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Upholding integrity: The influence of executives' backgrounds on corporate information environment

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ABSTRACT

Motivated by the roles of corporate management in shaping corporate decisions and the importance of stock liquidity in financial markets, we examine whether trust in management influences the liquidity costs of the firm that they manage. Using manually collected propriety data from several datasets, this study documents that firms led by ex-military CEOs are associated with higher stock market liquidity than firms run by non-military CEOs. Military CEOs influence stock liquidity by improving their firms' information environment and reducing performance volatility. Firms led by military CEOs have higher social capital, higher levels of voluntary disclosure, fewer stock price delays, and lower levels of informed trading. In addition, firms run by military CEOs have lower costs of capital and default risk. Overall, consistent with behavioral consistency theory, our findings highlight the importance of executives' early-life experience in reducing information frictions, fostering trust, and improving secondary market quality.

"I think of all the time I spent in the military and in law enforcement and the many times I saw someone do the right thing because it was the right thing to do. The essence of integrity is what you do in and of yourself — you must be true to yourself."

—Patrick O'Toole, Director & Executive Vice President, HealthMarkets Insurance Agency.

1. Introduction

Trust plays an important role in financial markets. Investors consider the risk of being cheated when deciding whether to buy stocks (Guiso et al., 2008) or invest in venture capital (Bottazzi et al., 2016). Therefore, trust serves as a prominent factor in explaining investors' stock market participation (e.g., Georgarakos and Pasini, 2011), and undermined trust in financial markets due to financial fraud can reduce market participation (e.g., Giannetti and Wang, 2016).[1] Despite the extensive literature on the importance of trust for financial markets, how trust in a firm's management translates to trading in secondary stock markets is less well understood. This paper fills this void by examining how trust in corporate management affects the liquidity costs of the firm that they manage.[2]

Our focus on stock liquidity is of significant economic relevance, for several reasons. First, stock liquidity, which refers to how quickly a large proportion of a firm's stock can be traded without significantly affecting its prices (e.g., Holden et al., 2014), is an important feature that impacts almost every aspect of financial markets (e.g., Chordia et al., 2001, 2008). Second and more importantly, liquidity in stocks has a vast variety of significant implications for investors, corporations, regulators, other financial market participants, and the entire economy.[3]

Motivated by the roles of corporate management in shaping corporate decisions (e.g., Bertrand and Schoar, 2003) and the importance of

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[1] Gurun et al. (2018), for example, study the role of trust in the investment industry and find that trustworthy financial advisers experience fewer withdrawals following the Madoff Ponzi scheme. Tran et al. (2025) find that trust in a company is associated with to higher stock liquidity for that firm.

[2] In addition to stock liquidity, our study examines the implications of CEOs' early experience on corporate voluntary disclosure, social capital, various corporate behavior, and market efficiency, which we discuss in the following sections.

[3] See, for example, Amihud and Mendelson (1986), Bhide (1993), Foster and Viswanathan (1993), Levin and Zervos (1998), Fang et al. (2009), Næs et al. (2011).

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stock liquidity in financial markets, we examine whether trust in corporate management is related to stock market liquidity. To capture trust in corporate management, we rely on evidence from behavioral and organizational literature. Specifically, studies in behavioral science suggest that military services instill values such as honesty, duty, honor, and integrity, and these experiences tend to translate to a strong sense of ethics among service personnel in their later civilian employment (Duffy, 2006; Elder et al., 1991; Franke, 1998; Franke, 2001). The behavioral consistency theory (e.g., Epstein, 1979; Hambrick and Mason, 1984; Funder and Colvin, 1991; McAdams, 1995) suggests that individuals tend to maintain a level of consistency in their beliefs and behavior over time. Armed with the upper echelon and behavioral consistency theories, we conjecture that executives' military experience, which fosters integrity and ethical behavior, can influence the information environment of the firms they manage. Since investors tend to value managers' creditworthiness when making investment decisions (Gibson et al., 2021; Gurun et al., 2018), we argue that executives' military training matters for investors' trading decisions, and hence, the liquidity costs of a firm's stock.[4]

To examine the relation between executives' military training and the corporate information environment, we hand-collect information on CEO characteristics from ExecuComp and manually search Marquis Who's Who for whether CEOs have previous military experience. For a large sample of U.S firms, we find a significant positive relation between CEOs' military experience and stock liquidity. We obtain consistent results when we use alternative measures of stock liquidity, alternative subsamples, and alternative model specifications. In terms of economic significance, the annual bid-ask spread of firms headed by military CEOs is about 7.4 % lower than those managed by non-military CEOs.

We acknowledge that the baseline regression results could be subject to a potential omitted variable issue, whereby an omitted variable could simultaneously affect both the probability of appointing a CEO with military experience and stock market liquidity. We perform several additional analyses to address this issue. First, we employ firm-fixed effect models to mitigate firm-specific time-invariant omitted variables issues. Second, we consider CEO turnover events and find evidence that stock liquidity increases when a non-military CEO is replaced with a CEO with military experience, whereas the opposite is true following the appointment of a CEO without military experience. Third, we use propensity score matching analysis and show that the stock liquidity of firms with military CEOs is higher than that of otherwise comparable firms without military CEOs. Forth, we perform an instrumental variable (IV) regression analysis, following Bedard and Deschenes (2006) and Benmelech and Frydman (2015). We observe a positive relation between the instrumented CEO military experience and stock liquidity. Furthermore, we consider alternative explanations and perform a myriad of sensitivity analyses. Overall, the results provide consistent support for our findings that military CEOs can enhance the stock liquidity of the firms that they manage.

We perform two sets of analyses to further support our main argument that CEOs' military experience instills investor trust and hence results in higher stock liquidity. In the first set of analyses, we examine the characteristics of firms headed by military CEOs that promote investor trust and improve stock liquidity. First, we consider whether military CEOs promote a culture of transparency. This test is motivated by prior findings that information asymmetry is one of the key determinants of stock liquidity (e.g., Attig et al., 2006; Healy and Palepu, 2001; Lang et al., 2012) and transparency is essential to promote trust (e.g., Norman, Avolio, and Luthans, 2010). We find that firms headed by military CEOs have better information transparency. In addition, using stock return volatility and earnings volatility as measures of performance volatility, we indeed find that military CEOs reduce performance volatility.

In the second set of analyses, we consider how the relation between military CEOs and stock liquidity varies with the public's trust in the military. We argue that if military-induced trust is a possible mechanism through which CEO military experience affects stock liquidity, this effect should be more (less) pronounced during periods with greater (less) trust in the military. We perform three different tests. First, we examine how CEOs' military experience shapes corporate social capital, an essential prerequisite to promoting trust between a firm and its stakeholders, as Lins et al. (2017) suggest. Our results show that firms led by military CEOs have higher levels of social capital compared to those run by non-military CEOs, suggesting that executives' military experience contributes to promoting trust among corporate stakeholders.

Second, we use the incidence at Lackland Air Force Base in Texas, one of the worst sexual misconduct assault scandals in the U.S. military in the past 20 years, as an exogenous shock to trust in the military. Consistent with our main argument, we find that the relation between military CEOs and stock liquidity is weaker during the period when sexual misconduct allegations came to light and military trials took place. In addition, using terrorist attacks as an exogenous shock that increases public military awareness, we find that the impact of executives' military experience on liquidity costs is more pronounced during periods with a higher number of terrorist attacks, and hence, greater public awareness of the military.

Third, we follow Da et al. (2011) and construct a measure of investors' trust in the military using Google search queries for the phrase "trust in the military". We find that the positive association between CEOs' military experience and stock liquidity is most prevalent during the period of high trust in the military.

In the final set of analyses, we examine the implications of higher stock liquidity for firms with military CEOs. Higher stock liquidity can be associated with higher informational efficiency of stock prices (Chordia et al., 2001, 2008), lower costs of capital (Diamond and Verrecchia, 1991; Leuz and Verrecchia, 2000), and lower default risk (Brogaard et al., 2017). We, therefore, examine the effect of military CEOs on these market quality measures and corporate outcomes. We document evidence that firms headed by military CEOs are associated with higher informational efficiency, lower costs of capital, and lower default risk.

Our study makes several contributions to the literature. First, we contribute to understanding the implications of trust in financial markets. Prior studies show trust plays an important role in explaining stock market participation (e.g., Georgarakos and Pasini, 2011; Guiso et al., 2008; Gurun et al., 2018). Choi and Robertson (2020) provide survey evidence that trust in market participants (e.g., companies, managers, brokers) is an important factor that individual investors consider when making investment decisions in equity markets.[5] We complement these studies by showing that the trust-building attributes of CEOs, such as military experience, are important in determining liquidity in secondary

[4] From a theoretical standpoint, the effect of military CEOs on stock liquidity remains unclear. On the one hand, Malmendier et al. (2011) suggest that CEOs with military experience choose aggressive corporate policies. On the other hand, more recent evidence suggests that ex-military CEOs are more likely to make ethical decisions and less likely to engage in corporate fraudulent activities, corporate tax avoidance, and other misconduct behavior (e.g., Benmelech and Frydman, 2015; Koch-Bayram and Wernicke 2018; Law and Mills, 2017). Furthermore, Cronqvist et al. (2012) and Cain and McKeon (2016) find a weak explanatory power of military experience for several corporate outcomes such as capital structure or acquisition actions, implying military experience of the CEOs may not have any material effect on their firms' liquidity costs. Taken together, the countervailing perspectives from the prior literature suggest that whether, and to what extent, executives' military experience affects stock market liquidity is an empirical question.

[5] Other studies on the role of trust in financial markets suggest that trust also plays important roles in debt contracting (e.g., Hasan et al., 2017; Hagendorff et al., 2022), credit risk assessment (Pham et al., 2023), or innovative activities (e.g., Xie et al., 2022).

equity markets.

Second, we contribute to the literature on the implications of CEOs' early life experiences for corporate outcomes. Prior work in this area demonstrates the importance of CEOs' early life experience in explaining corporate investments and financial and organizational practices (e.g., Benmelech and Frydman, 2015; Bernile et al., 2017; Malmendier et al., 2011). We extend the literature by focusing on the secondary market and show that CEOs' military experience has a positive effect on the liquidity of the underlying stock and other key aspects of financial markets (market efficiency or market reactions to corporate announcements) or corporate outcomes (default risk and financing costs) through its impact on stock liquidity. Our findings are important since stock liquidity is essential for the efficient operation of equity markets (Chordia et al., 2008; Sadka and Scherbina, 2007), firm value (Fang et al., 2009), and economic growth (Acemoglu and Zilibotti, 1999).

Furthermore, as liquidity serves as the blood flow of financial markets (Ranaldo, 2022), understanding the determinants of stock liquidity is important both from an economic and an investment perspective. While prior studies mainly focus on firm characteristics and macroeconomic factors as determinants of stock liquidity, we contribute to a growing body of research suggesting that corporate managers matter for their firms' liquidity costs.[6] We add to the literature by showing that executives' early career experience, such as military training, plays a significant role, incremental to firm-specific attributes, in explaining the liquidity costs of the firms that they manage.

The remainder of the paper is organized as follows. We develop a hypothesis in Section 2 and discuss the data and sample selection in Section 3. Sections 4 and 5 describe the main results and underlying economic channels, respectively. Section 6 discusses further analyses and Section 7 concludes the paper.

