

Behavioral Corporate Finance: The Life Cycle of a CEO Career

Marius Guenzel[†]

Ulrike Malmendier[‡]

July 31, 2020

Summary

One of the fastest-growing areas of finance research is the study of managerial biases and their implications for firm outcomes. Since the mid-2000s, this strand of *behavioral corporate finance* has provided theoretical and empirical evidence on the influence of biases in the corporate realm, such as overconfidence, experience effects, and the sunk-cost fallacy. The field has been a leading force in dismantling the argument that traditional economic mechanisms—selection, learning, and market discipline—would suffice to uphold the rational-manager paradigm. Instead, the evidence reveals that behavioral forces exert a significant influence at every stage of a chief executive officer’s (CEO’s) career. First, at the appointment stage, selection does not impede the promotion of behavioral managers. Instead, competitive environments oftentimes promote their advancement, even under value-maximizing selection mechanisms. Second, while at the helm of the company, learning opportunities are limited, since many managerial decisions occur at low frequency, and their causal effects are clouded by self-attribution bias and difficult to disentangle from those of concurrent events. Third, at the dismissal stage, market discipline does not ensure the firing of biased decision-makers as board members themselves are subject to biases in their evaluation of CEOs.

By documenting how biases affect even the most educated and influential decision-makers, such as CEOs, the field has generated important insights into the hard-wiring of biases. Biases

[†] The Wharton School, University of Pennsylvania.
mguenzel@wharton.upenn.edu.

[‡] Department of Economics and Haas School of Business, UC Berkeley; NBER, CEPR, briq, IZA.
ulrike@berkeley.edu.

do not simply stem from a lack of education, nor are they restricted to low-ability agents. Instead, biases are significant elements of human decision-making at the highest levels of organizations.

An important question for future research is how to limit, in each CEO career phase, the adverse effects of managerial biases. Potential approaches include refining selection mechanisms, designing and implementing corporate repairs, and reshaping corporate governance to account not only for incentive misalignments but also for biased decision-making.

Keywords: Managerial Biases, Behavioral Corporate Finance, CEO Careers, Corporate Governance, Organizational Economics, Investment, Mergers and Acquisitions, Financing

Chief executive officers (CEOs) and other top-level managers make decisions with far-reaching consequences for different stakeholders. Production decisions, for example, can have a substantial impact on both shareholder value and employment. Consider the aviation industry and the announcement by Airbus in 2019 that they would discontinue production of their flagship A380.¹ The announcement came after years of persistent cost explosions, development failures, and canceled orders. The news increased shareholder wealth by \$1.9bn on announcement day, but the decision was also expected to result in up to 3,500 job cuts and reassignments in multiple European countries.

Standard neoclassical economics assumes that all managerial decisions are based on rational payoff maximization. Apparent failures to maximize shareholder value, such as the delay in halting production of the Airbus A380, are attributed to incentive misalignment or uncertainty. Growing research in *behavioral corporate finance*, however, shows that biases and systematic mistakes in managerial decisions are oftentimes the better explanation.

Even though behavioral corporate finance has become one of the most active areas of research in finance, early behavioral research did not include the analysis of managerial decisions, but focused exclusively on biases in individual investors (e.g., overconfidence and cognitive limitations in Barber and Odean 2000; Lamont and Thaler 2003). Successful C-level managers were thought to be immune to these psychological forces. If anything, managers might exploit the biases of investors by timing the market (Baker et al. 2003; Baker and Wurgler 2000).

Why did early behavioral work draw such a stark contrast between managers and other agents? Why would managers not be subject to biases and systematic mistakes when lay people are? Why did the paradigm of the rational manager remain intact, even as the field's foremost motivation was to provide better explanations for puzzling investment and financing decisions such as the introductory Airbus example?

