of sales over a rolling five-year window scaled by net sales Data source: COMPUSTAT
OCF	Operating income before depreciation minus income taxes scaled by net sales Data source: COMPUSTAT
Tobin's Q	The sum of the market value of equity and total liabilities minus book value of equity scaled by total assets Data source: COMPUSTAT
Ln(Mkval)	The natural logarithm of the market value of equity Data source: COMPUSTAT
(*Ln(At)*)	The natural log of total assets Data source: COMPUSTAT
MktShare	The ratio of a firm's sales to the total sales in a given industry, where industries are defined by the Fama–French 49-industry classifications Data source: COMPUSTAT
Distress	An indicator variable equals one for a distressed firm and zero otherwise. A firm is defined as a distressed one if it has an interest coverage ratio less than one for two consecutive years or less than 0.8 in any given year, and has a leverage ratio in the top two deciles of its industry's leverage ratio in a given year. Data source: COMPUSTAT
Ln (CPI)	The natural logarithm of the consumer price index (CPI) in the CEO's birth year Federal Reserve bank of St. Louis. See https://fred.stlouisfed.org/series/FPCPITOTLZGUSA for details.
Last_year	An indicator variable that equals one if a CEO is in his/her last year in office and zero otherwise. Data source: Execucomp
Tenure3	An indicator variable that equals one if a CEO has a tenure equal to or less than three years and zero otherwise Data source: Execucomp

Appendix D. Industry- and firm-adjusted CEO age and the level of net operating working capital

Table D.12 presents the results of tests on the effect of CEO age on net operating working capital using alternative proxies for CEO age. Models (1) and (2) present regression results using industry-adjusted *Ln(CEO_age)* as the proxy for CEO age. Models (3) and (4) present regression results using firm-adjusted *Ln(CEO_age)* as the proxy for CEO age. All independent variables are lagged one period. All models control industry and year effects, where the industries are defined using Fama–French 49-industry classifications. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table B.10

	(1) INVT	(2) IndAdj_INVT	(3) RECT	(4) IndAdj_RECT	(5) AP	(6) IndAdj_AP
Ln(CEO_age)	0.0176*	0.0186**	0.0140	0.0117	−0.0167***	−0.0151***
	(1.84)	(2.12)	(1.54)	(1.34)	(−2.78)	(−2.67)
Ln(CEO_tenure)	0.0015	0.0012	−0.0009	−0.0006	0.0006	0.0007
	(1.19)	(1.08)	(−0.71)	(−0.48)	(0.83)	(0.97)
Female	0.0018	−0.0003	0.0016	0.0014	0.0079*	0.0073*
	(0.26)	(−0.04)	(0.26)	(0.25)	(1.84)	(1.81)
Ln(Vega/Tdc1)	−0.0169	−0.0176	0.0043	−0.0007	0.0024	−0.0033
	(−1.26)	(−1.30)	(0.30)	(−0.05)	(0.35)	(−0.53)
SalesGrowth	−0.0025	−0.0021	0.0080**	0.0072**	0.0063***	0.0062***
	(−1.04)	(−0.96)	(2.40)	(2.30)	(2.96)	(3.15)
GPM	0.0040	0.0061	0.0336***	0.0341***	−0.0194***	−0.0145**
	(0.59)	(0.95)	(3.65)	(3.89)	(−2.87)	(−2.35)
OCF	−0.0370***	−0.0295***	−0.0784***	−0.0756***	−0.0775***	−0.0682***
	(−3.95)	(−3.40)	(−6.99)	(−7.27)	(−9.24)	(−9.13)
Ln(Mkval)	−0.0057***	−0.0055***	0.0004	0.0008	−0.0024*	−0.0029**
	(−3.47)	(−3.55)	(0.19)	(0.38)	(−1.77)	(−2.37)
Ln(At)	0.0038**	0.0035**	0.0003	−0.0004	0.0051***	0.0054***
	(2.05)	(1.99)	(0.09)	(−0.17)	(3.06)	(3.51)
Tobin's Q	−0.0013**	−0.0016***	−0.0004	−0.0008	0.0009**	0.0007*
	(−2.18)	(−2.79)	(−0.50)	(−1.04)	(1.97)	(1.66)
MktShare	−0.2066***	−0.1853***	0.0367	0.0381	0.0932**	0.0914**
	(−3.29)	(−3.08)	(0.33)	(0.37)	(1.98)	(2.04)
Distress	0.0149	0.0126	−0.0146**	−0.0146**	0.0046	0.0063
	(1.37)	(1.31)	(−2.06)	(−2.17)	(0.80)	(1.24)
SalesVol	−0.0322***	−0.0313***	−0.0471***	−0.0460***	−0.0011	0.0001
	(−7.34)	(−7.48)	(−9.12)	(−9.42)	(−0.30)	(0.03)
Constant	0.1543***	−0.0183	−0.0007	−0.0443	0.0917***	0.0553**
	(2.97)	(−0.37)	(−0.02)	(−1.19)	(3.63)	(2.37)
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	28,876	28,876	28,876	28,876	28,876	28,876
R-squared	0.453	0.045	0.297	0.037	0.201	0.066

