CEO Information Skills, Information Sources, and Firm Performance

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The management of large firms is complex and emphasizes the importance of the Chief Executive Officer (CEO). We suggest that CEOs with information skills may be suitable to address this complexity. A CEO equipped with information skills may increase firm performance by acquiring new information sources or by using existing resources more efficiently. As information skills relate to excellence in collecting, processing, and using information, themes often attributed to the Chief Financial Officer (CFO), we identify CEOs with information skills by considering their background as a CFO. We find that former-CFO CEOs are positively associated with top management team (TMT) diversity, reflecting heterogeneous information sources, and firm performance, i.e., sustainability and financial performance. A mediator analysis reveals that TMT diversity partially explains the relation between former-CFO CEOs and firm performance, providing evidence for both information acquisition and efficient resource usage. The results suggest that CEOs with information skills relate to disruptions in the firm's TMT, thereby acquiring new information sources and using them effectively to increase firm performance.

JEL: C12, C33, J63, M14
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1 INTRODUCTION

Chief Executive Officers (CEOs) with interpersonal skills or general ability are often considered to be more successful in managing large organizations (Hansen et al., 2021; Kaplan & Sorensen, 2021). Since the management of large firms is often complex, e.g., due to intricated supply chains (Frostenson & Prenkert, 2015), comprehensive business opportunities (Quigley & Hambrick, 2015), and large demands for transparency (Leuz & Wysocki, 2016), information skills may improve decision-making and disclosures to increase firm performance. Hansen et al. (2021) attribute information skills to Chief Financial Officers (CFOs). Therefore, we examine whether CEOs with CFO background increase firm performance. Specifically, we investigate whether such CEOs acquire new information sources or use existing resources more efficiently to improve firm performance.

Directors' skills are essential for the decision outcomes of the top management team (TMT) and the board of directors (Adams et al., 2018; Hambrick & Mason, 1984). Due to the challenges that result from the complexity of managing large firms, information skills may be beneficial to steer the firm successfully. Hansen et al. (2021, p.14) define information skills as "cognitively demanding tasks related to information processing and problem solving", i.e., a manager with information skills has the ability to collect and use information efficiently and to monitor and steer resources. We identify a CEO with information skills by considering whether the CEO has a background as CFO (*former-CFO CEO*). The tasks of the CFO relate to information skills as the CFO deal with demands from the firm's environment and firm-specific processes and resources, which pose potential for performance increases (Hommel et al., 2012). The CFO is the main responsible for external and internal information provision and the first contact person for the capital

market (Loyeung & Spiropoulous, 2015; Mian, 2001; Naranjo-Gil et al., 2009). Both tasks require strong information skills (Hansen et al., 2021; Kaplan & Sorensen, 2021).

Given the information skills of CFOs, we expect that a former-CFO CEO improves firm performance assessed by information recipients either by acquiring new information sources or by using existing resources more efficiently.[1] We start the investigation by examining whether CEOs' information skills relate to increasing firm performance, i.e., financial and sustainability performance. We expect that former-CFO CEOs relate to increasing stock and Environmental, Social, and Governance (ESG) returns. Second, we examine whether CEOs with information skills acquire new information sources to increase firm performance. We expect that former-CFO CEOs relate to increased TMT diversity and that TMT diversity partially mediates the relation between former CFO-CEOs and firm performance, suggesting the usage of new information sources and improved decision-making (e.g., Barsade et al., 2000; Harjoto et al., 2015).

The results are consistent with the expectations. We find a positive association between former-CFO CEOs and both stock and ESG returns. Moreover, we find that the association of former-CFO CEOs with ESG return partially explains the increased stock return. Furthermore, the results show that former-CFO CEOs positively relate to TMT diversity and TMT diversity partially mediates the relation between former-CFO CEOs and firm performance. These results suggest that the CEO's more efficient use of existing resources (through the CEO's information skills) and the increased availability of new information (through the more diverse TMT) drive firm performance.

However, as Hansen et al. (2021) point out, the required skills for CEOs differ from those of CFOs. Therefore, former-CFO CEOs feature information skills at the expense of other CEO-attributed skills. The results confirm the expectations, suggesting that CEOs

[1] Hereinafter, we refer to firm performance assessed by information recipients as firm performance.

with information skills have less general ability and interpersonal skills. In additional analyses, we show that the results are robust to the information skills of the preceding CEO, the internal versus external promotion of the incumbent CEO, and the direct or indirect promotion from the CFO to the CEO position.

The study contributes to four streams of literature. First, we contribute to the literature on CEO skills. Research demonstrates that personal traits, skills, and backgrounds are crucial antecedents for the decision-making behavior of top managers and affect firm outcomes (e.g., Hambrick & Mason, 1984; Salancik & Pfeffer, 1978). Hansen et al. (2021) and Kaplan and Sorensen (2021) contrast CEOs' general and interpersonal skills to the cognitive and functional skills of CFOs. Whereas high levels of general ability, resoluteness, strategic perspectives, and charisma are considered more relevant for CEOs, CFOs require administrative and information skills (Hansen et al., 2021; Kaplan et al., 2012; Kaplan & Sorensen, 2021). The results suggest that CEOs with information skills relate to increased firm performance. Moreover, the results support the view of Hansen et al. (2021) that information skills refer to both the acquisition and processing of information to deal with complex management tasks and the more efficient usage of existing resources. Nevertheless, as individuals have limited skill sets (Lawler III, 1994; Morgeson et al., 2005), the results suggest that CEOs' information skills come at the expense of other skills attributed to CEOs, such as general ability or interpersonal skills.

Therefore, we contribute to this literature by showing that former-CFO CEOs positively relate to firm performance but show lower levels of other skills. Firms have to deal with this tradeoff between the benefits of a CEO with knowledge about information processing and resource usage but higher specialization and lower interpersonal skills. However, especially in times of higher uncertainty, information skills may become more

critical for future CEOs, as appropriately dealing with uncertainty-related information results in improved decision-making (Ittner & Michels, 2017).

Second, we contribute to sustainability literature showing that information skills are beneficial for CEOs to improve sustainability performance. Current research shows, i.a., that personal values (Agle et al., 1999), characteristics (Manner, 2010), or personality traits (Judge et al., 2009) shape managers' approach toward sustainability. We complement this view, showing that former-CFO CEOs relate to increased sustainability performance, suggesting that CEOs' information skills are able to identify stakeholder demands and means to address those (Hansen et al., 2021; Mian, 2001). We further add to this literature, suggesting that CEOs with information skills increase performance in all categories of sustainability by identifying new information sources and improving the usage of existing resources.

Third, we address TMT diversity literature, providing a deeper understanding of the importance of CEO skill sets to deal with the advantages and caveats of diverse teams. Diverse teams relate to increased knowledge, better stakeholder representation, and more creative solutions (Adams et al., 2015; Williams & O'Reilly III, 1998), but also to reduced speed of decision-making, increased communication cost, and higher coordination requirements (Adams et al., 2015; Anderson et al., 2011; Triana et al., 2014). Therefore, a diverse TMT represents a heterogeneous information source for decision-making that needs to be efficiently coordinated to reduce costs and utilize benefits (Brodbeck et al., 2007; Edmondson et al., 2003). This study adds to the literature that CEOs' information skills are a beneficial lever to coordinate a diverse TMT to acquire relevant information and use them to increase firm performance.

Finally, we contribute to research on CEO changes, showing that a former-CFO CEO relates positively to TMT diversity and firm performance. Current research, among

others, focuses on reasons for the CEO change (e.g., Ertugrul & Krishnan, 2011; Parrino, 1997), market reactions (e.g., Ballinger & Marcel, 2010; Friedman & Singh, 1989), or internal consequences (e.g., Weisbach, 1995; Weng & Lin, 2014). However, little evidence is provided for the consequences of former CFOs becoming CEOs (e.g., Matsunaga et al., 2013). This study suggests that more information skills are present when a CFO is directly promoted to the CEO position. Moreover, the effects of CEOs' information skills on firm performance depend on the information skills of the preceding CEO, with a positive interaction for financial and a negative interaction for sustainability performance.

The results further suggest that internally promoted CEOs with information skills relate more strongly to financial performance than externally promoted CEOs with information skills. However, internal promotions reduce the acquisition of new information sources through a more diverse TMT. As internally promoted CEOs have relationships with the existing TMT, contrary to an externally promoted CEO, these relationships may weaken the acquisition of information sources, confirming the view that internally promoted CEOs are less willing to execute disruptive decisions (Friedman & Singh, 1989; Weng & Lin, 2014).