The rational-manager paradigm is predicated on three pillars: (a) selection, (b) learning, and (c) market discipline. As for the first, corporate executives are *not* a random subsample of the

¹ After being in service for less than 12 years, the Airbus A380 had cost \$25 billion and “never turned a profit” even though “executives long maintained that demand would take off”; cf. the February 14, 2019 Wall Street Journal and New York Times articles [wsj.com/articles/airbus-will-stop-building-its-a380-superjumbo-jet-11550121699](https://www.wsj.com/articles/airbus-will-stop-building-its-a380-superjumbo-jet-11550121699) and [nytimes.com/2019/02/14/business/airbus-a380.html](https://www.nytimes.com/2019/02/14/business/airbus-a380.html).

population. They are smart and highly educated, and therefore presumed not to be susceptible to the biases of consumers and investors. As for the second, managers may make occasional mistakes, but are presumed to learn, update rationally, and optimize going forward. And the third pillar, market discipline, reflects that managers are closely monitored by corporate boards and the market, keeping any bias-driven errors at bay.

The new wave of behavioral corporate finance research that began to appear in the mid-to-late 2000s has drastically altered this line of reasoning. A convincing body of evidence documents systematic and persistent biases in managerial decision-making, including overconfidence, reference-dependent thinking, and reliance on cognitive shortcuts, and reveals that managers' character traits and past experiences shape their decisions. Circling back to the Airbus example, empire-building motives and rational career concerns are factors that might have contributed to the A380 decision timeline; but so are overconfidence (about product quality), the sunk-cost fallacy (in light of project overruns in excess of \$10 billion), managerial envy (of Boeing's 747 "jumbo jet"), and biased projections (of airline demand for supersized jets).

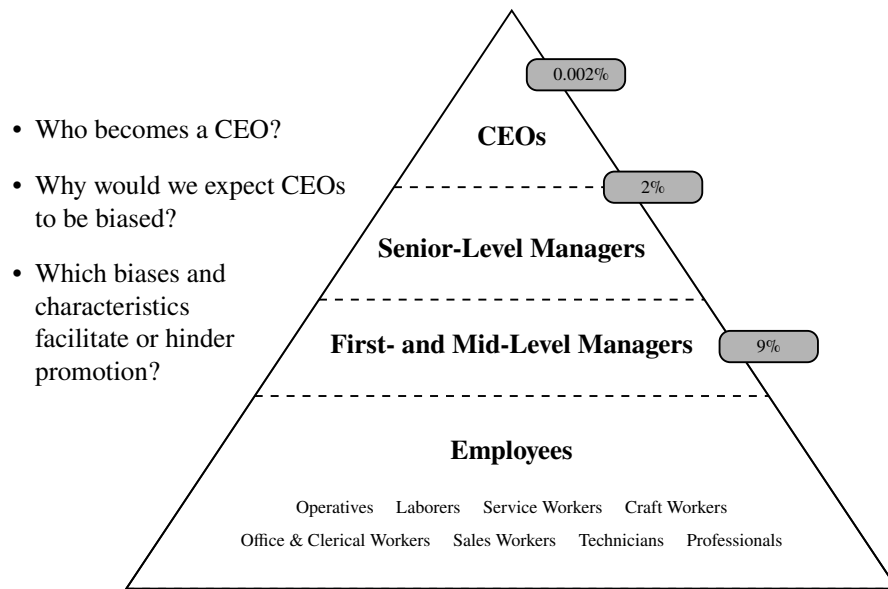
This article reviews and analyzes the growing body of research in behavioral corporate finance. The review is organized according to three distinct phases of CEO careers: appointment, being at the helm, and dismissal. Each phase of the CEO's career *life cycle* is closely linked to one of the three pillars of the rational-manager paradigm. The first section ('[CEO Selection: Who Becomes a CEO?](#)') discusses the first stage of the CEO career life cycle, the initial appointment, and links it to the selection argument: Why do selection mechanisms not filter out biased candidates? Why might they even favor candidates with certain biases? The second section ('[CEO Decisions: Do Biases Affect Corporate Policies?](#)') examines CEO decision-making while in office and links it to the learning argument: Which systematic biases do CEOs exhibit? What might prevent CEOs from learning from past mistakes? The third section ('[CEO Survival: When Are CEOs Dismissed?](#)') discusses CEO turnover and links it to the market-discipline argument: Are boards and markets aware of CEOs' biases? How are biased CEOs incentivized? When are biased CEOs replaced? The final section is the '[Conclusion.](#)' Throughout, the article identifies promising avenues for future research and discusses policy implications and managerial advice.