Table C.11

	(1) Pre-match Under50	(2) Post-match Under50
Ln(CEO_tenure)	−0.7085***	0.0273
	(−22.42)	(0.75)
Female	0.1877	0.0527
	(1.00)	(0.28)
Ln(Vega/Tdc1)	0.5073	0.2017
	(1.36)	(0.49)
SalesGrowth	0.5506***	0.0291
	(7.65)	(0.37)
GPM	0.5178***	0.0183
	(2.58)	(0.09)
OCF	−0.3994*	−0.1019
	(−1.88)	(−0.49)
Ln(Mkval)	0.0115	0.0184
	(0.24)	(0.38)
Ln(At)	−0.1842***	−0.0172
	(−3.63)	(−0.33)
Tobin's Q	0.0273*	0.0059
	(1.65)	(0.33)
MktShare	−5.3465***	0.3704
	(−2.67)	(0.21)
Distress	0.0040	−0.0284
	(0.02)	(−0.18)
SalesVol	0.3157***	0.1184
	(2.61)	(0.99)
Constant	1.0023*	0.2720
	(1.84)	(0.42)
Industry and year fixed effects	Yes	Yes
Observations	28,876	13,104
R-squared	0.1119	0.002

Table D.12

	(1) WCR	(2) IndAdj_WCR	(3) WCR	(4) IndAdj_WCR
Ind_Ln(CEO_age)	0.0483***	0.0482***		
	(3.55)	(3.73)		
Firm_Ln(CEO_age)			0.0429***	0.0414***
			(3.12)	(3.19)
Ln(CEO_tenure)	0.0000	−0.0001	0.0002	0.0001
	(0.02)	(−0.09)	(0.13)	(0.08)
Female	−0.0006	−0.0029	−0.0006	−0.0029
	(−0.07)	(−0.34)	(−0.06)	(−0.34)
Ln(Vega/Tdc1)	−0.0231	−0.0233	−0.0232	−0.0234
	(−1.41)	(−1.44)	(−1.41)	(−1.44)
SalesGrowth	−0.0002	0.0000	−0.0002	−0.0001
	(−0.05)	(0.00)	(−0.05)	(−0.02)
GPM	0.0654***	0.0608***	0.0655***	0.0608***
	(5.62)	(5.60)	(5.62)	(5.60)
OCF	−0.0537***	−0.0524***	−0.0536***	−0.0522***
	(−3.34)	(−3.63)	(−3.33)	(−3.61)
Ln(Mkval)	−0.0021	−0.0014	−0.0021	−0.0015
	(−0.68)	(−0.53)	(−0.70)	(−0.55)
Ln(At)	−0.0020	−0.0032	−0.0019	−0.0031
	(−0.52)	(−0.94)	(−0.50)	(−0.92)
Tobin's Q	−0.0029***	−0.0033***	−0.0029***	−0.0033***
	(−2.63)	(−3.22)	(−2.64)	(−3.24)
MktShare	−0.2068	−0.1877	−0.2067	−0.1873
	(−1.25)	(−1.36)	(−1.24)	(−1.36)
Distress	0.0118	0.0070	0.0118	0.0069
	(0.68)	(0.45)	(0.68)	(0.45)
SalesVol	−0.0776***	−0.0755***	−0.0774***	−0.0753***
	(−11.49)	(−12.02)	(−11.42)	(−11.96)
Constant	0.2497***	0.0640	0.2496***	0.0637
	(5.39)	(1.44)	(5.39)	(1.43)
Industry and year fixed effects	Yes	Yes	Yes	Yes
Observations	28,876	28,876	28,876	28,876
R-squared	0.314	0.052	0.313	0.051