Therefore, this study adds to the literature, suggesting that CEOs with information skills relate to improved usage of existing resources, acquisition of new information sources, and firm performance. However, the results also suggest that these relations' strength depends on the conditions of the CEO appointment.

2 THEORY AND HYPOTHESES DEVELOPMENT

Roles and Skills of CEOs

The most examined role within firms is the CEO as key decision-maker (Lo & Fu, 2016). Quigley and Hambrick (2015) investigate the significance of the CEO for firm

outcomes, showing that dynamic business environments and the complexity of firms increases the requirements for the CEO to steer the company successfully and efficiently. A more comprehensive range of potential business models, markets, and production possibilities reinforces the coordination requirements and the strategic position of the CEO. Therefore, as the range of possible strategies increases, the CEO has to be more involved in strategy formulation to accomplish the desired outcomes.

The importance of the CEO for firm decisions sheds light on the skills required to manage firms successfully. Based on the upper echelons theory of Hambrick and Mason (1984), managers' characteristics, background, experiences, and values determine their decisions and, thus, affect organizational outcomes. Kaplan et al. (2012) show that firms consider general ability when appointing a new CEO. Hansen et al. (2021) and Kaplan and Sorensen (2021) complement these findings showing that potential CEOs are required to be charismatic, have a strategic perspective, and show interpersonal skills.

In particular, complex firms demand advanced management skills. Wang and von Tunzelmann (2000) show that the complexity of firms arises, e.g., from technological challenges, market dynamics, customer diversity, or production processes, and results in an excess of information. Therefore, information skills may be beneficial in dealing with this complexity. Hansen et al. (2021) relate information skills to the collection and processing of information, the efficient usage of resources, the effective disclosure of information, and the identification of appropriate solution strategies for complex tasks (Hansen et al., 2021).

However, Hansen et al. (2021) and Kaplan and Sorensen (2021) attribute information skills to the CFO rather than the CEO.[2] The CFO is among the key decision-

[2] Literature assigns information skills to the CFO and the Chief Information Officer (CIO) (e.g., Hansen et al., 2021; Kaplan & Sorensen, 2021). Nevertheless, the tasks of the CIO are often within the department of the CFO (Ulrich & Lehmann, 2018), so that the CIO reports to the CFO. Otherwise, if the CIO is part of the TMT and reports only to the CEO, close cooperation between CIO and CFO is essential to achieve the firm's targets (Banker et al., 2011; Cusimano, 2013).

makers in firms today (Loyeung & Spiropoulous, 2015). They deal with financial regulations, policy implementation, and internal controls (Li et al., 2010; Mian, 2001), but also strategic tasks, such as the scouting and selection of finance and investment opportunities (Doron et al., 2019; Page, 2018), capital market interactions and investor relations (Buchheit et al., 2019; Groysberg et al., 2011), or the communication of the corporate strategy (Mian, 2001). Therefore, the scope of CFO tasks requires information skills (Hansen et al., 2021; Kaplan & Sorensen, 2021). Information skills relate to both the functional part, i.e., the responsibility for the external and internal information systems, and the strategic tasks, i.e., investment decisions. Moreover, due to their comprehensive tasks, the CFO requires knowledge of their firms' processes and resources (Hommel et al., 2012).

Therefore, the increasingly strategic role and information skills make the CFO a potential aspirant to become CEO, especially in complex firms (Farag et al., 2012; Loyeung & Spiropoulous, 2015). Nevertheless, there is little research on appointing a former CFO as CEO and, thereby, on CEOs with information skills. Marshall (2004) shows that the promotion of a CFO to CEO is more likely within the same industry. Matsunaga et al. (2013) show that a former-CFO CEO relates to higher reporting quality, analyst coverage, and analysts' forecast dispersion improvements. McCann (2017) argues that the likelihood of CFOs becoming CEO increases due to their competence in managing complex situations.

CEO Information Skills and Firm Performance

Since managing large firms is complex, i.a., due to the excess of information (Wang & Von Tunzelmann, 2000), a CEO with information skills may improve decision-making to increase firm performance. Relating to financial management, research shows that a former-CFO CEO or a financially-experienced CEO relates to higher financial disclosure

quality (Matsunaga et al., 2013), lower audit fees (Kalelkar & Khan, 2016), and more active financial management (Custódio & Metzger, 2014).

Next to financial performance, sustainability performance is of relevance for investors (Sun & Rakhman, 2013). Literature shows the relevance of sustainability disclosures and performance for investors and its pricing by the capital market (e.g., Liesen et al., 2017; Matsumura et al., 2014).[3] These studies agree that sustainability disclosure and performance positively relate to firm value. Flammer (2013) argues that sustainability strategies are relevant for achieving long-term objectives and should be enforced by the top management. However, sustainability management requires other information than financial management, e.g., insights about processes and supply chains (Schaltegger & Burritt, 2014).

As a CEO with information skills knows how to deal with different information demands, e.g., by investors, regarding multiple objectives, we expect that such CEOs improve decision-making to increase firm performance. Therefore, we start the investigation by examining whether CEOs with information skills relate to increased firm performance, i.e., financial and sustainability performance. We expect such CEOs to use their information skills to meet stakeholders' demands more accurately, which is rewarded by the stock market and by sustainability ratings. We hypothesize:

H1: CEOs' information skills relate to higher firm performance.

CEO Information Skills, Information Sources, and Firm Performance

We further aim to illustrate the mechanism of how CEOs with information skills relate to firm performance. One potential link between a CEO's information skills and firm

[3] E.g., the German Federal Financial Supervisory Authority recommends banks to include sustainability ratings when evaluating credit applications (BaFin, 2020).

performance may be the more efficient usage of existing resources (Hansen et al., 2021). Actions that come along with this mechanism are, e.g., improvements in processes and resource usages, such as increased efficiency (Hansen et al., 2021), or disclosure quality, resulting in reduced information asymmetry (Matsunaga et al., 2013).

However, information skills foremost refer to acquiring and using information (Hansen et al., 2021; Kaplan & Sorensen, 2021). Therefore, we expect that CEOs with information skills predominantly aim to acquire new information sources to improve decision-making and increase firm performance. One of the primary information sources for the CEO is the TMT, which includes the top managers of all firm divisions or functions with their specific knowledge (Guadalupe et al., 2014; Van Gils, 2005). Research shows that a heterogeneously composed TMT positively relates to the firm's financial and sustainability performance (Barsade et al., 2000; Boone & Hendriks, 2009; Certo et al., 2006; Henry et al., 2019).

Diversity in the TMT comes with benefits and costs. The main benefit of a diverse TMT is increased knowledge (Brodbeck et al., 2007). Since the TMT faces a wide range of different topics that span over the whole range of leadership and business issues, a diverse TMT's increased private information enhances decision-making quality when processed efficiently (Brodbeck et al., 2007; Edmondson et al., 2003; Forbes & Milliken, 1999; Reimer et al., 2018). However, TMT diversity also leads to conflicts and increased coordination effort due to the differing backgrounds of the individual team members (Anderson et al., 2011). Consequently, the coordination requirements decrease the speed of decision-making processes as well as the willingness and ability to find solutions (Adams et al., 2015; Triana et al., 2014).

As information skills come along with the ability to identify relevant information and process information even under complex circumstances, we expect that CEOs with

information skills are able to coordinate the cost and utilize the benefits of diversity. Therefore, we expect that CEOs with information skills increase TMT diversity to acquire new information sources and are able to coordinate the TMT to improve decision-making and, subsequently, increase firm performance. Consequently, we hypothesize:

H2: CEOs' information skills relate to higher firm performance by acquiring new information sources.

3 RESEARCH DESIGN

Data Sample and Sources

The data sample consists of 16,355 firm-year observations of European firms for the period between 1999 and 2020. We collect board- and TMT-related data from *Compustat's BoardEx Europe* database. We obtain firm data from the *Thomson Reuters Datastream* database. To control for managers' cultural backgrounds, we use Hofstede et al.'s (2010) cultural dimensions downloaded from *https://geerthofstede.com/research-and-vsm/dimension-data-matrix*.

Methodology

Chain of Evidence

As elaborated above, we expect CEOs with information skills to relate to an increased firm performance using their information skills to improve decision-making by exploiting new information sources.