2. Hypothesis development

Our study is motivated by several theoretical frameworks. First, the upper echelon theory (e.g., Hambrick and Mason, 1984; Hambrick, 2007) suggests that corporate managers' cognitive frames are shaped by their backgrounds and experiences. Consequently, the experiences and personal attributes of executives play a substantial role in shaping managerial choices and corporate results (Hambrick, 2007). We, therefore, argue that the corporate information environment is influenced by their managers' backgrounds and experience.

Second, military service is a significant turning point in life that leaves a lasting imprint on the lives of those who serve (Elder, 1986; Elder et al., 1991). Behavioral science literature suggests that military services instill values such as honesty, duty, honor, and integrity, and these experiences tend to translate to a strong sense of ethics among service personnel in their later civilian employment (Duffy, 2006; Elder et al., 1991). The behavioral consistency theory (e.g., Epstein, 1979; Funder and Colvin, 1991; McAdams, 1995) suggests that individuals tend to maintain a level of consistency in their beliefs and behavior over time.

Armed with the upper echelon and behavioral consistency theories, we argue that executives' military experience, which fosters integrity and ethical behavior, can influence the information environment of the firms they manage. Since investors tend to value managers' creditworthiness when making investment decisions (Gibson et al., 2021; Gurun et al., 2018; Pham, 2020), we argue that executives' military training matters for investors' trading decisions, and hence, the liquidity costs of a firm's stock. Our first and sole hypothesis is, therefore, as follows:

Hypothesis. *Firms led by military CEOs are associated with higher stock market liquidity.*

3. Data and variables

3.1. Sample selection

We obtain stock price, stock return, and trading volume data from the Center for Research in Security Prices (CRSP). We further gather firm-specific accounting data from Compustat. We source data for the number of analysts following firms from the Institutional Brokers' Estimate System (I/B/E/S) database and institutional ownership data from the Thomson Reuters Institutional Holdings (13 F) database. We obtain earnings announcement data from Compustat and board quality data from the RiskMetrics database. We source firm-level ESG information from the MSCI/KLD database. We exclude stocks with a share price of less than $5 at the end of the year, to mitigate the impact of micro caps (Chung et al., 2010; Fang et al. 2009; Kale and Loon, 2011). We winsorize all continuous variables at the 1st and 99th percentiles to mitigate the effects of outliers. Our final sample consists of 14,192 firm-year observations spanning 1993–2013. Our sample starts in 1993 because ExecuComp data are only available from 1992 and we lag all independent variables by one year relative to the liquidity measures to avoid potential reverse causality issues. Our sample ends in 2013 due to the availability of our manually collected data on CEO characteristics. In addition, Bao et al. (2018) and Bessembinder et al. (2018) document significant changes in liquidity costs after the adoption of the Dood-Frank Act and the Volcker Rule.[7] The Volcker Rule became effective in 2014. Our sample, therefore, ends in 2013 to ensure the consistency and comparability of the liquidity measures. Appendix A1 provides a detailed description of the variables.

3.2. Measures of stock liquidity

We employ two measures of stock liquidity for our analysis. The first measure is Amihud's (2002) illiquidity measure, which captures price changes per unit dollar of volume. The Amihud's ratio is one of the best measures for capturing price impacts (Goyenko et al., 2009). The Amihud's price impact ratio is defined as

$$Amihud'sratio_{i,\ y} = \ T_y^{-1}\sum\frac{|r_{i,t,y}|}{vol_{i,t,y}}, \tag{1}$$

where r is the return, vol is the dollar volume of stock i on day t in year y, and T is the number of trading days in year y. We multiply the value by 10^5 for practical application. A higher Amihud ratio indicates more illiquidity. Since the raw Amihud measure is highly skewed, we follow Edmans et al. (2013) and Fang et al. (2009) and take the natural logarithm of Amihud's price impact ratio for normalization. To avoid confusion, we follow the literature (e.g., Edmans et al. 2013; Pham, 2020) and multiply it by −1 (denoted as *LIQ_AMIHUD*) such that higher values of *LIQ_AMIHUD* indicate higher levels of liquidity.

Our second measure of liquidity is based on the bid-ask spread. We follow the method of Corwin and Schultz (2012) to estimate daily

[6] The literature on stock liquidity is threefold. The first strand of this literature attempts to construct, validate, and run horseraces of liquidity measures to test which liquidity measures best capture liquidity (Goyenko et al. 2009; Fong et al. 2017). The second strand of the literature investigates the economic consequences of stock liquidity (e.g., Levine and Zervos, 1998; Fang et al. 2009; 2014; Brogaard et al. 2017; Chang et al. 2017; Zhao et al., 2024; Nguyen and Nguyen, 2024). The third strand of the literature focuses on the determinants of stock liquidity and document several factors that relate to stock liquidity, including firm-specific characteristics (Attig et al. 2006; Chung et al. 2010), macroeconomic factors (Næs et al. 2011; Marshall et al. 2018; Nagar et al. 2019). Recent studies suggest that corporate management such as the centrality in managers' network and educational background also matters for liquidity costs (e.g., Egginton and McCumber, 2019; Pham, 2020).

[7] The Volcker Rule is a part of the Dodd-Frank Act which is intended to limit bank risk-taking by restricting prohibiting certain speculative activities (Adrian et al., 2017; Bessembinder et al., 2018).

bid-ask spreads for each stock as follows:[8]

$$CSPREAD = \frac{2(e^{\alpha}-1)}{1+e^{\alpha}}, \quad (2)$$

where:

$$\alpha = \frac{\sqrt{2\beta}-\sqrt{\beta}}{3-2\sqrt{2}} - \sqrt{\frac{\gamma}{3-2\sqrt{2}}}, \beta = \sum_{j=0}^{1}\left[\ln\left(\frac{H^{O}_{t+j}}{L^{O}_{t+j}}\right)\right]^{2}, \gamma = \left[\ln\left(\frac{H^{O}_{t,t+1}}{L^{O}_{t,t+1}}\right)\right]^{2},$$

with $H^{O}_{t,t+1}$ $(L^{O}_{t,t+1})$ as the high(low) price over days t and $t+1$.

We estimate the daily bid-ask spreads for all U.S.-based common stocks trading on the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX), and NASDAQ. We then compute the annual quoted spread for each stock, based on the average daily quoted spread over a year (*CSPREAD),* and take the natural logarithm of *CSPREAD* for normalization. By construction, the higher the bid-ask spread, the higher level of illiquidity. Therefore, we multiply CSSPREAD by −1 for easier interpretation. We denote our second measure of liquidity as (*LIQ_CSPREAD*), which is the inverse of the natural logarithm of *CSPREAD*.[9]

3.3. Measure of military CEOs

We obtain a full list of Standard & Poor's (S&P) 1500 firms and their CEOs from ExecuComp and hand-collect information on executives' military backgrounds from Marquis Who's Who.[10] We classify a manager as having military experience (*MILITARY*) if Marquis Who's Who indicates the manager has undergone military service in the U.S. Air Force, Army, Marines, or Navy or has other related military experience (i.e., Coast Guard and military reserve forces). Since Marquis Who's Who explicitly asks for information on military background, this source of data minimizes measurement error in our main variable of interest.

Furthermore, we hand-collect information on the CEOs' educational qualifications, country of birth, gender, year of birth, and other known CEO characteristics from the Marquis Who's Who and BoardEx databases. We use other databases, including the Notable Names Database, the Reference for Business, Bloomberg.com, Wikipedia, and Google searches, to cross-check the CEO information obtained from Marquis Who's Who and BoardEx. We then construct several CEO characteristics, including their educational backgrounds (e.g., whether they hold an MBA degree, or whether they graduate from Ivy League universities), age, gender, and tenure.

3.4. Firm-level control variables

We include several control variables that could influence a firm's stock liquidity, as suggested by the literature. Specifically, we control for firm size, measured as the natural logarithm of assets (*LOGASSET*), since it is associated with the degree of public information available about a stock (Chae, 2005; Harris, 1994). We include asset tangibility (*TANG*), research and development intensity (*R&D*), advertising expenditures (*ADVERTISING*), firm age (*FIRM_AGE*), and analyst coverage (*LOGANALYST)* because these variables are related to information asymmetry problems (Balakrishnan et al., 2014; Chung et al., 2010; Grullon et al., 2004; Kale and Loon, 2011). We also include institutional ownership (*INSTOWN*), since the presence of institutional investors can affect stock liquidity due to their roles in reducing information asymmetry (Attig et al., 2006; Cao and Petrasek, 2014; Szewczyk et al., 1992).

Prior research suggests that stock characteristics can capture a considerable proportion of variations in spreads (Chordia et al. 2001; Chung et al. 2010; Kale and Loon, 2011; Harris, 1994). We, therefore, control for the inverse of the stock price (*PRICE_INVERSE*) and return volatility (*RETVOL)* in our regressions. We also follow Fang et al. (2009), Ng (2011), and Kale and Loon (2011) and control for the debt ratio (*LEVERAGE*), share turnover (*TURNOVER*), and cumulative returns (*CUMRET*) and include a dummy variable (*SP500*) that indicates inclusion in the S&P 500 as our final control variable. We further control for firm-fixed effects to account for possible time-invariant firm-specific omitted variables.

3.5. Descriptive statistics

Table 1 presents the descriptive statistics for the variables used in this paper. We find that the CEOs with military experience in our sample account for 8.1 % of the total firm-year observations. About 21 % of the CEOs in our sample get an MBA and 17.9 % attend Ivy League universities. There is a small proportion of the CEOs (less than 5 %) were female or born overseas (outside of the US). A typical CEO in our sample is a 57-year-old male with a tenure of seven years. Our CEO samples are comparable with those in Benmelech and Frydman (2015), Cronqvist et al. (2012), Custódio and Metzger (2014), Duffy (2006), Law and Mills (2017), and Pan et al. (2018).

We also find that the statistics of our firm characteristic variables are consistent with previous studies (e.g., Atawnah et al. 2018; Brockman et al., 2009; Chung et al. 2010; Kale and Loon, 2011). A typical firm in our sample has a logarithm of firm size of 7.533 and a debt ratio of 17.8 %. Tangible assets, R&D, and advertising expenses account for 46.6 %; 2.5 %, and 1.4 % of total assets, respectively, and are owned mainly by institutional investors (67.9 %).

Panel B of Table 1 presents the univariate analyses for subsamples of firms led by military and non-military CEOs. We find that compared to non-military CEOs, military CEOs are more likely to have an Ivy League education, hold an MBA, and have longer tenures. The results from the univariate analysis also suggest that firms led by military CEOs tend to have higher stock liquidity or lower liquidity costs. In the following section, we will explore this relation using a regression framework that incorporates additional control variables and fixed effects.

4. Empirical results

4.1. Baseline regression

We provide the results of our baseline regressions in Table 2. We report results for different model specifications and liquidity measures (*LIQ_AMIHUD* and *LIQ_CSPREAD)*. In all the regression models, we control for year fixed effects and industry fixed effects to control for time- and industry-invariant factors, respectively, that could be associated with stock liquidity. Appendix A2 reports the distribution of CEOs with military experience across the industries in. As the proportion of military CEOs varies across different industries, the adoption of industry fixed effect is appropriate to partly address the endogeneity issues. We also adopt firm-fixed effects to account for possible time-invariant firm-specific omitted variables. Consistent with corporate information literature, all independent variables are lagged by one year relative to the liquidity measures to avoid potential reverse causality issues.