CEO Selection: Who Becomes a CEO?

This section discusses and evaluates the selection process, that is, the first stage in the life cycle of a CEO's career: Who becomes a CEO? Why would one expect CEOs to be rational or biased? Which biases facilitate or hinder the promotion to the CEO position?

Figure 1: The CEO Selection Process

Calculations for first-, mid-, and senior-level management are based on the 2015 EEO-1 report, the most recent report that presents total employment numbers aggregated across racial or ethnic groups (eeoc.gov/statistics/job-patterns-minorities-and-women-private-industry-eo-1). Calculations for CEOs are based on the total US labor force (for comparability, also using numbers from 2015; bls.gov/webapps/legacy/cpsatab1.htm) and the number of publicly listed firms, i.e., firms included in the Center for Research in Security Prices (CRSP) database in December 2015 with a share code of 10 or 11 (ordinary common shares) and an exchange code of 1 (NYSE), 2 (NYSE American / Amex), or 3 (Nasdaq).



As highlighted in Figure 1, CEOs are a very select group of people. Of the roughly 52 million employees of US firms that are required to file an EEO-1 report, only 9% reach entry- or mid-level management positions.² Just 2% advance to senior-level management, defined as those within two reporting levels of the CEO. A mere 0.002% of the total labor force in the United States rise to the very top of the pyramid and serve as CEO of a publicly listed firm. Those who make it all the way to the top are generally highly educated and can draw on decades of professional experience. For

² Private companies with at least 100 employees have to file an annual EEO-1 report with the US Equal Employment Opportunity Commission.

example, in a sample of more than 5,000 CEOs of US public firms from 1980 to 2011, [Dittmar and Duchin \(2015\)](#) find that 1 in 3 CEOs has an MBA degree and the average CEO accumulated 21 years of work experience at 4 different firms prior to attaining that position. For a comparable CEO sample over the period 1992-2010, [Schoar and Zuo \(2017\)](#) report that 15% of CEOs have prior experience in banking, 10% in consulting, and 3% in academia.

Economists have traditionally assumed that CEOs and other top managers are rational, unbiased decision-makers. This was both because of the self-selection of highly educated and trained individuals reflected in these statistics, and because firms' selection mechanisms were expected to filter out biased CEO candidates if their biases were detrimental to firm value. However, research in behavioral corporate finance has identified various channels that allow for or even favor the selection of biased CEOs, which reveals that this conclusion is premature.

The Selection Process

It is useful to distinguish between three scenarios: selection when managerial biases are *unobservable*, selection when managerial biases are *observable*, and *biases and frictions* in the selection process (cf. Figure 2).

Selection When Biases Are Unobservable: What mechanism might induce value-maximizing boards to appoint systematically biased CEOs when biases are unobservable (but board members are aware that managers are, with some probability, biased)? [Goel and Thakor \(2008\)](#) develop a simple model to illustrate one plausible mechanism. Consider a set of risk averse managers who are competing for a CEO position. All of them have previously implemented projects. Some are rational, and some are overconfident and underestimate the riskiness of their projects. While project risk levels, and managers' ability and overconfidence "status" are unobservable in the model, project payoffs are observable.

In this setup, the optimal selection rule appoints the manager with the highest payoff as CEO since ability (which is uncorrelated with overconfidence) has to be inferred from payoffs. As a result, the value-maximizing selection mechanism favors overconfident managers, who tend to choose higher-risk projects and to generate more extreme payoffs. Hence, biased candidates are *more* likely to be appointed as CEO than unbiased candidates in this setup.