We start the analyses by validating the identification of information skills. We examine whether CEOs with information skills have less present other skills that are typically attributed to the CEO, namely general ability and interpersonal skills. The validation bases on the assumption that individuals have a limited set of skills wherein a

more present skill implies less present other skills (Lawler III, 1994; Morgeson et al., 2005; Shaw, 1984). Custódio et al. (2019) show that the general ability of the CEO relates to more risk-taking and increased innovativeness of the firm. They argue that a CEO with higher general ability has more alternative job options than a more specialized CEO. Therefore, we examine whether research and development (R&D) intensity, as proxy for innovativeness following Kaplan and Sorensen (2021), and the change in capital intensity, as proxy for risk tolerance (Amihud & Lev, 1981), relate negatively to former-CFO CEOs. Furthermore, we consider the relation between information and interpersonal skills, examining the association of former-CFO CEOs and employee satisfaction, as interpersonal skills affect leadership with employee motivation being among the main tasks of the CEO (Conger et al., 2000; Hansen et al., 2021).

The main analysis of this study starts by examining the relation between former-CFO CEOs and stock return as well as ESG return *(H1)*. We use Model (1) to estimate the regression of firm performance on a binary variable that indicates whether the CEO is a former CFO and, thereby, has information skills. Subsequently, we perform a mediator analysis following MacKinnon et al. (2002) to examine whether TMT diversity, as proxy for the acquisition of new information sources, explains the relation between former-CFO CEOs and firm performance (*H2*).[4] We first estimate the regression of TMT diversity on the former-CFO CEO proxy. Then, we estimate the regression of firm performance on former-CFO CEO and TMT diversity and expect that the coefficients for both explanatory variables get insignificant, showing a mediation and suggesting that firm performance

[4] Following MacKinnon et al. (2002), we implement a mediator analysis with the following steps. (1) We examine the association of the main explanatory variable with the outcome variable. (2) We examine the association between the main explanatory variable with the mediator variable. (3) If both analyses yield significant results, we examine the association between the main explanatory variable and the mediator variable with the outcome variable and expect either insignificant coefficients for both independent variables, suggesting a full mediation, or a decreasing significance and magnitude of the coefficients, suggesting a partial mediation.

increases due to the acquisition of new information sources by the CEO with information skills.

In additional analyses, we show robustness of the main results regarding the conditions of CEO appointments. We follow the argumentation of Friedman and Singh (1989) and Weng and Lin (2014), who show that firm outcomes related to CEO appointments depend on different appointment conditions. For this purpose, we examine the preceding CEO's information skills, internal versus external promotions, and direct or indirect promotions from CFO to CEO. In a final step, we add CEOs' financial expertise as a further control variable to demonstrate that information skills have additional explanatory power and do not only capture financial skills.

Regression Model and Variable Description

To test the hypotheses, we follow prior research in the CEO succession, board and TMT diversity, and sustainability literature (e.g., Datta & Guthrie, 1994; Matsunaga et al., 2013; Sun & Rakhman, 2013) estimating the following OLS regression model:[5]

$$Y_t = \beta_0 + \beta_1 * CFO\ Past + \beta_2 * ESG_{t-1} + \beta_m * CEO\ Controls + \beta_n * Firm\ Controls + \gamma_i + \eta_y + \varepsilon. \quad (1)$$

Y is the dependent variable, *stock return* and *ESG return* for *H1* and *H2*, and *TMT diversity* for *H2*. We calculate the annual *stock return* by dividing the absolute change in stock prices by the previous year's stock price. We calculate *ESG return* using Datastream's ESG score and dividing the absolute change in ESG scores by the previous year's ESG score. The calculation of *TMT diversity* follows Bernile et al. (2018) with some adaptions to the European data sample. We calculate *TMT diversity* as follows:

[5] An overview of the variables and their calculation is provided in the Appendix.

$$
\begin{aligned}
TMT\ diversity = {} & stdz(percentage\ of\ \ female\ directors) \\
& + stdz(std.deviation\ of\ \ age) \\
& + stdz(number\ of\ \ boards) \\
& + stdz(HHI\ \ nationality) \\
& + stdz(HHI\ \ \ finance)
\end{aligned}
\tag{2}
$$

TMT diversity consists of the percentage of female TMT members, the standard deviation of age in the TMT, the mean number of TMT members' other boards, the Herfindahl index for the nationalities of the managers, and the Herfindahl index for their financial expertise. All of these factors are normalized by mean and standard deviation. We deviate from Bernile et al. (2018) using nationality instead of the top managers' ethnicities and exclude educational diversity.[6]

The explanatory variable *CFO past* is a binary proxy indicating whether the CEO is a former CFO. We determine the CEOs and whether they have experience as CFO manually based on the job titles in the BoardEx database, comparably to the procedure of Buchheit et al. (2019).[7] We delete an observation from the sample if the firm has non-identifiable or more than one CEO in the firm-year, resulting in a sample in which each firm has exactly one CEO per year. We further identify experience as CFO by observing the previous jobs of the CEOs in the sample.

When *ESG return* is the dependent variable, we include the *ESG score* of the previous year as control variable for a potential level effect. As Flammer (2013) shows, sustainability activities have a decreasing marginal return suggesting that the financial benefits of sustainability performance depend on the initial level of sustainability.

[6] As Bernile et al. (2018) use the college of the managers to calculate educational diversity, we exclude this type of diversity since a lot of managers in the European sample change their affiliated university during the course of their studies. In untabulated tests, we have included educational diversity and find no qualitative differences to the results presented in this study.

[7] The detailed procedure of identifying the CEO and the experience as CFO are presented in the Appendix.

Therefore, the initial level of ESG affects the potential and the financial benefit of further increasing the ESG score.

We use several CEO characteristics to control for potential effects from other CEO characteristics unrelated to information skills. We control for the CEO's cultural background related to firm performance in general and sustainability as well as diversity in particular. To this end, we include three of Hofstede et al.'s (2010) cultural dimensions, i.e., *individualism*, *long-term orientation*, and *indulgence*.[8] The cultural background may explain to which extent individuals are committed to sustainability and diversity and affect their behavior (Srikanth et al., 2016).

We also include CEOs' *tenure* since longer-serving CEOs are less willing to implement strategic changes (Weng & Lin, 2014). Therefore, we expect that *tenure* relates negatively to firm performance. Finally, we include the number of *boards* the CEOs are serving. CEOs serving on more boards have larger networks and, thus, a higher awareness of sustainability issues and stakeholder demands (Al-Dah, 2018). We expect CEOs affiliated with more boards to relate to stronger firm performance and higher TMT diversity.

We use indicators that may affect both the dependent variables and the CEO selection as firm control variables. We include the supervisory board's diversity (*board diversity*) calculated analogously to *TMT diversity* and consisting of the percentage of female board members, the standard deviation of age on the board, the mean number of board members' other boards, the Herfindahl index for the nationalities of the directors, and the Herfindahl index for their financial expertise. Through its influence on corporate governance, we expect *board diversity* to positively affect firm performance because more

[8] We exclude Hofestede et al.'s (2010) dimensions power distance, masculinity, and uncertainty avoidance due to multicollinearity.

diverse boards better represent stakeholders' interests and increase the understanding of their needs (Ararat et al., 2015; Harjoto et al., 2015).

We control for firm *size*, measured as the logarithm of the firm's average total assets. Harjoto et al. (2015) show that firm size positively relates to sustainability performance and different components of board diversity. Therefore, we expect that firm size positively relates to all dependent variables.

We include return on sales (*ROS*), measured as net income divided by sales, as a determinant for engagement in sustainability activities and diversity. More profitable firms may invest more in sustainability (Clarkson et al., 2011) and profitability may affect CEO choice and TMT structure (Anderson et al., 2011; Datta & Guthrie, 1994). Investors positively react to more profitable firms, leading to a positive association between *ROS* and *stock return* (Cho & Pucik, 2005; Varaiya et al., 1987).

We include *firm age*, measured as the time since either the firm's foundation or the year with the firm's first occurrence in the Thomson Reuters Datastream database if the foundation date is missing. We include *firm age* as Datta and Guthrie (1994) show that this variable affects the CEO selection. Finally, increasing sales represent firm growth, positively relate to TMT diversity (Anderson et al., 2011), and influence the CEO selection (Datta & Guthrie, 1994). We calculate *sales growth* as sales divided by previous year's sales.