Table 2 shows that the coefficient estimates for the *MILITARY* variable is consistently positive and statistically significant in all model specifications. These results suggest that in general stocks of firms

[8] As Corwin and Schultz (2012) note, bid–ask spreads constructed from daily high and low prices generally outperform other low-frequency measures.

[9] We also consider several alternative measures of stock liquidity as part of the sensitivity analysis in Section 6 and Table 9. We find that our results are robust to the choice of liquidity measures.

[10] Marquis Who's Who provides comprehensive biographical data for leaders and achieves all over the world. Several other studies (e.g., Bamber et al. 2010; Benmelech and Frydman, 2015; Bernile et al. 2017; Cronqvist and Yu, 2018; Schoar and Zuo, 2017) have obtained the biographical information from Marquis Who's Who to construct their main variables.

Table 1
Descriptive statistics.

Variable	Mean	Std. Dev.	25th Pct	50th Pct	75th Pct
Liquidity measures					
LIQ_AMIHUD	6.518	0.633	6.459	6.780	6.874
LIQ_CSPREAD	4.895	0.458	4.582	4.911	5.227
CEO characteristics					
MILITARY	0.081	0.273	0.000	0.000	0.000
MBA	0.213	0.409	0.000	0.000	0.000
IVY_EDUC	0.179	0.383	0.000	0.000	0.000
FIN_EDUC	0.224	0.417	0.000	0.000	0.000
FOREIGN_CEO	0.047	0.216	0.000	0.000	0.000
FEMALE_CEO	0.025	0.156	0.000	0.000	0.000
AGE	57.284	7.998	52.000	57.000	62.000
LOGTENURE	1.987	0.885	1.386	2.079	2.565
Firm characteristics					
LOGASSET	7.533	1.715	6.279	7.347	8.652
TANG	0.466	0.152	0.377	0.477	0.556
LEVERAGE	0.178	0.159	0.029	0.158	0.281
PRICE_INV	0.044	0.040	0.023	0.033	0.051
INSTOWN	0.679	0.209	0.547	0.705	0.839
LOGANALYST	1.871	0.762	1.386	1.946	2.442
RETVOL	0.025	0.012	0.017	0.023	0.031
FIRM_AGE	2.870	0.875	2.398	3.045	3.584
R&D	0.025	0.051	0.000	0.000	0.027
ADVERTISING	0.014	0.040	0.000	0.000	0.008
CUMRET	0.096	0.441	−0.164	0.024	0.25
LOGTURNOVER	−5.077	0.827	−5.619	−5.034	−4.518
SP500	0.829	0.376	1.000	1.000	1.000

Panel A of the table reports the descriptive statistics of variables for the full sample while Panel B reports the values for two subsamples of firms led by military CEO and non-military CEOs. Appendix A1 reports the variable description.

Panel B: Military CEOs vs. Non-military CEOs

	Military CEO	Non-military CEO	Difference in means
Liquidity measures			
LIQ_CSPREAD	5.043	4.881	0.163***
LIQ_AMIHUD	6.616	6.226	0.390***
Other characteristics			
MBA	0.325	0.209	0.116***
IVY_EDUC	0.335	0.168	0.167***
FIN_EDUC	0.230	0.228	0.002
FOREIGN_CEO	0.048	0.049	−0.001
FEMALE	0.000	0.028	−0.028***
LOGAGE	4.325	4.188	0.137
LOGTENURE	2.126	1.522	0.604***
LOGASSET	7.606	7.582	0.023
TANG	0.449	0.465	−0.016***
LEVERAGE	0.194	0.174	0.020
PRICE_INV	0.038	0.043	−0.005***
INSTOWN	0.649	0.693	−0.045***
LOGANALYST	1.784	1.902	−0.118***
RETVOL	0.022	0.026	−0.004***
FIRM_AGE	3.024	2.878	0.146***
R&D	0.012	0.025	−0.013***
ADVERTISING	0.018	0.013	0.004***
CUMRET	0.055	0.100	−0.045***
LOGTURNOVER	−5.423	−5.004	−0.419***
SP500	0.848	0.827	0.020*

managed by military CEOs are more liquid. In terms of economic significance, Column (6) of Table 2 suggests that the average annual bid-ask spread of firms with military CEOs is about 7.4 % lower than that of firms without military CEOs, which is which is economically significant.[11]

Consistent with prior studies on stock liquidity (e.g., Atawnah et al. 2018; Attig et al. 2006; Chung et al. 2010; Kale and Loon, 2011), we find that firms of larger size, lower leverage, less volatile returns, higher stock prices, higher cumulative returns, and share turnover, in general, have higher stock liquidity. In addition, stocks of firms followed by more analysts and have higher portions of shares owned by institutional investors are also more liquid.[12]

4.2. Addressing potential endogeneity concerns

Although we have documented a robust and significant relation between CEO military experience and stock liquidity, our results could be subject to an omitted variable issue. For example, certain firm characteristics can simultaneously influence the criteria that firms use in selecting a military CEO and the liquidity of a firm's shares. We attempt to address this issue with the use of several firm-level controls and fixed effects in our baseline regressions, however, there could be unobservable factors that are omitted in our analysis. Therefore, we consider several identification strategies to mitigate this issue such as CEO turnover analysis, propensity score matching procedure, and instrument variable approach. We also provide alternative explanations that could drive our results.

4.2.1. CEO turnover test

To mitigate concerns that omitted variables are driving our results, we examine how the changes in military CEO status as a result of CEO turnover events are associated with changes in stock liquidity. Specifically, to identify cases of significant change in CEO military background, we use the dummy variable *CEO_CHANGE*, which takes a value of one if the change is from a non-military CEO to a military CEO or from a military CEO to a non-military CEO, and zero otherwise. Firm-year observations for which *CEO_CHANGE* equals one are considered treatment firms. Each firm-year observation in the treatment group is matched with a firm-year observation in the control group (*CEO_CHANGE* = 0), using the nearest-neighbor propensity score matching procedure. The matched pair is obtained in the year before the CEO turnover takes place and is based on control variables as in the baseline model in Table 2 and the industry. We use the dummy variable *POST*, which takes the value of one if the observation is in the three-year period after the turnover, and zero otherwise. To avoid potential noise from other corporate events, we only consider the period from three years before to three years after the turnover. We use the interaction term *CEO_CHANGE*×*POST*, which is the interaction between the two dummy variables, *CEO_CHANGE* and *POST*, to capture the difference-in-difference effect of CEO military experience on stock liquidity. We rerun our baseline regression with the addition of the interaction term *CEO_CHANGE* × *POST*. In our sample, 22 cases involve changes from non-military CEOs to military CEOs and 73 cases involve military CEOs replaced by non-military CEOs.[13]

We report the CEO turnover analysis in Table 3. Results from Table 3 suggest that the coefficients on the variable of interest, *CEO_CHANGE*×*POST*, are significantly positive for cases involving a change from a non-military CEO to a military CEO (columns (1) and (3)) and significantly negative for cases where a military CEO is replaced by a non-military CEO (columns (2) and (4)). The turnover results indicate that the appointment of a CEO with military training increases firm liquidity

[11] The economic impact of military CEO on stock liquidity is favorably comparable to other determinants of stock liquidity as discussed in the literature (e.g., Kale and Loon, 2011; Chung et al. 2010).

[12] We supplement the baseline regression results from Table 2 with a myriad of robustness tests which we report in Section 6. Overall, we find our results to be robust to alternative model specifications, measures of stock liquidity, and sample selections.

[13] Benmelech and Frydman (2015) find that the percentage of CEOs with military experience reduces from 59 % in 1980 to 6 % in 2006. Our study extends Benmelech and Frydman's sample to 2013, which allows us to observe more incidences of changes in the military background of firms, and hence, facilitates our CEO turnover analyses.

Table 2
Regressions of military CEOs on stock liquidity.

	LIQ_AMIHUD			*LIQ_CSPREAD*		
	(1)	(2)	(3)	(4)	(5)	(6)
MILITARY	0.198***	0.056***	0.114***	0.142***	0.067***	0.074***
	(3.70)	(2.61)	(4.94)	(12.48)	(7.27)	(6.08)
LOGASSET		0.853***	0.647***		0.039***	0.027***
		(109.82)	(39.38)		(15.40)	(4.06)
TANG		0.516***	0.522***		−0.039*	−0.011
		(8.36)	(6.96)		(−1.83)	(−0.35)
LEVERAGE		−0.871***	−0.963***		0.045**	0.017
		(−14.43)	(−15.16)		(2.26)	(0.65)
PRICE_INVERSE		−8.041***	−9.012***		−1.777***	−1.546***
		(−26.09)	(−25.99)		(−19.85)	(−13.72)
INSTOWN		−0.111**	0.261***		0.046***	−0.007
		(−2.28)	(4.18)		(2.67)	(−0.26)
LOGANALYST		0.413***	0.212***		0.020***	0.018***
		(29.90)	(15.78)		(4.32)	(2.80)
RETVOL		−20.984***	−11.490***		−16.312***	−13.051***
		(−19.56)	(−11.95)		(−42.45)	(−32.08)
FIRM_AGE		0.009	0.214***		0.007*	0.019
		(0.75)	(8.31)		(1.76)	(1.63)
R&D		2.431***	1.390***		−0.081	0.035
		(9.45)	(3.45)		(−0.94)	(0.24)
ADVERTISING		1.217***	−0.597**		0.000	−0.353***
		(5.10)	(−2.21)		(0.00)	(−2.69)
CUMRET		0.568***	0.476***		0.014**	0.006
		(34.77)	(36.14)		(2.55)	(1.07)
LOGTUNRNOVER		0.579***	0.446***		−0.070***	−0.089***
		(36.58)	(26.53)		(−12.52)	(−12.79)
SP500		0.024	0.047**		−0.017**	−0.017*
		(1.13)	(2.09)		(−2.15)	(−1.70)
MBA		−0.030*	−0.034*		0.005	0.005
		(−1.94)	(−1.92)		(0.78)	(0.54)
IVEY_EDUC		0.014	0.040**		0.023***	0.024**
		(0.82)	(2.09)		(3.32)	(2.53)
FIN_EDUC		0.034**	−0.033*		−0.016**	−0.028***
		(2.18)	(−1.77)		(−2.76)	(−3.22)
FEMALE_CEO		−0.061*	−0.061*		−0.009	−0.016
		(−1.76)	(−1.68)		(−0.71)	(−0.98)
FOREIGN_CEO		0.152***	0.088***		0.002	0.018
		(5.58)	(2.64)		(0.17)	(0.96)
LOGAGE		0.001	0.030		0.000	−0.025
		(0.04)	(0.71)		(0.03)	(−1.25)
LOGTENURE		0.003	0.024***		0.001	0.002
		(0.58)	(3.83)		(0.40)	(0.61)
Industry fixed effects	Yes	Yes	No	Yes	Yes	No
Firm fixed effects	No	No	Yes	No	No	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,534	13,534	13,534	13,534	13,534	13,534
Adjusted R-squared	0.429	0.907	0.945	0.491	0.709	0.752

This table presents results for the relation between stock liquidity and military CEOs. The dependent variables are stock liquidity measures. For all liquidity measures, we take the natural logarithm of these measures and multiply them by minus one so that higher values indicate higher levels of liquidity. The main independent variable is an indicator (*MILITARY*) indicating if the CEO has military experience and zero otherwise. *t*-statistics (in parentheses) are computed using standard errors robust to heteroscedasticity. *, **, and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively. Appendix A1 reports the variable description.

and decreases liquidity costs, whereas the opposite is true following the appointment of a CEO without military experience. Thus, the results reported in Table 3 further support our prediction that military CEOs lead to improvements in stock liquidity.[14]

Furthermore, we validate the parallel trends assumption for the efficacy of the difference-in-difference approach by employing a dynamic difference-in-difference regression framework.[15] Specifically, we first create a set of time indicator variables: PRE^{-2} and PRE^{-1} are indicator variables that indicate two years before and one year before the CEO change, respectively. *POST* is an indicator indicating one or more years after the CEO change. We then replace the indicator variable in Table 3 with the list of these three indicator variables and generate three interaction terms (i.e., $CEO\_CHANGE \times PRE^{-2}$, $CEO\_CHANGE \times PRE^{-1}$, and $CEO\_CHANGE \times POST$).