Goel and Thakor's (2008) paper demonstrates a potential link between a specific bias—overconfidence—and the selection of CEOs. It also has two broader implications. First, as the main idea applies to lower- and mid-level promotions as well (not only CEO appointments), corporate selection mechanisms could spur the appointment of biased individuals at all levels of the managerial pyramid. As a result, the prevalence of biases might be increasing toward the top rather than the bottom of the pyramid, which in turn implies a prevalence of biases among CEO candidates. Second, while the model is framed in the context of overconfidence, *any* bias or character trait that affects attitudes toward project riskiness yields similar results. For example, managers might choose different risk levels because they apply a company-wide instead of the appropriate project-specific discount rate to evaluate project cash flows, or because their beliefs are influenced by their lifetime experiences.³ In all of these cases, value-maximizing boards might appoint candidates who are biased and whose biases and beliefs subsequently shape corporate outcomes.

Selection When Biases Are Observable: Implicit in the discussion thus far was the assumption that firms prefer to hire rational executives since managerial biases are detrimental to value generation. If, instead, biases have a “bright side,” and the benefits outweigh the costs, value-maximizing boards may deliberately seek managers with observable advantageous biases and character traits. A bias with an apparent “bright side” is overconfidence; it counteracts risk aversion and thus induces risk averse CEOs to choose investment levels closer to the first-best. In this spirit, the model of Gervais et al. (2011) shows that value-maximizing firms might favor overconfident CEOs even when they can *verify ex ante* whether a CEO candidate is overconfident. Firms then design incentive contracts to account for the CEO's level of overconfidence. In Gervais et al.'s (2011) setting, moderate levels of CEO overconfidence are optimal for shareholders. Moderate levels of overconfidence are also optimal for the CEOs themselves, who benefit when the CEO's surplus creation is shared between firms and managers.

³ The section ‘CEO Decisions: Do Biases Affect Corporate Policies?’ discusses the evidence on how incorrect discount-rate choices and lifetime experiences affect CEOs' strategic decisions in more detail. With regard to lifetime experiences, Schoar and Zuo (2017) show that CEOs who begin their career during recessions start out in, and ultimately also become CEO at smaller firms, suggesting selection and promotion effects of formative experiences also across firms.

Empirical evidence supports the notion that certain biases can be beneficial to shareholder value. Hirshleifer et al. (2012) find that CEO overconfidence is valuable in innovative industries in particular, where commitments to risky projects are essential.

Biases and Frictions in the Selection Process: Yet another reason for the appointment of biased managers to the helm of a company is the possibility that the selection mechanism may be distorted or that the board members in charge are themselves subject to biases.

As for the first aspect, distorted promotion and selection mechanisms have been documented at least at lower hierarchy levels. For example, in a micro data set comprised of 214 sales firms, Benson et al. (2019) show that manager selection criteria are heavily tilted toward current job performance, rather than those worker characteristics that predict managerial skill. Even if such “short-termism” reflects the attempt to induce high worker effort and establish transparent promotion principles, instead of misguided selection, it does open another channel for selecting biased managers, namely, overconfident managers who choose higher-risk projects with more extreme payoffs.

As for the second aspect, there is ample anecdotal evidence of corporate board members *themselves* exhibiting biases and favoring CEOs with similar viewpoints and biases to their own. For example, Qatar Airways CEO Akbar Al Baker responded to questions about gender equality and female leadership in the airline industry during a press conference in June 2018 that “Of course [the firm] has to be led by a man, because it is a very challenging position.”⁴ ⁵ In other words, if Al Baker has any influence on the selection of his successor, or if those in charge share similar viewpoints, the selection process at Qatar Airways is likely biased against high-ability women in the candidate pool. More generally, biased boards might be prone to appoint CEOs of the same gender, with a similar cultural background, or other salient similarities (homophily).⁶

Perhaps surprisingly, these aspects have not been identified convincingly in empirical data