References

2006. The effect of aging on entrepreneurial behavior. J. Bus. Ventur. 21 (2), 177–194.

Aktas, Nihat, Croci, Ettore, Petmezas, Dimitris, 2015. Is working capital management value-enhancing? Evidence from Firm Performance and Investments. J. Corp. Finance 30 (February), 98–113.

Alfonso, Elio, Brooks, Li-Zheng, Simonov, Andrey, Zhang, Joseph H., 2019. CEO career concerns and expectations management. J. Appl. Account. Res. 20 (3), 267–289.

Ali, Ashiq, Zhang, Weining, 2015. CEO tenure and earnings management. J. Account. Econ. 59 (1), 60–79.

Baginski, Stephen P., Campbell, John L., Hinson, Lisa A., Koo, David S., 2018. Do career concerns affect the delay of bad news disclosure?. Account. Rev. 93 (2), 61–95.

Barker III, Vincent L., Mueller, George C., 2002. CEO characteristics and firm R & D spending. Manage. Sci. 48 (6), 782–801.

Belenzon, Sharon, Shamshur, Anastasiya, Zarutskie, Rebecca, 2019. CEO's age and the performance of Closely Held Firms. Strateg. Manage. J. 40 (6), 917–944.

Bertrand, Mariann, Schoar, Antoinette, 2003. Managing with style: The effect of managers on firm policies. Q. J. Econ. 118 (4), 1169–1208.

Boisjoly, Russell P., Conine, Thomas E., McDonald IV, Michael B., 2020. Working capital management: Financial and valuation impacts. J. Bus. Res. 108 (March), 1–8.

Campello, Murillo, Gao, Janet, 2017. Customer concentration and loan contract terms. J. Financ. Econ. 123 (1), 108–136.

Chevalier, Judith, Ellison, Glenn, 1999. Career concerns of mutual fund managers. Q. J. Econ. 114, 389–432.

Chevalier, Judith A., Scharfstein, David S., 1996. Capital-market imperfections and countercyclical markups: Theory and evidence. Amer. Econ. Rev. 86 (4), 703–725.

Cline, Brandon N., Yore, Adam S., 2016. Silverback CEOs: Age, experience, and firm value. J. Empir. Finance 35 (January), 169–188.

Coles, Jeffrey L., Daniel, Naveen D., Naveen, Lalitha, 2006. Managerial incentives and risk-taking. J. Financ. Econ. 79, 431–468.

Cosci, Stefania, Guida, Roberto, Meliciani, Valentina, 2020. Does trade credit really help relieving financial constraints?. Eur. Financial Manag. 26 (1), 198–215.

Croci, Ettore, Giudice, Alfonso, Jankensgård, Håkan, 2017. CEO age, risk incentives, and hedging strategy. Financ. Manage. 46 (3), 687–716.

Croson, Rachel, Gneezy, Uri, 2009. Gender differences in preferences. J. Econ. Lit. 47 (2), 448–474.

Dechow, Patricia M., Sloan, Richard G., 1991. Executive incentives and the horizon problem: An empirical investigation. J. Account. Econ. 14, 51–89.

Deloof, Marc, 2003. Does working capital management affect profitability of belgian firms?. J. Bus. Finance Account. 30 (3–4), 573–588.

Dhaliwal, Dan J., Judd, Scott, Serfling, Matthew, Shaikh, Sarah, 2016. Customer concentration risk and the cost of equity capital. J. Account. Econ. 61 (1), 23–48.

Dhaliwal, Dan, Michas, Paul N., Naiker, Vic, Sharma, Divesh, 2019. Greater Reliance on major Customer and auditor going-concern decisions. Contemp. Account. Res..