4.2.2. Propensity score matching

We continue our identification strategy with the use of propensity score matching. We argue that if there exists a positive relation between the military experience of the CEOs and stock liquidity, we should observe a higher stock liquidity for firms led by military CEOs compared to that of comparable firms led by non-military CEOs firms. In order to test for that conjecture, we first estimate the propensity scores for having a military CEO using a logit regression that includes the same set of control variables as in the baseline regressions. We then match (without replacement) the treatment group (firms managed by military CEOs) and the control group (firms led by non-military CEOs) using nearest-neighbor matching within a caliper of 0.01. We report the differences in liquidity measures between the treatment and control groups in Panel A of Table 4. The univariate results from our propensity score matching

[14] The interpretation and implication from in Table 3 should be taken with cautious as our sample size for the turnover test is rather small.
[15] We thank the Associate Editor for suggesting this test.

Table 3
CEO turnover analysis.

	Dependent Variable: Stock Liquidity			
	LIQ_AMIHUD		*LIQ_CSPREAD*	
	From non-military to military CEO (1)	From military to non-military CEO (2)	From non-military to military CEO (3)	From military to non-military CEO (4)
CEO_CHANGE × *POST*	0.224**	−0.072**	0.100**	−0.039**
	(2.40)	(−1.99)	(1.99)	(−2.09)
POST	0.115	0.107	−0.057	0.066
	(0.79)	(1.15)	(−1.07)	(0.57)
CEO_CHANGE	0.199	0.116	0.081	0.043
	(1.45)	(0.33)	(1.51)	(0.29)
Controls as in baseline	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Adjusted R-squared	0.952	0.929	0.615	0.482
Observations	246	856	246	856

This table reports regression result for the difference-in-difference analysis. *CEO_CHANGE* is a dummy variable that equals one if the new CEO is from a non-military CEO to military CEO (Columns 1 and 3) and from a military CEO to a non-military CEO (Columns 2 and 4), and zero otherwise. Firm-year observations with *CEO_CHANGE* equals one are considered treated firms. Each firm-year observation in the treatment group is matched with a firm-year observation in the control group (*CEO_CHANGE* equals zero) using the nearest-neighbor propensity score matching procedure. The matched pair is obtained in the year before the CEO turnover takes place and is based on control variables as in the baseline model (Table 2) and industry. *POST* is a dummy variable that equals one if the year observation is in the three-year period after and zero in the three-year period before the turnover. Other firm characteristics variables are similar to those in the baseline regressions in Table 2. Constant term, year-fixed effects, and firm-fixed effects are included in all models. *t*-statistics (in parentheses) are computed using standard errors robust to heteroscedasticity. *, ** and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

procedure show that firms headed by military CEOs have significantly higher stock liquidity than the matched-sample of non-military firms, consistent with our prediction.[16]

We take a more conservative step by rerunning the baseline regression using the sample of treatment and their matched control firms. This setting allows us to control for various firm-level characteristics and, at the same time, account for time-invariant and industry-specific omitted variables. We report our regression estimates in Panel B of Table 4 and find that coefficients for *MILITARY* are consistent with those reported in the baseline analysis in terms of sign, significance level, and magnitude. Overall, the results from Table 4 show that the relation between military CEOs and stock liquidity is not fully explained by the heterogeneity between firms of military and non-military CEOs.

4.2.3. Instrumental variable estimation

To further account for the possibility that our regression estimates could be biased by unobserved personal traits and firm characteristics that are correlated with both military service and CEO decisions, we use an instrumental variable (IV) approach. Following Bedard and Deschênes (2006) and Benmelech and Frydman (2015), we use the CEO's birth year as an instrument for military experience, because the probability of being drafted is often associated with wartime. For example, during World War II, men born between 1914 and 1919 were

Table 4
Propensity score matching.

Panel A: Treatment and control groups comparison		
	LIQ_AMIHUD (1)	*LIQ_CSPREAD* (2)
Treatment - Control	0.249***	0.072***
No. matched pairs	1153	1153
Panel B: Regression results		
	LIQ_AMIHUD (1)	*LIQ_CSPREAD* (2)
MILITARY	0.0856***	0.0685***
	(3.01)	(5.45)
LOGASSET	0.9069***	0.0163**
	(46.23)	(2.04)
TANG	0.6861***	−0.0317
	(3.63)	(−0.42)
LEVERAGE	−1.2108***	0.0252
	(−7.81)	(0.40)
PRICE_INVERSE	−10.3954***	−2.2476***
	(−10.92)	(−6.10)
INSTOWN	−0.1012	0.1312**
	(−0.80)	(2.38)
LOGANALYST	0.4279***	0.0133
	(12.31)	(1.09)
RETVOL	−17.4355***	−18.4304***
	(−4.93)	(−11.68)
FIRM_AGE	−0.0185	0.0152
	(−0.63)	(1.12)
R&D	4.5400***	−0.8620**
	(5.14)	(−2.21)
ADVERTISING	−0.2480	0.1085
	(−0.44)	(0.43)
CUMRET	0.4873***	0.0407**
	(11.08)	(2.33)
LOGTUNRNOVER	0.3633***	−0.1267***
	(7.73)	(−6.71)
SP500	0.0236	−0.0175
	(0.41)	(−0.63)
MBA	0.0053	0.0069
	(0.14)	(0.39)
IVEY_EDUC	−0.0467	−0.0020
	(−1.11)	(−0.10)
FIN_EDUC	−0.0120	−0.0174
	(−0.29)	(−0.92)
FEMALE_CEO	−0.0392	0.0308
	(−0.36)	(0.70)
FOREIGN_CEO	−0.1324*	−0.0609*
	(−1.90)	(−1.77)
LOGAGE	0.0795	−0.0021
	(0.95)	(−0.06)
LOGTENURE	0.0319*	0.0099
	(1.92)	(1.34)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	2306	2306
Adjusted R-squared	0.919	0.650

The table reports the average treatment effects on liquidity measures obtained from the propensity score matching (Panel A), and the regression estimates of the baseline model on the matched sample (Panel B). We first obtain the propensity score using a logit regression, with all control variables as specified in the baseline model. We then perform nearest-neighbor matching within a caliper of 0.001 without replacement and report the differences in liquidity measures between the treatment and control group in Panel A. *t*-statistics (in parentheses) are computed using standard errors robust to heteroscedasticity. *, ** and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively. Appendix A1 reports the variable description.

eligible. The CEO's birth year is, therefore, more likely to be correlated with CEO military experience. In addition, it is less likely that the CEO's birth year influences investor decisions several years after the CEO was born. We, therefore, conjecture that choosing the CEO birth year as our instrument meets the relevance and exclusion conditions for an identification test (Roberts and Whited 2013). We perform a two-stage least squares (2SLS hereafter) regression as follows:

[16] In Table A4 in the Online Appendix, we find no statistical difference between the characteristics of the treatment and control firms after the matching, which confirms the quality of the match.

$MILITARY_{i,t} = f(BIRTH\_YEAR_{i,t-1}, FIRMCTRL_{i,t-1}, CEOCTRL_{i,t-1}, Industry\ FEs, Year\ FEs)$, (3)

$LIQUIDITY_{i,t} = f(MILITARYi,t\text{-}1\ FIRMCTRL_{i,t-1}, CEOCTRL_{i,t-1}, Industry\ FEs, Year\ FEs)$, (4)

where equation (3) is the first-stage regression and equation (4) is the second-stage equation under our two-stage least squares regression framework, *BIRTH_YEAR* represents the CEO's year of birth, and $\overline{MILITARY}$ is the predicted probability of the CEO having a military background. Consistent with the previous sections, we employ the same set of control variables as in the baseline results. We use bootstrapped standard errors with 500 replications to correct for any potential correlation of residuals across firms and across time.

We present the results in Table 5. The first-stage regressions yield negative and significant coefficients for the IV (-0.003 with $t = -6.16$), consistent with the declining trend in the likelihood of military service. The F-statistics obtained from the first-stage regressions pass the Stock and Yogo (2005) weak identification tests at the 1 % level. In the second-stage regression, the coefficients for $\overline{MILITARY}$ are positive and significant across different liquidity measures, further confirming that firms led by CEOs with military experience have lower liquidity costs. As an alternative approach, we consider the birth cohort dummy variables as instruments.[17] We report the results of this test in Models (3) to (4). We obtain the coefficients 0.104 ($t = 3.12$) and 0.028 ($t = 3.26$) for $\overline{MILITARY}$ across different liquidity measures when the birth cohort dummy variables are used as IVs.

Furthermore, we consider the Korean War birth cohort as another instrumental variable, following the literature (e.g., Benmelech and Frydman, 2015; Koch-Bayram and Wernicke, 2018).[18] Specifically, we instrument for military service within this sample with an indicator for men born from 1931 to 1936, the cohorts that were more likely to get drafted during the Korean War. We report the results in Columns 5–6 in Table 5. The first stage results suggest that individuals born between 1931 and 1936 were more likely to serve in the military. In the second-stage regression, the coefficients for $\overline{MILITARY}$ are positive and statistically significant across different liquidity measures, further confirming that firms led by CEOs with military experience have lower liquidity costs. Overall, our results are consistent with those reported in the baseline results.

5. Possible channels

After establishing a positive relation between military CEOs and stock liquidity, we further examine the economic mechanisms underlying this relation. We argue that CEOs' military experience influences the liquidity of their firms' shares, because of its role in promoting investor trust. We support this argument with two separate types of analyses. First, we demonstrate how military CEOs are associated with firm policies and outcomes that foster investor trust and stock liquidity. Second, we consider how the general level of public trust in the military moderates the relation between military CEOs and stock liquidity. We present the results for these analyses in the following discussions.

5.1. Trust-building channel

We argue that executives' military training can foster investors' trust and hence promote their willingness to invest, leading to an improvement in stock liquidity from the demand-side point of view. This argument implies that the relation between military CEOs and stock liquidity can be more/less pronounced during periods with higher/lower levels of trust in the military. Trust has several dimensions and, hence, cannot be measured using a single metric. Therefore, we consider several approaches to capturing investor trust in the military.