As firm-level risk control variables that may affect the selection of the CEO, the engagement in sustainability, or the establishment of a more diverse TMT, we use leverage and stock return volatility. *Leverage* is calculated as long-term debt plus current liabilities divided by book debt and market value (Bernile et al., 2018). Since the risk factor affects the relation between diversity and firm performance (Ararat et al., 2015), we expect leverage to relate negatively to sustainability performance (Sun & Rakhman, 2013). *Stock*

return volatility is the annualized volatility of the firm's stock returns using daily stock prices (Bernile et al., 2018). *Stock return volatility* may negatively affect sustainability performance due to the increased market risk (Harjoto et al., 2015). Moreover, *stock return volatility* is also a proxy for disclosure quality, where lower volatility relates to higher disclosure quality (Kothari et al., 2009; Lang & Lundholm, 1993). Therefore, we expect *stock return volatility* to affect all three dependent variables negatively.

Finally, we include year- and industry-fixed effects. We add year-fixed effects to control for the general trend towards higher TMT diversity and more sustainability activities in the economic context in recent years and for macroeconomic conditions. We use the Fama-French 48 industry classification to include industry-fixed effects, which reduce differences between industries since some industries may have inherently more diverse TMTs, engage more in sustainability, or have inherently higher stock returns.

Descriptive Statistics

The data sample includes 16,335 firm-year observations over 22 years from 1999 to 2020 for 1,977 firms in Continental Europe. Table 1 presents descriptive statistics for the variables used in the main tests of this study. Columns (1) through (6) present the statistics for the whole sample, columns (7) through (9) for observations where the CEO is a former CFO, and (10) through (12) for observations where the CEO has not been CFO.

[Insert Table 1 here]

The average *stock return* is 10.3%, ranging from -81% to 234.6%. *ESG return* ranges from -43.5% to 136.5% for the whole sample, with a mean of 8%. The average *TMT Diversity* in the sample is at -0.620, ranging from -4.316 to 6.193. The average *ROS* of the sample firm is -7.9%, with a median value of 5.1%, showing that the firms in the sample are profitable most time, but there are some firm-years with very small values of *ROS*.

Comparing former-CFO CEOs and CEOs that have not been CFO shows a significantly lower mean of *tenure* for former-CFO CEOs. Furthermore, the number of other *boards* the CEO serves does not differ significantly between both groups. Regarding the cultural background of the CEOs, we do not find significant differences in the *indulgence* score. However, former-CFO CEOs have significantly higher scores for *individualism* and significantly lower scores for *long-term orientation*.

The data sample includes 2,020 CEO changes, of which 648 are promotions within the same firm. 145 of these newly appointed CEOs are former CFOs and 107 of them are internally promoted. 86 of these internal successions are direct promotions from the CFO to the CEO position. In total, 99 CFOs directly become CEO in the sample.

Table 2 reports pairwise correlations for the main variables of this study. The results report no correlation between *CFO past* and both *stock return* and *ESG return* and a positive and significant correlation between *CFO past* and *TMT diversity*. *ESG return* correlates positively with *stock return* and *TMT diversity* correlates positively with *ESG return*. Whereas *individualism* relates negatively to *CFO past* and *TMT diversity*, *long-term orientation* relates positively to both variables. In line with prior literature, *boards* relates positively to *ESG return* and *TMT diversity*. Moreover, *board diversity* correlates negatively with *stock return* and *ESG return* but positively with *TMT diversity*.

[Insert Table 2 here]

4 RESULTS

Validation of the Information Skills Variable

Based on the assumption of limited skill sets, this analysis aims to show that CEOs with information skills show less present other skills attributed to CEOs, such as general ability and interpersonal skills (Hansen et al., 2021; Kaplan et al., 2012; Kaplan & Sorensen,

2021). We use the regression model following Model (1) for this analysis, with *R&D intensity*, the change in capital intensity (*ΔCAPIN*), and *employee satisfaction* as dependent variables.[9]

Table 3 presents the results of the analysis. The results in Column (1) show that the coefficient of *CFO past* relates negatively and significantly to *R&D intensity*. Using *ΔCAPIN* as dependent variable in Column (2) yields a significant negative coefficient for *CFO past*. The result of the regression model also shows a negative and significant relation between *CFO past* and *employee satisfaction* in Column (3). These results suggest that firms face a tradeoff. CEOs have a specific skill set that affects firm outcomes in different ways. Whereas former-CFO CEOs have more pronounced information skills, they have less present general ability and interpersonal skills. Therefore, firms have to assess which skills are more crucial given a specific situation.

[Insert Table 3 here]

Former-CFO CEOs, Stock Return, and ESG Return

Table 4 presents the main results for Hypothesis *H1*. We use robust standard errors clustered at firm level to exclude potential effects of heteroskedasticity and serial correlation. Columns (1) and (2) present the results for *stock return*, and columns (3) and (4) the results for *ESG return* as dependent variable. We find significantly positive relations between *CFO past* and both dependent variables. When including CEO characteristics as controls, the main coefficients remain significant (columns (2) and (4)) and the model's explanatory power increases.

[9] *R&D intensity* is calculated as research and development expenses divided by the number of employees (Baysinger & Hoskisson, 1990). The change in capital intensity (*ΔCAPIN*) as the change in capital expenditures divided by total assets (Clarkson et al., 2011). *Employee satisfaction* is a proxy from Thomson Reuters Datastream and a score based on satisfaction measures reported by the company.

[Insert Table 4 here]

The results in Column (2) show that *CFO past* relates positively and statistically significantly to *stock return* (β=0.031, p<0.1), suggesting that CEOs' information skills relate to higher financial performance. Column (4) reports the results for *ESG return* as dependent variable showing a positive and significant association with *CFO past* (β=0.021, p<0.1).[10] Therefore, the results for the coefficients of *CFO past* in all analyses support *H1*, i.e., a former-CFO CEO positively relates to firm performance.

In Column (5), we examine further whether the increase in financial performance, shown in Column (2), can be partially attributed to the increase in sustainability performance, shown in Column (4), which relates to the former-CFO CEO. Employing a mediator analysis following MacKinnon et al. (2002) and including *ESG return* as an additional explanatory variable reveals that the coefficient for *CFO past* turns insignificant, whereas *ESG return* (β=0.039, p<0.1) relates significantly and positively to *stock return*. The results suggest that, on the one hand, CEOs with information skills positively relate to sustainability performance and, thereby, to increasing financial performance. On the other hand, CEOs with information skills also directly relate to increasing financial performance.

In terms of CEO control variables, we find that *long-term orientation* is, contrary to expectations, negatively associated with *ESG return* and *stock return. Indulgence* relates significantly negatively to *ESG return* but positively to *stock return*. The same holds for *tenure*. Regarding firm control variables, we find a negative and significant association between the previous year's *ESG* score and *ESG return*, in line with Flammer's (2013) argument for decreasing marginal effects of sustainability activities. Moreover, supervisory

[10] In untabulated tests, we examine the individual components of the ESG score and their returns. The results show that *CFO past* relates significantly and positively to the *social* and *governance score* as well as to *environmental* (one-tailed) and *governance return*. These results suggest that information skills positively relate to all aspects of sustainability performance.

board diversity and *size* relate significantly positively to *ESG return*. S*tock return volatility* relates significantly negatively to *stock return* and *ESG return*, whereas *leverage* relates negatively and significantly only to *stock return*.

Former-CFO CEOs, TMT Diversity, and Firm Performance

Table 5 presents the main results for *H2*. We use robust standard errors clustered at firm level to exclude potential effects of heteroskedasticity and serial correlation. Columns (1) and (2) present the results for *TMT diversity* as dependent variable. Columns (3) and (4) present the results for both financial and sustainability performance as dependent variables and a potential mediation effect.

[Insert Table 5 here]

We find a positive and significant relation between *CFO past* and *TMT diversity* in Column (1). When including CEO characteristics as controls in Column (2), the model's explanatory power increases and the results show that *CFO past* relates positively and statistically significantly to *TMT diversity* (β=1.059, $p<0.01$). Therefore, the results suggest that CEOs with information skills acquire new information sources.

Columns (4) and (5) present the results of the mediator analyses. As former-CFO CEOs relate to higher *TMT diversity*, we use a mediator analysis to examine whether such CEOs are able to coordinate the TMT and use the benefits to increase firm performance. The coefficient for *CFO past* remains significant for *stock return* as dependent variable (β=0.030, $p<0.1$) but at a smaller magnitude and turns insignificant for *ESG return* as dependent variable. The coefficient for *TMT diversity* is insignificant in both analyses. Therefore, the results suggest a full mediation for sustainability performance and a partial mediation for financial performance, supporting *H2*.