Doan, Trang, Iskandar-Datta, Mai, 2021. Does gender in the C-suite really matter? Journal of accounting. Audit. Finance 36 (1), 81–107.

Eckbo, B., Espen, Karin S., Thorburn, Wang, Wei, 2016. How costly is corporate bankruptcy for the CEO. J. Financ. Econ. 121 (1), 210–229.

Faccio, Mara, Marchica, Maria-Teresa, Mura, Roberto, 2016. CEO gender, corporate risk-taking, and the efficiency of capital allocation. J. Corp. Finance 39, 193–209.

Fama, Eugene F., 1980. Agency problems and the theory of the firm. J. Political Econ. 88 (2), 288–307.

Farrell, Kathleen A., Hersch, Philip L., 2005. Additions to corporate boards: The effect of gender. J. Corp. Finance 11 (1–2), 85–106.

Fu, Yishu, 2019. Independent directors, CEO career concerns, and firm innovation: Evidence from China. N. Am. J. Econ. Finance 50 (November), N.PAG–N.PAG.

Garcia-Appendini, Emilia, Montoriol-Garriga, Judit, 2013. Firms as liquidity providers: Evidence from the 2007–2008 financial crisis. J. Financ. Econ. 109 (1), 272–291.

Garcia-Teruel, Pedro, Martinez-Solano, Pedro, 2007. Effects of working capital management on SME profitability. Int. J. Manage. Finance 3, 164–177.

Giannetti, Mariassunta, Burkart, Mike, Ellingsen, Tore, 2011. What you sell is what you lend? Explaining trade credit contracts. Rev. Financ. Stud. 24 (4), 1261–1298.

Gibbons, Robert, Murphy, Kevin J., 1992. Optimal incentive contracts in the presence of career concerns: Theory and evidence. J. Political Econ. 100 (3), 468–505.

Gillan, Stuart L., Hartzell, Jay C., Parrino, Robert, 2009. Explicit versus implicit contracts: Evidence from CEO employment agreements. J. Finance 64 (4), 1629–1655.