First, we examine how CEOs' military experience shapes corporate social capital, a founding factor in promoting the trust that stakeholders have in firms (e.g., Lins et al. 2017; Hasan et al., 2017). We follow Lins et al. (2017) and use firm-level environmental, social, and governance (ESG) ratings to capture its social capital. Specifically, we source ESG information from the MSCI/KLD database, one of the leading ESG data providers. MSCI/KLD data rates companies using different ESG categories, including environment, employee relation, community, diversity, and human rights. For each category, we construct an ESG measure that is the net of strengths and concerns (Lins et al. 2017). Each ESG category can have a different number of strengths and concerns over time, therefore, we follow Servaes and Tamayo (2013) and scale the strengths (concerns) by the maximum number of strengths (concerns) of that category in a given year. The net ESG index per each category ranges from −1 to +1. We then sum them and construct the aggregate measure of firm-level ESG, denoted *ESG_SCORE*. The value of *ESG_SCORE*, ranging from −5 to +5, provides a comprehensive and conservative measure of firm-level ESG performance. Results for these tests, as shown in Panel A of Table 6, suggest that firms led by military CEOs are associated with higher levels of social capital compared to those run by non-military CEOs. These findings indicate that executives' military experience contributes to promoting trust among corporate stakeholders.

Second, we consider the Air Force sexual assault scandal as a natural experiment to examine the role of trust in the military in understanding a firm's liquidity costs. The sexual misconduct and assault at Lackland Air Force Base in Texas, with over 30 victims, is potentially the worst sexual scandal in the U.S. military in the past few decades.[19] This incidence allows us to test the causal relationship between trust in the military and stock liquidity since the scandal generated an exogenous shock to trust in the military. Allegations for the Lackland incidence came to light in late 2011 and the military trials took place during the period 2012 and 2013.[20] We, therefore, use the indicator *LACK_TRUST*, which equals one for the period from 2011 to 2013, and zero otherwise. We include an interaction term $MILITARY \times LACK\_TRUST$ in our baseline regressions and report the regression estimates in Panel B of Table 6. If military-induced trust is a possible mechanism through which CEOs' military experience influences the liquidity cost of their firm, we should observe a negative and statistically significant coefficient on the interaction terms. We find this to be the case.

Third, we use terrorist attacks as proxies for increased public military awareness and examine their implications for liquidity costs.[21] We source data for terrorist attacks from the Global Terrorism Database (https://www.start.umd.edu/gtd) and use an indicator, *MILITARY_AWARENESS* that equals one if the number of terrorist attacks in a given year is above the 70th percentile of the sample measure and zero otherwise. We rerun our baseline model with the inclusion of the interaction term between executives' military experience and the indicator for military awareness. We report the results in Panel C of Table 6. Using terrorist attacks as an exogenous shock that increases public military awareness, we find that the impact of executives' military experience on liquidity costs is more pronounced during periods with a

[17] We use birth cohort indicators indicating CEOs born before 1930, between 1931 and 1945, between 1946 and 1960, and after 1960.

[18] We thank the Associate Editor for suggesting this instrument.

[19] See, for example, https://www.nytimes.com/2013/02/27/us/former-air-force-recruit-speaks-out-about-rape-by-her-sergeant-at-lackland.html and https://www.washingtonpost.com/world/national-security/air-force-investigates-growing-sex-abuse-scandal/2012/06/28/gJQAutm39V_story.html (retrieved on February 20, 2024).

[20] Details are available at https://www.cbsnews.com/news/lackland-sex-scandal-prompts-us-air-force-to-discipline-former-commanders and https://www.theatlantic.com/national/archive/2012/06/31-female-victims-and-counting-air-force-sexual-assault-scandal/326434 (retrieved on February 20, 2024).

[21] We thank the referee for suggesting this test.

Table 5
Instrumental variable estimation.

	IV = Birth year		IV = Birth cohort dummies		IV = Korea draft cohort	
Second-stage regressions	Dependent variables = Liquidity measures					
	LIQ_AMIHUD	*LIQ_CSPREAD*	*LIQ_AMIHUD*	*LIQ_CSPREAD*	*LIQ_AMIHUD*	*LIQ_CSPREAD*
	(1)	(2)	(3)	(4)	(5)	(6)
MILITARY	0.061**	0.030**	0.104***	0.028***	0.215***	0.081***
	(1.98)	(2.25)	(3.12)	(3.26)	(3.12)	(2.64)
Controls as in baseline	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8811	8811	8811	8811	6473	6473
First-stage regressions	Dependent variables = Military experience					
Instrumental variable (IV)	−0.003***		-		0.046***	
	(−6.16)		-		(3.10)	
First-stage F-statistic	37.94***		33.13***		10.07***	

The table reports the results of the effect of military CEOs on stock liquidity using the two-stage least squares regression. The dependent variables are stock liquidity measures. The instruments for CEO military experience include the year of birth of the CEO and birth cohort dummy variables. *MILITARY* is an indicator variable for whether the CEO of the firm in the given year has any military experience. Year fixed effects and industry fixed effects are included in all models. Standard errors are bootstrapped with 500 replications. *, ** and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively. Appendix A1 reports the variable description.

higher number of terrorist attacks, and hence, greater public awareness of the military.

Forth, we follow Da et al. (2011) and use Google's search volume index to measure investor confidence in the military. Specifically, we collect monthly Google search queries for the term *trust in the military* and then aggregate the results as annual search interest (*SVI*).[22] Google *SVI* data are available from 2004, so our analysis covers the period from 2004 to 2013. We define low-trust (high-trust) periods as when the *SVI* in a given year is below the 30th (above the 70th) percentile of the sample measure. Consistent with the previous approach, we run sub-sample analysis for periods of high and low levels of trust in the military using the same regression model as in Table 2 and report the results in Panel D of Table 6. The results suggest that the positive relation between CEOs' military experience and stock liquidity exists only during periods of high trust in the military. Overall, the consistent findings from different approaches suggest a strong association between military-induced trust and stock market liquidity. Trust in corporate management is therefore a possible channel through which executives' military experience affects investor decisions and hence the liquidity of their firms' shares.

5.2. Information asymmetry channel

We examine the corporate disclosure policies of firms with military CEOs. Previous studies have established that liquidity costs are higher for firms with high information asymmetry (e.g., Healy and Palepu, 2001; Lang et al., 2012). Information environment measures, such as earnings management, also indicate the investors' trustworthiness in firms (Eugster and Wagner, 2021). We conjecture that CEOs' military experience can influence stock liquidity by improving information transparency of the firms that they manage.

To test for this possibility, we employ seven proxies for information asymmetry and construct an aggregate transparency measure based on all individual measures. First, financial reporting transparency can proxy for the information environment. Therefore, we follow Hutton et al. (2009) to construct the opacity in financial reporting. Specifically, we calculate absolute discretionary accruals and take their three-year moving sum and denote this value as *OPACITY*.

A higher degree of earnings management can lead to a poor information environment (e.g., Lang et al. 2012). We, therefore, follow Roychowdhury (2006) and Cohen and Zarowin (2010) and estimate the degree to which a firm engages in real activity–based earnings management (*EARNS_MGMT*). Higher values of *EARNS_MGMT* indicate lower levels of transparency.

Our third measure is earnings transparency. Barth et al. (2013) show that firms with more transparent earnings are associated with lower levels of information asymmetry. We construct an earnings transparency measure (*EARNS_TRANS*) following Barth et al. (2013), with a higher value of *EARNS_TRANS* indicating greater transparency.

Our fourth and fifth measures are related to the readability of a firm's financial disclosure. Markets react less completely to information that is less easily extracted from public resources (Li 2008), and companies with more readable financial disclosures provide more valuation-relevant information to their investors (Loughran and McDonald, 2014). To capture the readability of financial reports, we use the Bog index (*BOG_INDEX*) and the file size of firm 10-K disclosure (*FILE_SIZE*) (e.g., Loughran and McDonald, 2014; Bonsall et al., 2017)).[23] A lower value for *BOG_INDEX* or *FIZE_SIZE* indicates greater transparency.

We use the financial report comparability (*FSCOMPAT*) as proposed in De Franco et al. (2011) as our sixth proxy for information asymmetry. Higher comparability increases the quality and quantity of information about a firm and thus indicates a lower level of information asymmetry. In addition to mandatory disclosures captured in financial reports, we consider the voluntary disclosures of firms as a proxy for corporate disclosure policies. We use the number of voluntary disclosures (*VOL_DISCLOSE*) as our final measure of information asymmetry, with a higher value of *VOL_DISCLOSE* indicating greater transparency (e.g., Bourveau et al. 2018).

We then follow Anderson et al. (2009) and Lang et al. (2012) and construct a composite transparency index (*TRANS_INDEX*) based on seven common information asymmetry measures. Specifically, each year, we rank firms based on each of the seven information asymmetry variables into percentile ranks and then take the average of these ranks, according to the following equation:

$$TRANS\_INDEX = 1/7 \times [(-1) \times OPACITY \text{ Rank} + (-1) \times INV\_DISX \text{ Rank} + EARNS\_TRANS \text{ Rank} + (-1) \times BOG\_INDEX \text{ Rank} + (-1) \times FIZE\_SIZE \text{ Rank} + FSCOMPAT \text{ Rank} + VOL\_DISCLOSE \text{ Rank}]. \quad (5)$$

By construction, higher values of *TRANS_INDEX* denote more transparent firms and hence lower levels of information asymmetry. As Anderson et al. (2009) note, the composite index provides a robust measure of transparency, since it incorporates different measures and

[22] The search is limited to the U.S. only.

[23] We thank Brian Miller for making their data available at their websites (https://kelley.iu.edu/bpm/activities/bogindex.html and https://www3.nd.edu/~mcdonald/.

Table 6
Trust in military.