The results suggest that CEOs with information skills affect firm performance in two ways. The first way is by acquiring new information sources and dealing with the costs of diverse teams to improve decision-making. The second way is a more efficient usage of existing resources, including, e.g., a higher disclosure quality of more efficient processes (Hansen et al., 2021; Matsunaga et al., 2013).

Regarding the control variables, *indulgence* relates significantly negatively to *TMT diversity*, whereas the number of *boards* shows a positive and significant coefficient. Moreover, supervisory *board diversity* and *stock return volatility* relate significantly negatively to *TMT diversity*.

Additional Analyses

We perform several additional tests to show the robustness of the results depending on the conditions of CEO appointments and that information skills differ from financial expertise. Table 6 presents the results. The dependent variable is *stock return* in columns (1) through (4), *ESG return* in columns (5) through (8), and *TMT diversity* in columns (9) through (12).

[Insert Table 6 here]

In columns (1), (5), and (9), we present the results when including whether the preceding CEO is a former CFO. For *ESG return* as dependent variable, the marginal effect is negative if the former-CFO CEO's predecessor is also a former CFO. For *TMT diversity* as dependent variable, the interaction is insignificant, but the main effects of *CFO past* and *predecessor* relate significantly positively to *TMT diversity*, suggesting that, in general, CEOs with information skills use more heterogeneous information sources.[11]

[11] The interaction coefficient for *stock return* as dependent variable is one-tailed significant but positive, confirming prior findings.

The negative marginal effect regarding sustainability performance for two consecutive former-CFO CEOs may initially contradict expectations. However, following Flammer's (2013) argument that the marginal utility of increasing sustainability performance decreases, the result suggests that the predecessor has found a reliable level of sustainability performance for the firm, which the successor does not seem to increase further.

Columns (2), (6), and (10) report the results when comparing whether the CEO is promoted internally or externally. The results show a positive marginal effect on *stock return* when a former-CFO is promoted internally, suggesting that the CEO's information skills may be more beneficial when the CEO knows the firm better. For *TMT diversity* as dependent variable, the interaction coefficient is significantly negative, but the overall marginal effect is still positive. This result supports the argument of Friedman and Singh (1989) and Weng and Lin (2014) that externally-hired CEOs are more disruptive whereas internally-promoted CEOs are less disruptive, e.g., due to personal connections with other members of the TMT. Nevertheless, the overall marginal effect suggests that there is still some disruption even if the new CEO is internally promoted.

Regarding direct promotions from CFO to CEO in columns (3), (7), and (11), we find significant and positive results for all three dependent variables, which are larger than their corresponding *CFO past* coefficients in the main analyses. These results suggest that the information skills of CEOs directly promoted from the CEO position are more present than when they have had other positions in-between.

Finally, columns (4), (8), and (12) report the results when including financial expertise (*finance*) as a further control variable. The results show that *CFO past* is positive and significant for *stock return* and *TMT diversity* as dependent variables.[12] *Finance* is

[12] For *ESG return* as dependent variable, the coefficient for *CFO past* is one-tailed significant and positive.

insignificant for all three dependent variables. Therefore, the results suggest that information skills differ from financial expertise and that the increased firm performance and the acquisition of information sources result from the knowledge about information processing to improve decisions.

5 CONCLUSION

This study examines whether CEOs with information skills relate to increased firm performance through the acquisition of new information sources that enable better decision-making or the more efficient usage of existing resources. The proxy for information skills is a previously held CFO position since the tasks of CFOs as primary contact for investors and main responsible for the firm's information system (Loyeung & Spiropoulous, 2015; Mian, 2001; Naranjo-Gil et al., 2009) require high levels of information skills (Hansen et al., 2021; Kaplan & Sorensen, 2021).

The findings show that former-CFO CEOs positively relate to stock return, sustainability return, and TMT diversity. The results are robust when applying several additional tests and controlling for different conditions affecting the outcome of CEO appointments. Moreover, we show that TMT diversity partially mediates the relation between former-CFO CEOs and firm performance. We provide evidence that CEOs with information skills affect firm performance in two ways – through the acquisition and efficient processing of new information sources and the more efficient usage of existing resources.

Nevertheless, the study also has some limitations. First, the sample is unbalanced regarding the distribution of firms with and without former-CFO CEOs. Second, both measures of sustainability performance only reflect the market's perception. Since sustainability performance is complex to measure and disclosures are not as standardized

as accounting measures, we use the ESG rating as a comparable measure among a broad range of companies.

The study provides fertile ground for further research. First, future research could examine the role of incentives for CEO decisions to change the TMT composition or engage in sustainability activities. Prior research indicates that incentive payments lead to increased environmental performance (Russo & Harrison, 2005). Therefore, future research could examine whether CEOs with information skills get different incentives for sustainability performance and TMT diversity. Second, future research could take a closer look at the differences between targets of CEOs with and without information skills. Third, future research could more broadly examine the effects of CEO skills on firm outcomes and the interaction of TMT members with different skills. This broad examination would clarify the relations between individual roles and deliver answers on the optimal composition of TMTs.

In conclusion, to the best of our knowledge, this study is the first to examine the importance of CEOs' information skills. As the study demonstrates, information skills are beneficial to acquire new information sources through more diverse teams and to more efficiently use existing resources to improve firm performance, e.g., through process improvements or higher disclosure quality. Therefore, the study adds to the emerging stream of research on CEO skills and provides evidence that information skills are an essential CEO characteristic to address today's challenges on diversity and sustainability.

Appendix

Variable Definitions.

Variable	Definition
DEPENDENT VARIABLES	
Stock Return	The absolute change in stock prices divided by the previous year's stock price.
ESG Return	The absolute change in ESG scores divided by the previous year's ESG score.
TMT Diversity	Sum of standardized values for the percentage of female TMT members, the standard deviation of age, the number of boards, the Herfindahl index of nationality, and the Herfindahl index of financial expertise, following Bernile et al. (2018).
INDEPENDENT VARIABLE	
CFO Past	Binary indicator, which is equal to one when the CEO has been CFO in the past and zero otherwise. We manually identify CEOs for each firm-year based on the job title in the BoardEx database. After an initial round, we replicate the procedure and clarify ambiguous evaluations. We check if each firm has one CEO per year and delete observations if it was impossible to identify one clear CEO in the firm-year. To determine whether the CEO is a former CFO, we manually identify CFO positions based on the job title in the BoardEx database.
CONTROL VARIABLES	
ESG	Thomson Reuters Datastream's ESG score.
Individualism	Cultural dimension of Hofstede et al. (2010).
Long-term Orientation	Cultural dimension of Hofstede et al. (2010).
Indulgence	Cultural dimension of Hofstede et al. (2010).
Tenure	Tenure of the CEO.
Boards	Number of boards the CEO is serving.
Board Diversity	Diversity of the supervisory board calculated analogously to TMT diversity.
Size	Natural logarithm of the average total assets.
ROS	Net income divided by sales.
Stock Return Volatility	Annualized volatility of stock returns using daily stock prices (Bernile et al., 2018).

Firm Age	The time between either the firm's foundation or the firm's first occurrence in the Datastream database if the foundation date is missing and the respective observation's year.
Leverage	Long-term debt plus current liabilities divided by the sum of book debt and market value (Bernile et al., 2018).
Sales Growth	Sales divided by the previous year's sales.
ESG	Thomson Reuters Datastream's ESG score.
ADDITIONAL ANALYSES	
R&D Intensity	R&D expenses divided by the number of employees.
ΔCAPIN	Capital intensity divided by the previous year's capital intensity.
CAPIN	Capital expenditures divided by the previous year's total assets.
Employee Satisfaction	Thomson Reuters Datastream's employee satisfaction score.
Predecessor	Binary indicator whether the previous CEO has been a former CFO.
Same Firm	Binary indicator whether the new CEO is promoted internally.
Direct	Binary indicator whether the CEO has been CFO directly before being appointed as CEO.
Finance	Binary indicator of whether the CEO has financial expertise. We measure financial expertise using the description of the managers' educational data and their job titles. The binary financial expertise indicator switches to one starting with the year the manager completes her education or starts a job with financial reference.

Note: This table lists the calculation of the main variables of the empirical analysis and the data source.