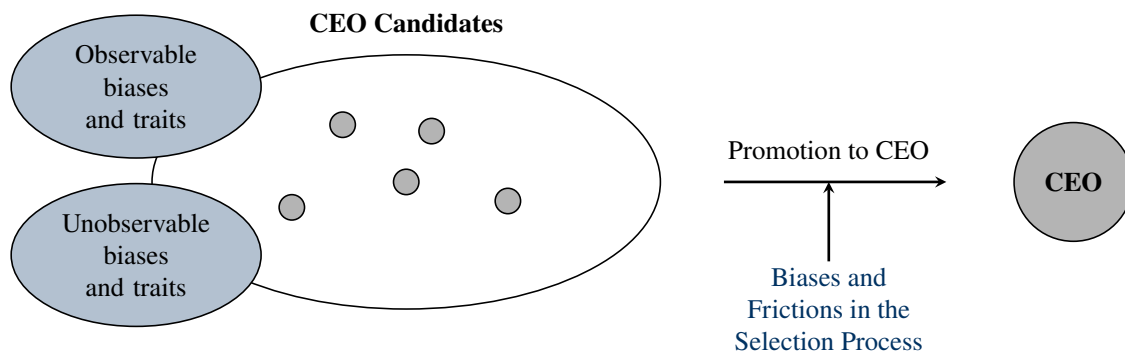
⁴ The flag carrier of Qatar carried over 32 million passengers and employed more than 43,000 people from 168 nationalities in 2017; cf. qatarairways.com/content/dam/documents/annual-reports/2017_Annual_Report_ENGLISH-WEB.pdf for the 2017 annual report.

⁵ One day later, the airline released a written statement from Al Baker, reading: “Qatar Airways firmly believes in gender equality in the workplace ... With a female work force of more than 33%, as I mentioned today, it would be my pleasure if I could help develop a female candidate to be the next CEO of Qatar Airways.” Cf. theguardian.com/business/2018/jun/05/qatar-airways-akbar-al-baker-airline-iata.

⁶ Homophily is the tendency to collaborate and mingle with similar others. For an example of the detrimental effects of homophily in the context of venture capital syndicates, see Gompers et al. (2016).

on CEO selection. There is some evidence that new executives are chosen in part based on congruence in (biased) viewpoints with existing decision-makers. In particular, [Malmendier et al. \(2018\)](#) estimate that overconfident CEOs are seven times more likely to appoint overconfident chief financial officers (CFOs) than are non-overconfident CEOs. There is also some literature that looks at CEO dismissal when boards are biased, that is, the flipside of hiring (discussed in the section ‘[CEO Survival: When Are CEOs Dismissed?](#)’). A comprehensive “behavioral approach” should allow for possible biases among *all* parties involved—including board members—in all decisions. Misattribution of past managerial performance, recency bias, or projection bias come to mind as natural promising starting points for such an analysis.

Figure 2: Biases and CEO Selection



What other reasons could prompt firms to select biased CEOs? One avenue for future research would be a broader consideration of correlations between biases, other personality traits, and abilities. That is, even if a specific bias is detrimental to shareholder value *ceteris paribus*, it might be correlated with beneficial traits or personality characteristics. In this vein, [Kaplan and Sorensen \(2019\)](#) find that company founders, who are likely particularly (over)confident, score high on charisma in executive personality assessments. With increasing availability of micro data on executives’ assessments and on selection criteria, researchers can explore the interplay of different biases, other personality traits, and ability scores, and test whether the selection mechanisms in place allow boards and selection committees to identify biases in candidates.

Self-Selection and Assortative Matching

Self-selection and manager-firm assortative matching also contribute to the prevalence of behavioral biases among CEOs as well as their cross-sectional variation (cf. Figure 3).

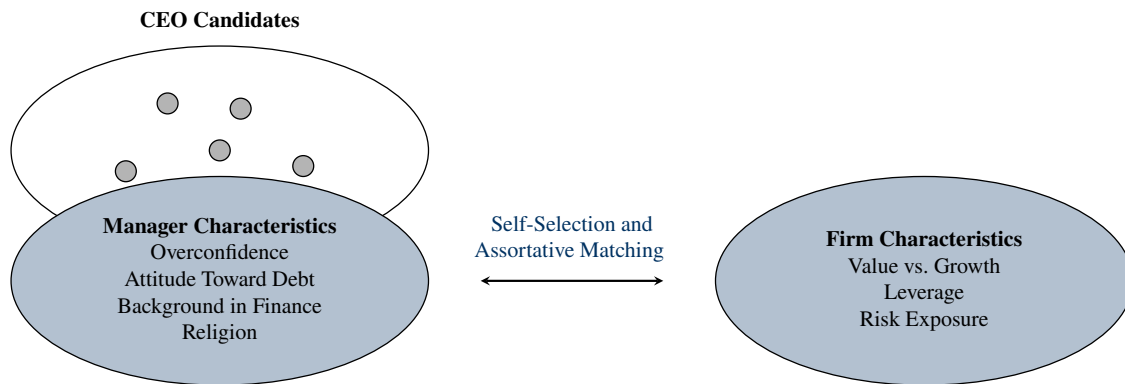
One dimension is sorting into growth versus value firms. The model of [Gervais et al. \(2011\)](#), augmented with a competitive labor market for CEOs, predicts that overconfident managers are more likely to be employed in growth than in value firms. The reason is that growth firms have more upside potential and can offer highly convex compensation schemes. These contracts appeal to overconfident CEOs, who overestimate their ability to create value. [Graham et al. \(2013\)](#) take up these theoretical predictions and show that tall and young CEOs—characteristics that are frequently associated with overconfidence—are more likely to head firms with high expected growth rates.