Panel A: Military CEOs and corporate social capital				
	ESG_SCORE		*ESG_SCORE*	
	(1)		(2)	
MILITARY	0.0511***		0.0279**	
	(2.88)		(1.98)	
Controls as in baseline	No		Yes	
Industry fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
Observations	10,469		10,469	
Adjusted R-squared	0.274		0.318	
Panel B: Military scandal as a natural experiment				
	LIQ_AMIHUD		*LIQ_CSPREAD*	
MILITARY	0.1257***		0.0794***	
	(5.37)		(6.34)	
MILITARY × *LACK_TRUST*	−0.1155**		−0.0565***	
	(−2.41)		(−2.61)	
Controls as in baseline	Yes		Yes	
Industry fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
Observations	13,534		13,534	
Adjusted R-squared	0.945		0.752	
Panel C: Terrorist Attacks as shocks to military awareness				
	LIQ_AMIHUD		*LIQ_CSPREAD*	
MILITARY	0.1230**		0.0481***	
	(2.34)		(4.05)	
MILITARY × *MILITARY_AWARENESS*	0.1451**		0.0206**	
	(2.05)		(2.00)	
Controls as in baseline	Yes		Yes	
Industry fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
Observations	13,534		13,534	
Adjusted R-squared	0.428		0.683	
Panel D: Trust in military				
	LIQ_AMIHUD		*LIQ_CSPREAD*	
	Low trust	High trust	Low trust	High trust
MILITARY	−0.016	0.077***	−0.001	0.076***
	(−0.26)	(2.96)	(−0.06)	(6.46)
Controls as in baseline	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	2604	7946	2604	7946
Adjusted R-squared	0.905	0.907	0.814	0.661

Panel A reports the regression estimates of CEOs' military experience on corporate ESG performance. The dependent variable is *ESG_SCORE*, an aggregate measure of firm-level ESG from the MSCI/KLD database. We follow Servaes and Tamayo (2013) to construct the ESG measure. In Panel B, we consider the Air Force sexual assault scandal as an exogenous shock to the trust in the military. *LACK_TRUST* is an indicator that equals one for the years 2011–2013 and zero otherwise. The dependent variables are stock liquidity measures. In Panel D, we use the number of terrorist attacks to capture public attention to military. *MILITARY_AWARENESS* is an indicator that equals one if the number of terrorist attacks in a given year is above the 70th percentile of the sample measure and zero otherwise. We source data for terrorist attacks from the Global Terrorism Database (https://www.start.umd.edu/gtd). In Panel D, we follow Da et al. (2011) and use Google's search volume index (SVI) to measure investors' trust in the military. We define low (high) trust periods if the *SVI* in a given year is below the 30th (above the 70th) percentile of the sample measure. Year fixed effects and industry fixed effects are included in all models. *t*-statistics (in parentheses) are computed using standard errors robust to heteroscedasticity. *, **, and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

thus diversifies away noise related to individual measures. We examine the effect of the CEO military experience on the firm information environment using the following regression framework:

$$TRANS_{i,t} = f(MILITARY_{i,t-1}, FIRMCTRL_{i,t-1}, Industry\ FEs, Year\ FEs), \quad (6)$$

where *TRANS* denotes our alternative measures of information asymmetry. Following the literature (e.g., Grullon et al. 2004; Attig et al. 2006; Fang et al. 2009; Chung et al. 2010; Kale and Loon, 2011), we control for several firm attributes that can affect information asymmetry problems, including firm size, asset tangibility, R&D intensity, the leverage ratio, the book-to-market ratio, firm age, advertising expenditures, a S&P 500 dummy, institutional ownership, and analyst coverage.

We report the results of these tests in Table 7. We find that CEOs with military training are significantly negatively related to financial reporting opacity (*OPACITY*) and earnings management (*EARNS_MGMT*), and positively associated with earnings transparency (*EARNTRANS*), financial statement readability (*BOG_INDEX* and *FILE_SIZE*), financial statement comparability (*FSCOMPAT*), and voluntary disclosure (*VOL_DISCLOSURE*). The composite transparency index based on all the individual measures is also positively related to military CEOs.[24] Overall, the results consistently suggest that CEO military experience improves information environment, leading to higher stock liquidity.

Implications of a more transparent information environment are less informed trading in firms with military CEOs. We follow Llorente et al. (2002) and construct a measure of informed trading based on the dynamic volume–return relation (*INFORMED_TRADE*). Table 7's Model (9) shows that the level of informed trading is indeed lower in firms led by military CEOs.

5.3. Cash flow and earnings volatility channel

In this section we explore firm risk as another mechanism through which CEOs' military experience affects the liquidity of their firms' shares. Prior studies show that the experience in the military can have an effect on CEOs' behavior and thereby reducing their risk tolerance in making corporate decisions such as investment policies and R&D expenditure (e.g., Bamber et al. 2010; Benmelech and Frydman, 2015). As a result of their conservative approach, we expect that firm managed by military CEOs have lower risk, such as lower volatility of cash flows and stock returns. Several studies document the role of cash flows and stock returns volatility in influencing stock price informativeness and stock liquidity (Peress, 2010; Kale and Loon, 2011). Taken together, we conjecture that firms managed by military CEO have better stock liquidity as their volatility of cash flows and stock returns are lower. Table 8

We examine the effect of CEO military experience on firms' information environment using three different measures of firm risk, including (*i*) stock return volatility (e.g., Brogaard et al. 2017), (*ii*) earnings volatility (e.g., Graham et al., 2008), and (*iii*) cash flow volatility (e.g., Chen *et al.* 2015). We run the following regression:

$$VOL_{i,t} = f(MILITARY_{i,t-1}, FIRMCTRL_{i,t-1}, Industry\ FEs, Year\ FEs), \quad (7)$$

where *VOL* denotes three different measures for volatility and *FIRMCTRL* refers to the firm characteristics variables that we use as control as in the previous channel. We report the results of this test in Table 7. The negative and significant coefficients of *MILITARY* support our prediction that CEO military experience is associated with lower firm risks, evidenced by lower volatility of stock returns, cash flow, and earnings. The results in Table 7 imply that CEO military experience can improve stock liquidity as it helps reduce firm risk.[25]

[24] Our findings that firms with military CEOs have lower levels of earnings management are also consistent with the trust-building military experience.

[25] Another possible channel through which military CEOs may influence a firm's liquidity costs is by reducing corporate fraud. Giannetti and Wang (2016) show that financial fraud can reduce market participation, while Gurun et al. (2018) find that trustworthy financial advisers experience fewer withdrawals following the Madoff Ponzi scheme. The reduction in corporate fraud also helps enhance trust in corporate management, which can reflect into liquidity costs. We thank the referee for suggesting this explanation.

Table 7
Military CEOs and corporate information environment.

	OPACITY (1)	*EARNS_MGMT* (2)	*BOG_INDEX* (3)	*FILE_SIZE* (4)	*FSCOMPAT* (5)	*EARNTRANS* (6)	*VOL_DISCLOURE* (7)	*TRANS_INDEX* (8)	*INFORMED_TRADE* (9)
MILITARY	−0.011***	−0.029**	−0.835***	−0.034**	0.128***	0.017***	0.0691***	2.146***	−0.0107**
	(−3.57)	(−2.33)	(−4.02)	(−2.04)	(3.39)	(4.15)	(2.66)	(3.29)	(−2.39)
Controls as in baseline	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,240	11,074	12,699	11,676	8895	11,318	7403	4772	13,359
Adjusted R-squared	0.258	0.462	0.505	0.798	0.446	0.306	0.389	0.253	0.082

This table reports the regression estimates of the effect of military CEOs on the corporate information environment. We employ seven information asymmetry measures, including (i) the financial reporting opacity measure (*OPACITY*), (ii) the real activity based earnings management (*EARNS_MGMT)*, (iii) the Bog index (*BOG_INDEX*), (iv) file size of firm 10-K disclosure (*FILE_SIZE*), (v) the financial report comparability measure (*FSCOMPAT*), (vi) the earnings transparency measure (*EARNS_TRANS*), and (vii) the number of voluntary disclosures in a given firm-year (*VOL_DISCLOSE*) as a proxy for corporate disclosure policies. In model (8), we construct an aggregate transparency measure (*TRANS_INDEX*) by ranking firms for each of the seven variables into percentile ranks every year and then taking the average of these rankings. In model (9) we capture informed transactions using Llorente et al. (2002)'s measure for informed trading based on the dynamic volume-return relation (*INFORMED_TRADE*). The main independent variable is an indicator (*MILITARY*) indicating if the CEO has military experience and zero otherwise. Year fixed effects and industry fixed effects are included in all models. *t*-statistics (in parentheses) are computed using standard errors robust to heteroscedasticity. *, **, and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively. Appendix A1 reports the variable description.

Table 8
Military CEOs, return and cash flow volatility.

	RETVOL (1)	*EARNVOL* (2)	*CFVOL* (3)
MILITARY	−0.0019***	−0.0022**	−0.0026**
	(−5.30)	(−2.02)	(−2.33)
Controls as in baseline	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	13,534	13,491	11,816
Adjusted R-squared	0.645	0.165	0.474

The table reports the regression estimates of the effect of military CEOs on three measures of volatility, including (i) stock return volatility (*RETVOL*), (ii) earnings volatility (*EVOL*), and (iii) cash flow volatility (*CFVOL*). The main independent variable is an indicator (*MILITARY*) indicating if the CEO has military experience and zero otherwise. Year fixed effects and industry fixed effects are included in all models. *t*-statistics (in parentheses) are computed using standard errors robust to heteroscedasticity. *, **, and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

6. Further analyses

6.1. Further analyses

We perform a range of additional tests to ensure that our results are robust. First, we consider alternative model specifications such as the Fama and MacBeth (1973) cross-sectional regressions and the median regression to mitigate the effect of outliers and ensure that our results are robust. We report the results in Panel A of Table 9.

Second, we consider three alternative measures of stock liquidity in Panel B of Table 9 to address a concern that our results are specific to the choice of Amihud's (2002)'s ratio and Corwin and Schultz's (2012) bid-ask spread as our liquidity measures. Specifically, we use the Gibbs measures (Hasbrouck, 2004, 2009), the Roll (1984)'s spread, and Abdi and Ranaldo (2017)'s bid-ask spread,[26] and Chung and Zhang (2014)'s closing spreads.[27]

Third, we employ additional control variables to mitigate the concern that our results are driven by other factors not necessarily the military experience of the CEOs. We include controls for product market competition, proxied by the Lerner index (Kale and Loon, 2011) and dollar trading volume (Chung et al. 2010). Next, we follow the prior studies (e.g., Brockman et al., 2009; Ng, 2011) and include other control variables such as sale growth, cash liquidity, market-to-book ratio, negative earnings, NASDAQ stocks, and idiosyncratic volatility. Finally, we include all additional control variables in our regressions.

Forth, we perform several subsample analyses in Panel D of Table 9. Specifically, we exclude the financial crisis period (2007–2008) to mitigate the impact of financial turmoil on market liquidity. Next, we only consider stocks in the S&P 500 index to ensure that our results are not driven by a large number of small stocks. Furthermore, to rule out the concern that the effects of military CEOs are driven by certain industries, we exclude firms in defence and military industries.[28]

The results from various robustness tests suggest that the effect of CEO military experience on stock liquidity remains robust and significant across different model specifications, alternative measures of stock liquidity, and sampling methods.

Finally, we consider several alternative explanations to ensure that they do not drive our documented findings. First, we consider whether the effect of CEO military experience on stock market liquidity is driven by a firm's corporate governance as firms with better corporate governance tend to have lower liquidity costs (Chung et al. 2010). We examine this possibility by controlling for several measures of corporate governance including the Gompers et al. (2003)'s governance index, Cain et al. (2017)'s takeover index, board size and board independence (Coles et al., 2008; Weisbach, 1988). We present the results for this test in Panel E of Table 9. The coefficients of *MILITARY* remain positive and significant across different model specifications, suggesting the effect of CEO military experience on stock liquidity is independent of the influence of corporate governance.

We further examine whether the documented effect can be cofounded by the roles of other top managers. The literature documents the role of general counsels in enhancing corporate reporting quality (e.g., Bamber et al. 2010; Jagolinzer et al. 2011; Al Mamun et al. 2021). Therefore, we examine whether the effect of CEO military experience on liquidity costs is independent of the effect of general counsels. We follow Kwak et al. (2012) and define an executive as a general counsel if his/her title reported in ExecuComp is related to the key words *counsel*, *law*, *legal*, and their variants. Titles that contain those keywords but do not relate to legal expertise will be excluded from our manual check. We only consider the legal counsel position for the top five highest-paid executives as they play an important role in the firm. We include the indicator for legal counsel, denoted as *GC*, as a control variable and report the results in Model (17), Panel F of Table 9.