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Table 1: Descriptive Statistics

							CFO Past = 1			*CFO Past = 0*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Obs.	Mean	Std. Dev.	Min	Median	Max	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
Stock Return	16,335	0.103	0.463	-0.810	0.059	2.346	791	0.109	0.500	15,544	0.103	0.461
ESG Return	6,570	0.083	0.258	-0.435	0.026	1.368	374	0.079	0.242	6,196	0.083	0.259
TMT Diversity	16,335	-0.620	2.721	-4.316	-0.632	6.193	791	0.491	2.660	15,544	-0.677	2.712
CFO Past	16,335	0.048	0.215	0.000	0.000	1.000	791	1.000	0.000	15,544	0.000	0.000
Individualism	16,335	68.612	12.034	20.000	71.000	91.000	791	67.042	13.550	15,544	68.692	11.947
Long-term Orientation	16,335	61.258	16.142	20.403	63.476	87.406	791	63.193	19.788	15,544	61.160	15.929
Indulgence	16,335	51.843	14.647	15.625	47.768	97.321	791	51.836	12.995	15,544	51.843	14.727
Tenure	16,335	8.736	5.072	1.000	8.000	22.000	791	7.824	4.282	15,544	8.782	5.105
Boards	16,335	1.827	1.395	1.000	1.000	16.000	791	1.861	1.882	15,544	1.825	1.366
Board Diversity	16,335	-0.246	2.570	-8.528	0.017	5.075	791	-0.259	2.444	15,544	-0.245	2.577
Size	16,335	14.988	2.405	7.885	14.820	20.652	791	14.940	2.340	15,544	14.991	2.408
ROS	16,335	-0.079	1.719	-23.065	0.051	3.399	791	-0.240	2.677	15,544	-0.070	1.655
Stock Return Volatility	16,335	0.353	0.191	0.030	0.307	1.602	791	0.368	0.220	15,544	0.352	0.190
Firm Age	16,335	52.871	49.344	1.000	31.000	190.000	791	55.162	53.479	15,544	52.754	49.123
Leverage	16,335	3.696	6.470	-7.778	1.591	35.051	791	3.280	5.243	15,544	3.717	6.526
Sales Growth	16,335	1.107	0.494	0.004	1.051	6.752	791	1.081	0.431	15,544	1.108	0.497

Note: This table presents descriptive statistics on the main variables used in the analyses for *H1* and *H2*. *Stock return* is calculated by dividing the absolute change in stock prices by the previous year's stock price. *ESG return* is calculated by dividing the absolute change in ESG scores by the previous year's score. *TMT diversity* is the sum of standardized values for the percentage of female TMT members, the standard deviation of age, the number of boards, the Herfindahl index of nationality, and the Herfindahl index of financial expertise, following Bernile et al. (2018). *CFO past* indicates whether the CEO has been CFO in the past. *Individualism*, *long-term orientation*, and *indulgence* are cultural dimensions of Hofstede et al. (2010). *Tenure* is the tenure of the CEO. *Boards* is the number of boards the CEO is serving. *Board diversity* is the diversity of the supervisory board calculated analogously to TMT diversity. *Size* is the natural logarithm of the average total assets. *ROS* is measured as net income divided by sales. *Stock return volatility* is the annualized volatility of stock returns using daily stock prices (Bernile et al., 2018). *Firm age* is the time between either the firm's foundation or the firm's first occurrence in the Datastream database and the respective observation's year. *Leverage* is calculated by dividing long-term debt plus current liabilities by book debt and market value (Bernile et al., 2018). *Sales growth* is sales divided by the previous year's sales.

Table 2: Pariwise Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) CFO Past	1.000														
(2) Stock Return	0.003	1.000													
(3) ESG Return	-0.004	0.058***	1.000												
(4) TMT	0.092***	-0.004	0.026**	1.000											
(5) Individualism	-0.029***	0.001	-0.011	-0.060***	1.000										
(6) Long-Term Orientation	0.027***	-0.008	-0.003	0.079***	0.134***	1.000									
(7) Indulgence	0.000	0.022***	-0.011	-0.149***	0.354***	-0.325***	1.000								
(8) Tenure	-0.041***	0.049***	-0.007	0.044***	0.008	0.030***	-0.006	1.000							
(9) Boards	0.005	0.000	0.023*	0.385***	0.016**	0.032***	-0.024***	0.066***	1.000						
(10) Board	-0.001	-0.014*	-0.051***	0.043***	0.020**	-0.010	-0.037***	0.040***	0.189***	1.000					
(11) Size	-0.004	-0.014*	-0.061***	0.092***	-0.130***	-0.024***	-0.029***	-0.016**	0.238***	0.322***	1.000				
(12) ROS	-0.021***	0.053***	0.035***	0.024***	-0.029***	0.055***	-0.020**	0.040***	0.031***	0.026***	0.158***	1.000			
(13) Stock Return Volatility	0.018**	-0.166***	0.004	-0.074***	0.002	-0.086***	0.028***	-0.115***	-0.082***	-0.126***	-0.244***	-0.213***	1.000		
(14) Firm Age	0.010	-0.008	-0.020*	0.074***	0.017**	0.165***	-0.041***	0.026***	0.153***	0.129***	0.306***	0.059***	-0.141***	1.000	
(15) Leverage	-0.015*	-0.050***	-0.015	0.068***	-0.050***	0.030***	-0.056***	-0.089***	0.071***	0.025***	0.432***	0.034***	-0.005	0.164***	1.000
(16) Sales	-0.012	0.127***	0.066***	-0.004	0.007	-0.017**	0.005	-0.017**	0.010	-0.037***	-0.083***	0.004	0.030***	-0.070***	-0.032***

Note: This table presents pairwise correlations on the main variables used in the analyses for *H1* and *H2*. *CFO past* indicates whether the CEO has been CFO in the past. *Stock return* is calculated by dividing the absolute change in stock prices by the previous year's stock price. *ESG return* is calculated by dividing the absolute change in ESG scores by the previous year's score. *TMT diversity* is the sum of standardized values for the percentage of female TMT members, the standard deviation of age, the number of boards, the Herfindahl index of nationality, and the Herfindahl index of financial expertise, following Bernile et al. (2018). *Individualism*, *long-term orientation*, and *indulgence* are cultural dimensions of Hofstede et al. (2010). *Tenure* is the tenure of the CEO. *Boards* is the number of boards the CEO is serving. *Board diversity* is the diversity of the supervisory board calculated analogously to TMT diversity. *Size* is the natural logarithm of the average total assets. *ROS* is measured as net income divided by sales. *Stock return volatility* is the annualized volatility of stock returns using daily stock prices (Bernile et al., 2018). *Firm age* is the time between either the firm's foundation or the firm's first occurrence in the Datastream database and the respective observation's year. *Leverage* is calculated by dividing long-term debt plus current liabilities by book debt and market value (Bernile et al., 2018). *Sales growth* is sales divided by the previous year's sales.

Table 3: Tradeoff between Information Skills and Other CEO Skills

	(1) R&D Intensity	(2) ΔCAPIN	(3) Employee Satisfaction
CFO Past	-7.739***	-1.170*	-0.040*
	(2.905)	(0.634)	(0.020)
Individualism	-0.065	-0.087*	0.000
	(0.085)	(0.049)	(0.000)
Long-term Orientation	-0.048	0.048	0.000
	(0.078)	(0.039)	(0.000)
Indulgence	0.496***	0.097	0.000
	(0.095)	(0.064)	(0.000)
Tenure	-0.398**	0.005	-0.001
	(0.176)	(0.080)	(0.001)
Boards	-0.061	1.265	-0.003
	(0.525)	(0.862)	(0.004)
Board Diversity	1.324***	-0.137	0.000
	(0.320)	(0.241)	(0.003)
Size	1.957**	-0.283	0.006**
	(0.922)	(0.318)	(0.003)
ROS	-6.967***	0.104	0.048***
	(1.897)	(0.112)	(0.014)
Stock Return Volatility	19.709***	1.108	-0.013
	(4.818)	(1.380)	(0.025)
Firm Age	-0.032	-0.017	-0.000
	(0.021)	(0.015)	(0.000)
Leverage	-0.525***	0.021	-0.001
	(0.127)	(0.074)	(0.001)
Sales Growth	7.888***	5.099	-0.002
	(2.392)	(3.314)	(0.013)
$CAPIN_{t-1}$		-40.140***	
		(12.108)	
Constant	-62.426***	-4.919	0.637***
	(14.030)	(7.414)	(0.060)
Observations	15,603	15,661	932
Industry/Year FE	YES	YES	NO
Robust/Cluster	YES	YES	YES
Adjusted R^2	0.221	0.004	0.044

continued on the next page

Table 3 (cont.)