Relatedly, self-selection pertains to the dimension of financial risk-taking. [Cronqvist et al. \(2012\)](#) provide evidence of a “behavioral consistency” between firms’ and CEOs’ leverage ratios: CEOs’ personal leverage strongly predicts their firm’s leverage. This correlation might be the result of CEOs “imprinting” their preferences on firms’ capital structures; but [Cronqvist et al. \(2012\)](#) argue that self-selection and matching are (also) at work since a CEO’s personal leverage strongly predicts that of their successor.

Combining the two aspects of value-versus-growth and financing, [Custódio and Metzger \(2014\)](#) report that CEOs with a background in finance are more likely to be appointed by mature firms, and “nonfinance CEOs” by growth firms. Here, the self-selection interpretation is that financial experts prefer mature firms because of their financial characteristics (e.g., higher retained earnings). Of course, alternative channels might also be at work. For example, financing and the minimization of cost of capital might become more important value drivers as firms mature.

Finally, cultural and educational factors might induce self-selection. [Hilary and Hui \(2009\)](#) find that firms in religious counties have more prudent corporate policies (e.g., reduced risk exposure). They also document that when CEOs switch firms, the religious environments of the old and new employer are similar. They infer that a desire for alignment between corporate culture and managerial preferences or styles drives manager-firm matching.

Figure 3: CEO Self-Selection and Assortative Matching



Psychological Assessments of CEO Candidates

Having presented various arguments for why selection and self-selection mechanisms do not prevent, and sometimes even encourage the rise of biased managers, this subsection takes a step back and turns to direct psychological evidence on the personalities of CEOs and C-suite candidates. One piece of evidence on CEOs and CFOs comes from [Graham et al. \(2013\)](#), who use psychological assessments of managers from survey-based psychometric personality tests. In their data, CEOs are substantially more optimistic than both the lay population and CFOs. Moreover, top-level managers are aware of these differences in character traits: 35.7% of CFOs perceive their CEO peers to be “more optimistic about all aspects of life, above and beyond the CEO’s extra optimism about business prospects” ([Graham et al. 2013](#), p. 112).

In a similar vein, [Kaplan et al. \(2012\)](#) and [Kaplan and Sorensen \(2019\)](#) utilize proprietary data on assessments of more than 2,600 C-suite candidates from a consulting firm to identify their traits and biases. They distinguish between the characteristics of those who make it into the pool, those who are selected, and those who are successful in their new position.

The firm scores interviewees on 30 characteristics, such as “Develops People,” “Aggressive,” or “Holds People Accountable.” [Kaplan and Sorensen \(2019\)](#) extract four underlying (latent) factors that capture the variation in these 30 characteristics, via factor analysis. The heat map in [Figure 4a](#) (constructed from their Table 5) visualizes the factor loadings on each of the 30

assessed characteristics. The loadings are color-coded from dark green (most negative loadings) to dark brown (most positive loadings). The first factor loads positively on all 30 characteristics, and is interpreted as *general talent*. The second factor loads most positively on “Respect” and “Teamwork,” and most negatively on “Aggressive.” Kaplan and Sorensen (2019) interpret this factor as distinguishing between *interpersonal* versus *execution skills*. The third factor loads positively on, for example, “Analytical Skills” and negatively on “Enthusiasm” and “Persuasion,” and identifies candidates as *analytical* versus *charismatic*. The fourth factor loads positively on, for example, “Strategic Vision” and “Brainpower” and negatively on “Holds People Accountable.” It classifies candidates with stronger *strategic skills* versus *detail* orientation.