Gormley, Todd A., Matsa, David A., 2016. Playing it safe? Managerial preferences, risk, and agency conflicts. J. Financ. Econ. 122 (3), 431–455.
Graham, John R., Harvey, Campbell R., Rajgopal, Shiva, 2005. The economic implications of corporate financial reporting. J. Account. Econ. 40 (1–3), 3–73.
Guay, W., 1999. The sensitivity of CEO wealth to equity risk: An analysis of the magnitude and determinants. J. Financ. Econ. 53, 43–71.
Hambrick, Donald C., Mason, Phyllis A., 1984. Upper echelons: The organization as a reflection of its top managers. Acad. Manag. Rev. 9 (2), 193–206.
Helwege, Jean, Zhang, Gaiyan, 2016. Financial firm bankruptcy and contagion. Rev. Finance 20 (4), 1321–1362.
Hermalin, Benjamin E., Weisbach, Michael S., 1998. Endogenously chosen boards of directors and their monitoring of the CEO. Amer. Econ. Rev. 88 (1), 96–118.
Hertzel, Michael G., Li, Zhi, Officer, Micah S., Rodgers, Kimberly J., 2008. Inter-firm linkages and the wealth effects of financial distress along the supply chain. J. Financ. Econ. 87, 374–387.
Hill, Matthew D., Wayne Kelly, G., Highfield, Michael J., 2010. Net operating working capital behavior: A first look. Financ. Manage. 39 (2), 783–805.
Himmelberg, C., Hubbard, G., Palia, D., 1999. Understanding the determinants of managerial ownership and the link between ownership and performance. J. Financ. Econ. 53, 353–384.
Hirshleifer, David, Thakor, Anjan V., 1992. Managerial conservatism, project choice, and debt. Rev. Financ. Stud. 5 (3), 437–470.
Holmström, Bengt, 1999. Managerial incentive problems: A dynamic perspective. Rev. Econom. Stud. 66 (1), 169–182.
Holmstrom, Bengt, Costa, Joan Ricart I., 1986. Managerial incentives and capital management. Q. J. Econ. 101, 835–860.
Hong, H., Kubik, J.D., Solomon, A., 2000. Security analysts' career concerns and herding of earnings forecasts. Rand J. Econ. 31, 121–144.
Hu, May, Mou, Jiayi, Tuilautala, Mataiasi, 2020. How trade credit affects mergers and acquisitions. Int. Rev. Econ. Finance 67 (May), 1–12.
Huang, Hua-Wei, Rose-Green, Ena, Lee, Chih-Chen, 2012. CEO age and financial reporting quality. Account. Horiz. 26 (4), 725–740.
Jalal, Abu, Khaksari, Shahriar, 2020. Cash cycle: A cross-country analysis. Financ. Manage. 49 (3), 635–671.
James, Hui Liang, 2020. CEO age and tax planning. Rev. Financ. Econ. 38 (2), 275–299.
Jorion, Philippe, Zhang, Gaiyan, 2009. Credit contagion from counterparty risk. J. Finance 64 (5), 2053–2087.
Jory, Surendranath Rakesh, Khieu, Hinh D., Ngo, Thanh N., Phan, Hieu V., 2020. The influence of economic policy uncertainty on corporate trade credit and firm value. J. Corp. Finance 64, 101671.
Kayani, Umar Nawaz, Silva, Tracy-Anne De, Gan, Christopher, 2019. Working capital management and corporate governance: A new pathway for assessing firm performance. Appl. Econ. Lett. 26 (11), 938–942.
Kieschnick, R., Laplante, M., Moussawi, R., 2013. Working capital management and Shareholders' wealth. Rev. Finance 17 (5), 1827–1852.
Kim, Y., Chung, K., 1990. An integrated evaluation of investment in inventory and credit: A cash flow approach. J. Bus. Finance Account. 17, 381–390.
Laghari, Fahmida, Chengang, Ye, 2019. Investment in working capital and financial constraints. Int. J. Manage. Finance 15 (2), 164–190.
Lee, Joon Mahn, Park, Jung Chul, Folta, Timothy B., 2018. CEO career horizon, corporate governance, and real options: The role of economic short-termism. Strateg. Manage. J. 39 (10), 2703–2725.
Levi, M., Li, K., Zhang, F., 2014. Director gender and mergers and acquisitions. J. Corp. Finance 28, 185–200.
Levine, Ross, Lin, Chen, Xie, Wensi, 2018. Corporate resilience to banking crises: The roles of trust and trade credit. J. Financ. Quant. Anal. 53 (4), 1441–1477.
Li, Xiaoyang, Low, Angie, Makhija, Anil K., 2017. Career concerns and the busy life of the Young CEO. J. Corp. Finance 47 (December), 88–109.
Lian, Yili, 2017. Financial distress and customer–supplier relationships. J. Corp. Finance 43, 397–406.
Long, Michael S., Malitz, Ileen B., Abraham Ravid, S., 1993. Trade credit, quality guarantees, and profuct marketability. Financ. Manage. 22 (4), 117–127.
Love, Inessa, Preve, Lorenzo A., Sarria-Allende, Virginia, 2007. Trade credit and bank credit: Evidence from recent financial crises. J. Financ. Econ. 83 (2), 453–469.