Note: This table reports regression results for tests whether CEOs with information skills have less-present further CEO-attributed skills. Column (1) examines how information skills relate to innovation measured by *R&D Intensity*. Column (2) examines the relation between information skills and risk appetite measured by *ΔCAPIN*. Column (3) examines the relation between information skills and leadership skills measured by *employee satisfaction*. *R&D Intensity* is calculated by dividing R&D expenses by the number of employees. *ΔCAPIN* is calculated by dividing capital intensity by the previous year's capital intensity. *Employee Satisfaction* is Thomson Reuters Datastream's employee satisfaction score. *CFO past* indicates whether the CEO has been CFO in the past. *Individualism*, *long-term orientation*, and *indulgence* are cultural dimensions of Hofstede et al. (2010). *Tenure* is the tenure of the CEO. *Boards* is the number of boards the CEO is serving. *Board diversity* is the diversity of the supervisory board calculated analogously to TMT diversity. *Size* is the natural logarithm of the average total assets. *ROS* is measured as net income divided by sales. *Stock return volatility* is the annualized volatility of stock returns using daily stock prices (Bernile et al., 2018). *Firm age* is the time between either the firm's foundation or the firm's first occurrence in the Datastream database and the respective observation's year. *Leverage* is calculated by dividing long-term debt plus current liabilities by book debt and market value (Bernile et al., 2018). *Sales growth* is sales divided by the previous year's sales. *CAPIN* are capital expenditures divided by the previous year's total assets.
We estimate the models using an OLS regression with robust standard errors clustered by firms and years that are reported in parentheses. *, **, *** indicate two-tailed significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 4: Information Skills, Financial, and Sustainability Performance

	(1) Stock Return	(2) Stock Return	(3) ESG Return	(4) ESG Return	(5) Stock Return
CFO Past	0.027*	0.031*	0.020*	0.021*	0.021
	(0.016)	(0.016)	(0.012)	(0.012)	(0.022)
ESG Return					0.039*
					(0.020)
Individualism		-0.000		0.000	-0.000
		(0.000)		(0.000)	(0.000)
Long-term Orientation		-0.000**		-0.001**	-0.000
		(0.000)		(0.000)	(0.000)
Indulgence		0.001**		-0.001***	0.001***
		(0.000)		(0.000)	(0.000)
Tenure		0.003***		-0.002***	0.003***
		(0.001)		(0.001)	(0.001)
Boards		-0.003		-0.002	-0.005
		(0.002)		(0.003)	(0.003)
Board Diversity	-0.002	-0.001	0.004**	0.005***	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Size	-0.002	-0.002	0.021***	0.022***	0.002
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)
ROS	0.008**	0.008**	0.010	0.010	0.030***
	(0.003)	(0.003)	(0.007)	(0.007)	(0.010)
Stock Return Volatility	-0.245***	-0.240***	-0.038*	-0.048**	-0.296***
	(0.024)	(0.024)	(0.023)	(0.023)	(0.044)
Firm Age	-0.000***	-0.000***	0.000	0.000**	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	-0.003***	-0.002***	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Sales Growth	0.084***	0.084***	0.015	0.016	0.139***
	(0.012)	(0.012)	(0.015)	(0.014)	(0.032)
ESG_{t-1}			-0.006***	-0.006***	-0.001*
			(0.000)	(0.000)	(0.000)
Constant	0.388***	0.384***	0.836***	0.932***	-0.345***
	(0.054)	(0.059)	(0.071)	(0.076)	(0.096)
Observations	16,287	16,287	6,537	6,537	6,537
Industry/Year FE	YES	YES	YES	YES	YES
Robust/Cluster	YES	YES	YES	YES	YES
Adjusted R^2	0.273	0.275	0.168	0.171	0.357

continued on the next page

Table 4 (cont.)

Note: This table reports regression results for *H1*. Columns (1) and (2) report results for the relation between *CFO past* and *stock return*. Columns (3) and (4) report results for the relation of *CFO past* and to *ESG return*. Column (5) reports the mediator analyses that *ESG return* mediates the relation between *CFO past* and *stock return*. *Stock return* is calculated by dividing the absolute change in stock prices by the previous year's stock price. *ESG return* is calculated by dividing the absolute change in ESG scores by the previous year's score. *CFO past* indicates whether the CEO has been CFO in the past. *Individualism*, *long-term orientation*, and *indulgence* are cultural dimensions of Hofstede et al. (2010). *Tenure* is the tenure of the CEO. *Boards* is the number of boards the CEO is serving. *Board diversity* is the diversity of the supervisory board calculated analogously to TMT diversity. *Size* is the natural logarithm of the average total assets. *ROS* is measured as net income divided by sales. *Stock return volatility* is the annualized volatility of stock returns using daily stock prices (Bernile et al., 2018). *Firm age* is the time between either the firm's foundation or the firm's first occurrence in the Datastream database and the respective observation's year. *Leverage* is calculated by dividing long-term debt plus current liabilities by book debt and market value (Bernile et al., 2018). *Sales growth* is sales divided by the previous year's sales. *ESG* is Thomson Reuters Datastream's ESG score.
We estimate the models using an OLS regression with robust standard errors clustered by firms and years that are reported in parentheses. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 5: Information Skills, Information Sources, and Firm Performance

	(1) TMT Diversity	(2) TMT Diversity	(3) Stock Return	(4) ESG Return
CFO Past	1.226***	1.059***	0.030*	0.019†
	(0.220)	(0.189)	(0.016)	(0.012)
TMT Diversity			0.001	0.001
			(0.001)	(0.001)
Individualism		-0.008	-0.000	0.000
		(0.005)	(0.000)	(0.000)
Long-term Orientation		0.005	-0.000**	-0.001**
		(0.003)	(0.000)	(0.000)
Indulgence		-0.021***	0.001**	-0.001***
		(0.004)	(0.000)	(0.000)
Tenure		0.008	0.003***	-0.002***
		(0.011)	(0.001)	(0.001)
Boards		0.746***	-0.003	-0.003
		(0.030)	(0.002)	(0.003)
Board Diversity	0.005	-0.059***	-0.001	0.005***
	(0.021)	(0.018)	(0.002)	(0.002)
Size	0.058*	-0.024	-0.002	0.022***
	(0.031)	(0.028)	(0.002)	(0.003)
ROS	0.010	0.013	0.008**	0.010
	(0.021)	(0.020)	(0.003)	(0.007)
Stock Return Volatility	-0.861***	-0.684***	-0.240***	-0.048**
	(0.217)	(0.203)	(0.024)	(0.023)
Firm Age	0.002*	0.000	-0.000***	0.000**
	(0.001)	(0.001)	(0.000)	(0.000)
Leverage	0.001	0.003	-0.002***	0.001
	(0.010)	(0.009)	(0.001)	(0.001)
Sales Growth	0.061	0.008	0.084***	0.016
	(0.051)	(0.048)	(0.012)	(0.014)
ESG_{t-1}				-0.006***
				(0.000)
Constant	-2.695***	-1.246	0.384***	0.932***
	(0.868)	(0.940)	(0.059)	(0.076)
Observations	16,287	16,287	16,287	6,537
Industry/Year FE	YES	YES	YES	YES
Robust/Cluster	YES	YES	YES	YES
Adjusted R-squared	0.073	0.216	0.275	0.171

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Table 5 (cont.)

Note: This table reports regression results for *H2*. Columns (1) and (2) report results for the relation between *CFO past* and *TMT diversity*. Columns (3) and (4) report the mediator analyses that *TMT diversity* mediates the relation between *CFO past* and *stock return,* respectively *ESG return*. *TMT diversity* is the sum of standardized values for the percentage of female TMT members, the standard deviation of age, the number of boards, the Herfindahl index of nationality, and the Herfindahl index of financial expertise, following Bernile et al. (2018). *Stock return* is calculated by dividing the absolute change in stock prices by the previous year's stock price. *ESG return* is calculated by dividing the absolute change in ESG scores by the previous year's score. *CFO past* indicates whether the CEO has been CFO in the past. *Individualism*, *long-term orientation*, and *indulgence* are cultural dimensions of Hofstede et al. (2010). *Tenure* is the tenure of the CEO. *Boards* is the number of boards the CEO is serving. *Board diversity* is the diversity of the supervisory board calculated analogously to TMT diversity. *Size* is the natural logarithm of the average total assets. *ROS* is measured as net income divided by sales. *Stock return volatility* is the annualized volatility of stock returns using daily stock prices (Bernile et al., 2018). *Firm age* is the time between either the firm's foundation or the firm's first occurrence in the Datastream database and the respective observation's year. *Leverage* is calculated by dividing long-term debt plus current liabilities by book debt and market value (Bernile et al., 2018). *Sales growth* is sales divided by the previous year's sales. *ESG* is Thomson Reuters Datastream's ESG score.