[26] We thank Joel Hasbrouck, Angelo Ranaldo, and Farshid Abdi for making their measures available through their websites.
[27] We thank the referee for suggesting this measure.
[28] Specifically, we follow Law and Mills (2017) and exclude defence and military firms with SIC 3721, 3724, 3728, 3764, and 3769.

Table 9
Sensitivity analyses.

	LIQ_AMIHUD		Alternative measures		
	Coeff.	R^2/Pseudo R^2	Coeff.	Coeff.	R^2/Pseudo R^2
Panel A: Alternative model specifications					
(1) Use Fama-Macbeth regression	0.055***	0.756	0.048***		
	(2.73)		(4.19)		
(2) Use median regression	0.065***	0.614	0.039***		
	(5.54)		(4.23)		
Panel B: Alternative measures of stock liquidity					
(3) Gibbs (Hasbrouck, 2004, 2009)				0.051**	0.566
				(2.27)	
(4) Roll (1984) spread				0.123***	0.316
				(3.57)	
(5) Bid-ask spread from daily close prices				0.059***	0.761
				(4.30)	
(6) Chung and Zhang (2014)'s closing spreads				0.062**	0.899
				(2.19)	
Panel C: Additional control variables					
(7) Control for product market competition	0.061***	0.914	0.068***		
	(3.18)		(7.51)		
(8) Other control variables	0.041**	0.934	0.046***		
	(2.12)		(5.16)		
(9) All additional control variables	0.047**	0.937	0.048***		
	(2.48)		(5.43)		
Panel D: Subsamples analyses					
(10) Exclude financial crisis period (2007–2008)	0.078***	0.904	0.071***		
	(3.49)		(7.36)		
(11) S&P 500 stocks only	0.057***	0.910	0.059***		
	(2.68)		(6.42)		
(12) Exclude defense and military industries	0.074***	0.903	0.065***		
	(3.47)		(7.23)		
		LIQ_AMIHUD			*LIQ_CSPREAD*	
		Coeff.		R^2	Coeff.	R^2
Panel E: Control for corporate governance						
(13) Control for governance index		0.073***		0.904	0.065 ***	0.702
(14) Control for takeover index		0.064***		0.907	0.067***	0.688
(15) Control for board quality		0.072***		0.904	0.065***	0.702
(16) Control for all governance measures		0.063***		0.907	0.066***	0.694
Panel F: Other Executives						
(17) Control for General Counsels		0.074**		0.906	0.062***	0.707
(18) Control for military CFOs		0.106***		0.905	0.053***	0.696

This table presents the regression estimates of a range of sensitivity analyses performed on the regressions of stock liquidity measures. For brevity, the table only reports the coefficients on the main independent variable, *MILITARY*, which is an indicator indicating if the CEO has military experience and zero otherwise. In Model (1), we employ the Fama and MacBeth (1973)'s cross-sectional regressions. Model (2) employs the median regression with robust standard errors. In Models (3) to 6), we consider four alternative measures of stock liquidity, including Gibbs measures, Roll (1984)'s spread, bid-ask spread estimated using the closing price from Abdi and Ranaldo (2017), and Chung and Zhang (2014)'s closing spreads. From Models (7) to (8), we augment the baseline model with additional control variables individually. In Model (7), we control for product market competition as in Kale and Loon (2011). In Model (8), we include several additional control variables, including sale growth, cash liquidity, market-to-book ratio, an indicator indicating whether the firm has negative earnings before extraordinary, an indicator for NASDAQ stocks, and idiosyncratic volatility. In Model (9), we include all additional control variables (in Models 7–8) in our regressions. In Models (10) to (12), we consider subsample analyses. In Models (13) to (15), we augment our baseline model with each governance proxy individually, including the corporate governance index of Gompers et al. (2003), the takeover index constructed from the laws from Cain et al. (2017), and board quality measured by board size and the proportion of independent directors on the board. In Model (16), we include all governance measures in our regressions. In Model (17), we control for corporate general counsels as in Kwak et al. (2012). In Model (18), we control for military CFOs. *, ** and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively. Appendix A1 reports the variable description.

Finally, we consider the possibility that the military experience of chief financial officers (CFOs) affects the effect of the CEO's military experience on their firms' liquidity costs. We collect data on the CFO's military background using the same procedure as when we collect the information on the CEOs. Our variable of interest is *MILITARY_CFO,* an indicator denoting the CFO has undergone military service. The results of Model (18) suggest that the relation between miliary CEOs and stock liquidity is significant and is not affected by the inclusion of the CFO military experience in the model. Our results support Malmendier et al. (2011) who posit that it is the CEO, not the CFO who has the final say in the financing decision of the firm.

Collectively, consistent findings in Table 9 suggest that CEO military training has a direct effect on the liquidity of their firms' shares, and this effect is not driven by corporate governance, other CEO characteristics, and other top management.[29]

[29] We further examine whether CEO military expertise matters more in different economic conditions. The results, reported in Table A5 in the Online Appendix, suggest that the effect of CEO military experience on liquidity is more pronounced during industry downturns or when business environment is competitive.

6.2. Implications of military CEOs for price efficiency and corporate outcomes

Subrahmanyam and Titman (2001) and Chordia et al. (2001, 2008) document that higher liquidity can help to improve stock price informativeness. Having documented a positive relation between military CEOs and stock liquidity, we, therefore, expect that firms led by military CEOs to have higher stock price efficiency. To capture price efficiency, we use Hou and Moskowitz's (2005) price delay measure.

We further study the how CEO military experience affects market reactions to corporate announcements. Since military CEOs can enhance corporate transparency, we expect that earnings announcements from military-run CEO firms are less likely to surprise investors. We use the 3-day cumulative abnormal returns surrounding earnings announcement dates, *CAR(-1, +1),* as a proxy for market reactions to earnings announcements.[30] We obtain earnings announcement dates from Compustat and I/B/E/S databases. We report the results of these tests in Appendix A6.

In Model (1) of Appendix A6, the negative and significant coefficients on *MILITARY* suggest that firms led by CEOs with military experience are associated with shorter price delays and hence greater stock price efficiency. In Models (2), we find a negative relation between *CAR(-1,+1)* and military CEOs. The results are consistent with our prediction that market reactions to earnings announcements of firms run by CEOs with military experience are less pronounced.

Since liquidity improvements and more transparent corporate disclosures reduce a firm's cost of capital (Diamond and Verrecchia, 1991; Lambert et al., 2007; Leuz and Verrecchia, 2000), we conjecture that firms headed by military CEOs will enjoy lower equity costs of capital. Furthermore, Brogaard et al. (2017) and Nadarajah et al. (2021) document that enhanced liquidity decreases corporate default risk. We, therefore, argue that firms managed by military CEOs are related to lower default risks, partly because of the improvements in liquidity.

To capture a firm's cost of capital, we use the average of the four commonly used implied cost of equity measures estimated from (i) the Gode–Mohanram (2003) model, (ii) the Claus–Thomas (2001) model, (iii) the model of Gebhardt et al. (2001), and (iv) Easton's (2004) model. Given the apparent lack of consensus on the best model for estimating the cost of equity capital, following prior studies (e.g., Daske et al., 2008; Hail and Leuz, 2006), we use the yearly average of these four implied cost-of-equity measures (*AVG_COC)* as our measure of equity costs.

To capture corporate default risk, we construct the expected default frequency (*EDF*) (e.g., Merton, 1974; Bharath and Shumway, 2008; Brogaard et al. 2017). The probabilities of default in this measure are cross-sectional and time-varying. Higher values of *EDF* indicate higher default risk.

We present the results of these tests in Models (3) and (4) of Appendix A6. We find negative and significant coefficients on *MILITARY,* suggesting that firms led by CEOs with military experience have a lower cost of equity capital and lower default risk. Overall, these further analyses provide more insights into the economic consequences of improvements in liquidity due to military CEOs.

7. Conclusion

We consider how the early life experience of CEOs influences stock liquidity. We show strong evidence that firms run by CEOs with a military background have higher stock market liquidity. Our results remain robust across several robustness tests in which we control for several CEO characteristics or use various model specifications, alternative liquidity measures, and subsamples.

We further examine the economic mechanisms underlying the relation between military CEOs and stock liquidity. We show that the association between military CEOs and stock liquidity is stronger during periods with higher confidence or trust in the military. Firms with military CEOs also adopt policies and exhibit characteristics that foster investor trust and secondary market liquidity, such as more transparent disclosure policies and lower levels of performance volatility. Finally, we find that the influence of stock liquidity on market efficiency, market reactions to corporate announcements, corporate default risk, and the cost of equity capital can be partially explained by the CEO military experience. Taken in their entirety, our findings highlight the importance of CEOs' early life experience in fostering investor trust and affecting the liquidity of firms' stock.

CRediT authorship contribution statement

Hoang Vu Ngan: Writing – review & editing, Resources, Project administration, Funding acquisition, Conceptualization. **Pham Mia Hang:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Nguyen Harvey:** Writing – review & editing, Writing – original draft, Visualization, Validation, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Dang Ha V.:** Writing – review & editing, Visualization, Validation, Resources, Methodology, Investigation, Funding acquisition, Conceptualization.

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Appendix A1. Variable description

Variables	Descriptions	Sources
Liquidity Measures		
LIQ_AMIHUD	The natural logarithm of the annual Amihud (2002)'s ratio, measured over a firm's fiscal year multiplied by minus one.	CRSP
LIQ_CSPREAD	Annual bid-ask spreads for each stock, estimated following Corwin and Schultz (2012)'s method which uses daily high and low prices to derive daily bid-ask spreads. *LIQ_CSPREAD* is measured as minus one multiplied by the natural logarithm of annual bid-ask spreads.	CRSP
CEO characteristics		

(*continued on next page*)

[30] We find that our results (not tabulated for brevity) are robust to the choices of the earnings announcement window, such as the five-day window (CAR(-2,+2)) or the seven-day window (CAR(-3,+3)) surrounding earnings announcement dates.