Lyngstadaas, Hakim, Berg, Terje, 2016. Working capital management: Evidence from Norway. Int. J. Manage. Finance 12 (3), 295–313.
Ma, Liangbo, Ma, Shiguang, 2020. Trade credit use and bank loan access: An agency theory perspective. Account. Finance 60 (2), 1835–1865.
Martínez-Sola, Cristina, García-Teruel, Pedro J., Martínez-Solano, Pedro, 2013. Trade credit policy and firm value. Account. Finance 53 (3), 791–808.
McClelland, Patrick L., Barker, Vincent L., Oh, Won-Yong, 2012. CEO career horizon and tenure: Future performance implications under different contingencies. J. Bus. Res. 65 (9), 1387–1393.
Mian, Shehzad L., Smith, Jr., Clifford W., 1992. Accounts receivable management policy: Theory and evidence. J. Finance 47, 169–200.
Molina, Carlos A., Preve, Lorenzo A., 2009. Trade receivables policy of distressed firms and its effect on the costs of financial distress. Financ. Manage. 38, 663–686.
Murfin, Justin, Njoroge, Ken, 2015. The implicit costs of trade credit borrowing by large firms. Rev. Financ. Stud. 28 (1), 112–145.
Narayanan, M.P., 1985. Managerial incentives for short-term results. J. Finance 40 (5), 1469–1484.
Pae, Suil, Song, Chang Joon, Yi, Andrew C., 2016. Career concerns and management earnings guidance. Contemp. Account. Res. 33 (3), 1172–1198.
Pais, Maria Amélia, Gama, Paulo Miguel, 2015. Working capital management and SMEs profitability: Portuguese evidence. Int. J. Manage. Finance 11 (3), 341–358.
Palia, D., 2001. The endogeneity of managerial compensation in firm valuation: A solution. Rev. Financ. Stud. 14, 735–764.
Petersen, Mitchell A., 2009. Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. Rev. Final. Stud. 22 (1), 435–480.
Prendergast, Canice, Stole, Lars, 1996. Impetuous Youngsters and Jaded Old-timers: Acquiring a reputation for learning. J. Political Econ. 104 (6), 1105–1134.
Riddick, Leigh A., Whited, Toni M., 2009. The corporate propensity to save. J. Finance 64 (4), 1729–1766.
Rosenbaum, Paul R., Rubin, Donald B., 1983. The central role of the propensity score in observational studies for causal effects. Biometrika 70, 41–55.
Sartoris, William L., Hill, Ned C., 1983. A generalized cash flow approach to short-term financial decisions. J. Finance 38, 349–360.
Scharfstein, David, Stein, Jeremy, 1990. Herd behavior and investment. Amer. Econ. Rev. 80, 465–479.
Schiff, Michael, Lieber, Zvi, 1974. A model for the integration of credit and inventory management. J. Finance 29, 133–140.
Serfling, Matthew A., 2014. CEO age and the riskiness of corporate policies. J. Corp. Finance 25 (April), 251–273.
Shin, Hyun-Han, Soenen, Luc, 1998. Efficiency of working capital management and corporate profitability. Financ. Pract. Educ. 8, 37–45.
Soenen, L., 1993. Cash conversion cycle and corporate profitability. J. Cash Manage. 13, 53–58.
Song, Fenghua, Thakor, Anjan V., 2006. Information control, career concerns, and corporate governance. J. Finance 61 (4), 1845–1896.
Thomas, Anisya S., Litschert, Robert J., Ramaswamy, Kannan, 1991. The performance impact of strategy-manager coalignment: An empirical examination. Strateg. Manage. J. 12 (7), 509–522.
Wang, Baolian, 2019. The cash conversion cycle spread. J. Financ. Econ. 133 (2), 472–497.
Williams, M.A., Rao, R., 2006. CEO stock options and equity risk incentives. J. Bus. Finance Account. 33, 26–44.
Wilson, Nicholas, Summers, Barbara, 2002. Trade credit terms offered by small firms: Survey evidence and empirical analysis. J. Bus. Finance Account. 29 (3/4), 317–351.
Wu, Qi, Muthuramna, Kumar, Seshadri, Sridhar, 2019. Effect of financing costs and constraints on real investments: The case of inventories. Prod. Oper. Manage. 28 (10), 2573–2593.
Xie, Jun, 2015. CEO career concerns and investment efficiency: Evidence from China. Emerg. Mark. Rev 24 (September), 149–159.
Yazdanfar, Darush, Öhman, Peter, 2014. The impact of cash conversion cycle on firm profitability an empirical study based on Swedish data. Int. J. Manage. Finance 10 (4), 442–452.
Yim, Soojin, 2013. The acquisitiveness of youth: CEO age and acquisition behavior. J. Financ. Econ. 108 (1), 250–273.
Zhang, Teng, Sabherwal, Sanjiv, Jayaraman, Narayanan, Ferris, Stephen P., 2016. The Young and the restless: A study of age and acquisition propensity of CEOs of U.K. firms. J. Bus. Finance Account. 43 (9/10), 1385–1419.
Zwiebel, Jeffrey, 1995. Corporate conservatism and relative compensation. J. Political Econ. 103, 1–25.