We estimate the models using an OLS regression with robust standard errors clustered by firms and years that are reported in parentheses. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively. † indicates one-tailed significance at the 10 percent level.

Table 6: Additional Analysis examining the Conditions of CEO Appointments on Firm Performance

	Stock Return				*ESG Return*				*TMT Diversity*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Predecessor	Same Firm	Direct Promotion	Financial Expertise	Predecessor	Same Firm	Direct Promotion	Financial Expertise	Predecessor	Same Firm	Direct Promotion	Financial Expertise
CFO Past	0.029†	0.025†		0.043**	0.010	0.020†		0.020†	1.111***	1.080***		1.131***
	(0.019)	(0.017)		(0.017)	(0.015)	(0.013)		(0.014)	(0.225)	(0.205)		(0.210)
Predecessor	-0.018				0.036†				0.606*			
	(0.021)				(0.023)				(0.342)			
CFO	0.065†				-0.106*				-0.835			
	(0.051)				(0.061)				(0.937)			
Same Firm		-0.040**				-0.014				0.809***		
		(0.016)				(0.016)				(0.115)		
*CFO Past*Same*		0.075*				0.016				-0.756***		
		(0.045)				(0.037)				(0.271)		
Direct			0.078**				0.082*				1.064***	
			(0.035)				(0.049)				(0.263)	
Finance				-0.015**				0.001				-0.093
				(0.008)				(0.008)				(0.120)
Individualism	-0.000	-0.000	-0.000	-0.000	-0.001*	0.000	0.000	0.000	-0.017**	-0.008	-0.008*	-0.008
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)	(0.005)	(0.005)	(0.005)
Long-term	-0.001**	-0.000**	-0.000**	-0.000**	-0.000	-0.001**	-0.001**	-0.001**	0.007	0.004	0.005	0.004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.003)	(0.003)	(0.003)
Indulgence	0.001***	0.001**	0.001**	0.001**	-0.001***	-0.001***	-0.001***	-0.001***	-0.008	-0.020***	-0.020***	-0.020***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.004)	(0.004)	(0.004)
Tenure	0.003***	0.003***	0.003***	0.003***	0.000	-0.002***	-0.002***	-0.002***	-0.029*	0.011	0.007	0.007
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.017)	(0.011)	(0.011)	(0.011)

continued on the next page

Table 6 (cont.)

	Stock Return				*ESG Return*				*TMT Diversity*			
	(1) Predecessor	(2) Same Firm	(3) Direct Promotion	(4) Financial Expertise	(5) Predecessor	(6) Same Firm	(7) Direct Promotion	(8) Financial Expertise	(9) Predecessor	(10) Same Firm	(11) Direct Promotion	(12) Financial Expertise
Boards	0.000	-0.003	-0.003	-0.003	-0.004	-0.002	-0.002	-0.002	0.693***	0.749***	0.747***	0.747***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.039)	(0.030)	(0.029)	(0.030)
Board Diversity	-0.001	-0.001	-0.001	-0.001	0.002	0.005***	0.005***	0.005***	-0.079***	-0.058***	-0.061***	-0.059***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.030)	(0.018)	(0.018)	(0.018)
Size	-0.004	-0.002	-0.002	-0.002	0.025***	0.022***	0.022***	0.022***	-0.001	-0.026	-0.024	-0.023
	(0.003)	(0.002)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)	(0.044)	(0.028)	(0.029)	(0.028)
ROS	0.010	0.008**	0.008**	0.008**	0.018**	0.010	0.010	0.010	-0.033	0.013	0.012	0.013
	(0.006)	(0.003)	(0.003)	(0.003)	(0.009)	(0.007)	(0.007)	(0.007)	(0.037)	(0.020)	(0.020)	(0.020)
Stock Return	-0.359***	-0.240***	-0.239***	-0.240***	-0.039	-0.048**	-0.048**	-0.048**	-1.083***	-0.682***	-0.643***	-0.684***
	(0.029)	(0.024)	(0.024)	(0.024)	(0.026)	(0.023)	(0.023)	(0.023)	(0.280)	(0.202)	(0.202)	(0.203)
Firm Age	-0.000**	-0.000***	-0.000***	-0.000***	0.000***	0.000**	0.000**	0.000**	0.001	0.000	0.001	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.001)	(0.001)
Leverage	-0.002**	-0.002***	-0.002***	-0.002***	0.001	0.001	0.001	0.001	0.012	0.003	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.012)	(0.009)	(0.009)	(0.009)
Sales Growth	0.075***	0.084***	0.084***	0.084***	0.032	0.015	0.016	0.016	0.001	0.009	0.005	0.008
	(0.020)	(0.012)	(0.012)	(0.012)	(0.030)	(0.014)	(0.014)	(0.014)	(0.077)	(0.048)	(0.048)	(0.048)
ESG_{t-1}					-0.006***	-0.006***	-0.006***	-0.006***				
					(0.000)	(0.000)	(0.000)	(0.000)				
Constant	0.518**	0.383***	0.381***	0.383***	0.880***	0.935***	0.930***	-0.068	-0.615	-1.236	-1.320	-1.250
	(0.218)	(0.059)	(0.059)	(0.059)	(0.092)	(0.076)	(0.076)	(0.076)	(1.360)	(0.928)	(0.945)	(0.938)

continued on the next page

Table 6 (cont.)

	Stock Return				*ESG Return*				*TMT Diversity*			
	(1) Predecessor	(2) Same Firm	(3) Direct Promotion	(4) Financial Expertise	(5) Predecessor	(6) Same Firm	(7) Direct Promotion	(8) Financial Expertise	(9) Predecessor	(10) Same Firm	(11) Direct Promotion	(12) Financial Expertise
Observations	7,042	16,287	16,287	16,287	3,925	6,537	6,537	6,537	7,042	16,287	16,287	16,287
Industry/Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Robust/Cluster	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Adjusted R^2	0.304	0.275	0.275	0.275	0.195	0.171	0.171	0.171	0.237	0.218	0.210	0.216

Note: This table reports regression results to show robustness to the information skills of the preceding CEO (columns (1), (5), and (9)), the internal versus external promotion of the incumbent CEO (columns (2), (6), and (10)), the direct or indirect promotion from the CFO position to the CEO (columns (3), (7), and (11)), and to financial expertise of CEOs (columns (4), (8), and (12)). *Stock return* is calculated by dividing the absolute change in stock prices by the previous year's stock price. *ESG return* is calculated by dividing the absolute change in ESG scores by the previous year's score. *TMT diversity* is the sum of standardized values for the percentage of female TMT members, the standard deviation of age, the number of boards, the Herfindahl index of nationality, and the Herfindahl index of financial expertise, following Bernile et al. (2018). *CFO past* indicates whether the CEO has been CFO in the past. *Predecessor* indicates whether the preceding CEO has been a former CFO. *Same firm* indicates whether the CEO is appointed from inside the firm. *Direct* indicates whether the CEO has been CFO directly before being appointed as CEO. *Finance* indicates whether the CEO has financial expertise. *Individualism*, *long-term orientation*, and *indulgence* are cultural dimensions of Hofstede et al. (2010). *Tenure* is the tenure of the CEO. *Boards* is the number of boards the CEO is serving. *Board diversity* is the diversity of the supervisory board calculated analogously to TMT diversity. *Size* is the natural logarithm of the average total assets. *ROS* is measured as net income divided by sales. *Stock return volatility* is the annualized volatility of stock returns using daily stock prices (Bernile et al., 2018). *Firm age* is the time between either the firm's foundation or the firm's first occurrence in the Datastream database and the respective observation's year. *Leverage* is calculated by dividing long-term debt plus current liabilities by book debt and market value (Bernile et al., 2018). *Sales growth* is sales divided by the previous year's sales. *ESG* is Thomson Reuters Datastream' s ESG score.

We estimate the models using an OLS regression with robust standard errors clustered by firms and years that are reported in parentheses. *, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively. † indicates one-tailed significance at the 10 percent level.