(*continued*)

Variables	Descriptions	Sources
MILITARY	An indicator indicating if the CEO has military service in the U.S Air Force, Amy, Marines, or Navy, or other related military experience	Marquis Who's Who
MBA	An indicator indicating if the CEO has an MBA degree.	Marquis Who's Who; BoardEx
IVY_EDUC	An indicator indicating if the CEO attended one of the Ivy-League institutions.	Marquis Who's Who; BoardEx
FIN_EDUC	An indicator indicating if the CEO obtained an MBA or has a degree in accounting or economics.	Marquis Who's Who; BoardEx
FOREIGN_CEO	An indicator indicating if the CEO was born outside the U.S.	Marquis Who's Who; BoardEx
FEMALE_CEO	An indicator indicating if the CEO is female.	ExecuComp
TENURE	CEO's tenure, which is the number of years since the current CEO became CEO.	ExecuComp
Firm-level controls		
LOGASSET	The logarithm of total assets.	Compustat
TANG	Tangibility, measured as property, plant, and equipment over total assets.	Compustat
LEVERAGE	Leverage ratio, measured as the ratio of total debt to book assets.	Compustat
PRICE_INVERSE	The inverse of the mean daily stock's price over the fiscal year *t*.	CRSP
INSTOWN	Institutional ownership computed as the fraction of its outstanding common shares owned by all 13 F reporting institutions.	Thompson Reuters Institutional 13 F
LOGANALYST	Analyst coverage, measured as the natural logarithm of the average number of analysts following the company during the year.	I/B/E/S
ADVERTISING	Advertising intensity, measured as advertising expense divided by the total asset.	Compustat
R&D	R&D expenditures, computed by dividing R&D expenditures by book assets.	Compustat
TURNOVER	The natural logarithm of share turnover.	CRSP
BTM	Book-to-market, measured as the ratio of the book equity value over market capitalization value	Compustat
CUMRET	Cumulative return, measured as the compounded market-adjusted monthly returns for six months prior to fiscal year end.	CRSP, Compustat
FIRM_AGE	Log of a company's age, approximated by the number of years listed on Compustat.	Compustat
Information asymmetry measures		
OPACITY	Financial reporting opacity in Hutton et al. (2009), measured as a three-year moving sum of absolute discretionary accruals, where discretionary accruals are estimated with the modified Jones (1991) model, following Dechow et al. (1995).	Compustat
EARNS_MGMT	Real-activity based earnings management, estimated following Roychowdhury (2006) and Cohen and Zarowin (2010).	Compustat
BOG_INDEX	The Bog index of Bonsall et al. (2017)	Bonsall et al. (2017)
FILE_SIZE	The natural logarithm of the file size of firm 10-K disclosure	Loughran and McDonald (2014)
FSCOMPAT	A measure of financial statement compatibility	De Franco et al. (2011)
EARNS_TRANS	Earnings transparency, measured following Barth et al. (2013)	Compustat
TRANS_INDEX	The transparency index based on seven information asymmetry measures	Compustat Authors' calculation
Volatility Measures		
RETVOL	Stock return volatility, measured as the standard deviation of daily stock returns over the fiscal year.	CRSP
EARNVOL	Earnings volatility, defined as the standard deviation of quarterly earnings ratio over the preceding four years. Earnings ratio is the ratio of income before extraordinary items over total assets.	Compustat
CFVOL	Cash flow volatility, measured as the standard deviation of quarterly cash flows from operations in the previous four years.	Compustat
Other variables		
IDIOVOL	The standard deviation of OLS regression residuals where the excess daily return of firm *i*'s stock is regressed on Fama-French-Carhart four factors. The OLS regressions are estimated over one year.	CRSP, Kenneth French's Data Library
LERNER INDEX	The Lerner index as in Kale and Loon (2011), measured as the ratio of operating profit to sales	Compustat
GINDEX	The corporate governance index.	Gompers et al. (2003)
TAKEOVER INDEX	The takeover index constructed from the laws from Cain et al. (2017)	Cain et al. (2017)
INFORMED_TRADE	A measure for informed trading based on the dynamic volume-return relation follow as in Llorente et al. (2002)	CRSP
INSIDER_TRADING	Insider trading ratio, measured as the ratio of the number of shares traded by insiders to the total number of shares outstanding.	2IQ, CRSP
ESG_SCORE	*ESG_SCORE* is an aggregate measure of firm-level ESG score from five ESG categories, including environment, employee relation, community, diversity, and human rights.	MSCI/KLD database Lins et al. (2017)
DELAY	A price delay measure proposed by Hou and Moskowitz (2005).	CRSP, Compustat, Hou and Moskowitz (2005).
CAR (−1, +1)	Cumulative abnormal returns during the three-day period surround earnings announcement dates.	Compustat, CRSP
AVG_COC	The average of the four implied cost of equity measures estimated from the Gode and Mohanram (2003)'s model, the Claus and Thomas (2001)'s model, the Gebhardt et al. (2001)'s model, and the Easton (2004)'s model.	Compustat, CRSP
EDF	The expected default frequency (EDF) estimated following Brogaard et al. (2017).	Compustat, CRSP

Appendix A2. Distribution of CEOs with military experience

Fama French 10 Industry Classification	Percentage of Military CEOs
FF1: Consumer Nondurables – Food, Tobacco, Textiles, Apparel, Leather, Toys	0.61 %
FF2: Consumer Durables – Cars, TVs, Furniture, Household Appliances	0.18 %
FF3: Manufacturing – Machinery, Trucks, Planes, Chemicals, Off Furn, Paper, Com Printing	1.82 %
FF4: Energy: Oil, Gas, and Coal Extraction and Products	0.72 %
FF5: Hitech: Business Equipment – Computers, Software, and Electronic Equipment	0.35 %
FF6: Telecom: Telephone and Television Transmission	0.03 %
FF7: Shops: Wholesale, Retail, and Some Services (Laundries, Repair Shops)	1.31 %
FF8: Healthcare, Medical Equipment, and Drugs	0.75 %
FF9: Utilities	0.67 %
FF10: Other – Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment, Finance	1.71 %

(*continued on next page*)

(*continued*)

Fama French 10 Industry Classification	Percentage of Military CEOs
Total:	**8.15 %**
Military branch	Percentage
US Army	17.92 %
US Nary	12.26 %
US AirForce	2.83 %
Other military branches	66.98 %
Total:	**100.00 %**

Appendix A3 reports the results for these tests. We find the coefficients of *CEO_CHANGE* × PRE^{-2} and *CEO_CHANGE* × PRE^{-1} are statistically insignificant, while the coefficient of *CEO_CHANGE* × *POST* is statistically significant. These results suggest that higher stock liquidity follows a change in CEO military background, but not before. Thus, the parallel trends assumption for the efficacy of the difference-in-difference approach is satisfied and the documented effect of *CEO* military experience on the stock liquidity of their firms is more likely causal.

Appendix A3. Dynamic turnover analysis

	Dependent Variable: Stock Liquidity			
	LIQ_AMIHUD		*LIQ_CSPREAD*	
	From non-military to military CEO	From military to non-military CEO	From non-military to military CEO	From military to non-military CEO
	(1)	(2)	(3)	(4)
CEO_CHANGE × PRE^{-2}	−0.011	0.003	0.043	−0.022
	(−0.09)	(0.07)	(0.42)	(−1.36)
CEO_CHANGE × PRE^{-1}	−0.012	0.002	0.004	0.018
	(−0.11)	(0.05)	(0.04)	(1.04)
CEO_CHANGE× *POST*	0.329***	−0.116*	0.102**	−0.026**
	(2.61)	(−1.92)	(1.98)	(−2.00)
Controls as in baseline	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Adjusted R-squared	0.953	0.937	0.605	0.487
Observations	246	856	246	856

This table reports regression result for the dynamic turnover analysis. *CEO_CHANGE* is a dummy variable that equals one if the new CEO is from a non-military CEO to military CEO (Columns 1 and 3) and from a military CEO to a non-military CEO (Columns 2 and 4), and zero otherwise. *Pre* $^{-2}$ and *Pre* $^{-1}$ are indicator variables that indicate two years before and one year before the CEO change, respectively. *Post* is an indicator indicating one or more years after the CEO change. Each firm-year observation in the treatment group is matched with a firm-year observation in the control group (*CEO_CHANGE* equals zero) using the nearest-neighbor propensity score matching procedure. Control variables are similar to those in the baseline regressions in Table 2. Constant term, year-fixed effects, and firm-fixed effects are included in all models. *t*-statistics (in parentheses) are computed using standard errors robust to heteroscedasticity. *, ** and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

Appendix A4. PSM match quality

	Treatment	Control	Difference (*p*-value)
LOGASSET	7.65	7.62	0.60
TANG	0.44	0.45	0.85
LEVERAGE	0.19	0.20	0.81
PRICE_INVERSE	0.03	0.04	0.87
INSTOWN	0.65	0.64	0.77
LOGANALYST	1.80	1.77	0.36
RETVOL	0.02	0.02	0.33
FIRM_AGE	3.04	3.01	0.37
R&D	0.01	0.02	0.34
ADVERTISING	0.01	0.02	0.31
CUMRET	0.06	0.05	0.74
LOGTUNRNOVER	−5.38	−5.41	0.47
SP500	0.87	0.85	0.22
MBA	0.31	0.25	0.11
IVY_EDUC	0.29	0.30	0.58
FIN_EDUC	0.22	0.23	0.80
FOREIGN_CEO	0.05	0.04	0.92
FEMALE	0.00	0.01	0.32
LOGAGE	4.30	4.20	0.12
LOGTENURE	1.96	2.03	0.14

This table presents the after-match characteristics of treatment (firms with military CEOs) and control firms (firms without military CEOs) reported

in Table 4. We obtain the propensity score using a logit regression, with all control variables as specified in the baseline model. We perform nearest-neighbor matching within a caliper of 0.01 without replacement. P-value presents the *p*-value of the test for the difference in mean between the characteristics of treatment and control firms.

Appendix A5. Cross-sectional analysis

	Industry distress		High Competition	
	LIQ_AMIHUD (1)	*LIQ_CSPREAD* (2)	*LIQ_AMIHUD* (3)	*LIQ_CSPREAD* (4)
MILITARY	0.054**	0.059***	0.066***	0.051***
	(2.26)	(5.74)	(3.35)	(4.54)
MILTARY × IND_DISTRESS	0.113***	0.032*		
	(2.65)	(1.72)		
IND_DISTRESS	−0.162***	−0.021***		
	(−9.41)	(−3.13)		
MILTARY × HIGH_COMPETITION			0.048*	0.033*
			(1.95)	(1.73)
HIGH_COMPETITION			−0.131***	−0.034***
			(−5.72)	(−3.47)
Other control variables	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Observations	13,534	13,534	11,923	11,923
Adjusted R-squared	0.904	0.709	0.890	0.711

The table presents the regression estimates of cross-sectional analyses performed on the regressions of stock liquidity measures. Columns (1) and (2) report results for the effect of military experience on stock liquidity during industry downturns. Columns (3) and (4) report results for the effect of military experience on stock liquidity in highly competitive environments. We follow Benmelech and Frydman (2015) and classify an industry as being in distress (*IND_DISTRESS*) if its asset-weighted return-on-asset ratio in a given year is below the 20th percentile of the sample measure. To capture product market threats, we use Hoberg *et al.* (2014)'s fluidity measure and employ an indicator (*HIGH_COMPETITION)* indicating if the fluidity measure in a given year is above the 80th percentile of the same measure for the entire sample period, and zero otherwise. *, ** and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively. Appendix A1 reports the variable description.

Appendix A6. Military CEO, price efficiency, and corporate outcomes

	DELAY (1)	*CAR(-1, +1)* (2)	*AVG_COC* (3)	*EDF* (4)
MILITARY	−0.0167*	−0.0020**	−0.0055**	−0.0142**
	(−1.72)	(−2.17)	(−1.98)	(−1.97)
Controls as in baseline	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	11,298	53,519	11,339	10,063
Pseudo R^2/ R^2	0.319	0.007	0.221	0.337

This table reports the regression estimates of the impact of CEO military experience on stock price efficiency (Column 1), and market reactions to corporate earnings announcements (Column 2). We use Hou and Moskowitz (2005)'s price delay measure to capture the average delay in stock price movements in response to information. *CAR(-1, +1)* is the cumulative abnormal returns during the three-day period surrounding earnings announcement dates. The main independent variable is an indicator (*MILITARY*) indicating if the CEO has military experience and zero otherwise. *, **, and *** denote significance at the 10 %, 5 %, and 1 % levels, respectively. Appendix A1 reports the variable description.

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