Figure 4b shows the average factor scores across all CEO candidates (All), as well as average scores for CEO candidates at venture capital (VC), private equity (PE), and public (P) firms.⁷ Relative to candidates for other C-suite positions, CEO candidates are, on average, more talented, and score higher on execution, charisma, and strategic skills. CEO candidates at VC and PE firms are particularly charismatic, while CEO candidates at public firms are much more analytical.

Turning to candidate selection, Kaplan and Sorensen (2019) find that higher general ability and interpersonal skills are strong predictors for being hired. The latter finding is particularly interesting since high execution scores, as opposed to interpersonal skills, predict initial selection into the CEO candidate pool and a CEO’s ultimate success if selected. Why, then, are interpersonal skills more important than execution skills for the appointment and selection among several suitable candidates? Are different characteristics valued differently by employers and selection committees? Is the selection process suboptimal because selection committee members make biased choices? The assessment of CEO characteristics and their potential misvaluation throughout the selection process is a promising avenue for future research.⁸

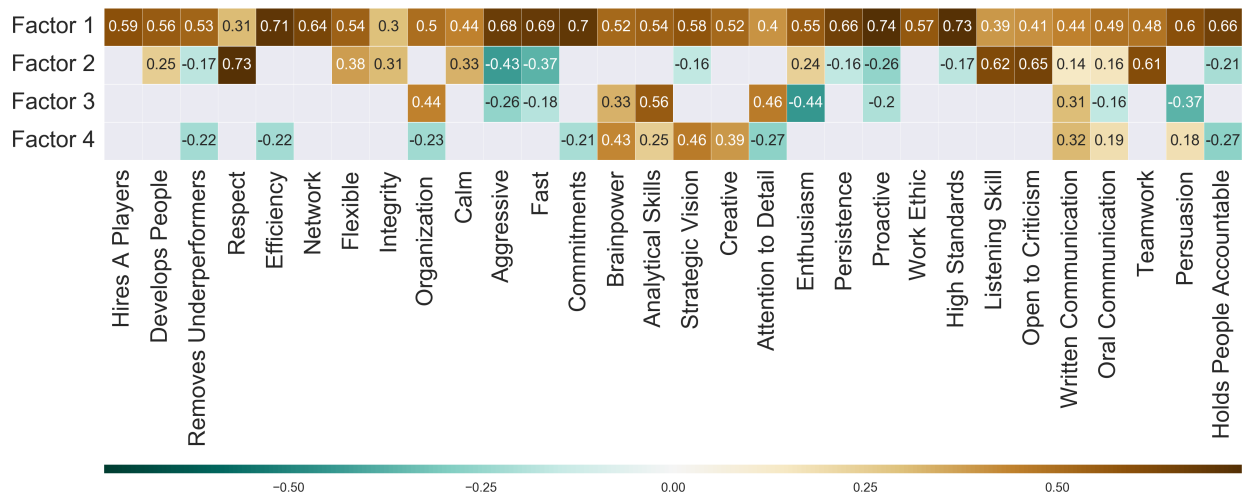
⁷ Kaplan and Sorensen (2019) construct the factors such that sample-wide average score is zero. Thus, cross-group comparisons implicitly use the other candidates as a control group. If, for example, the sample consisted of CEO and CFO candidates only, any factor where CEO candidates score above zero, on average, would result in CFO candidates having a below-zero mean.

⁸ As discussed in the subsection on the CEO selection process, more research is also warranted on how biases correlate with personality characteristics. For example, some of the personality characteristics from Figure 4a that are used to identify execution skills (e.g. “Aggressive” or “Fast”) are plausibly correlated with overconfidence (see also the discussion in Bolton et al. 2013).

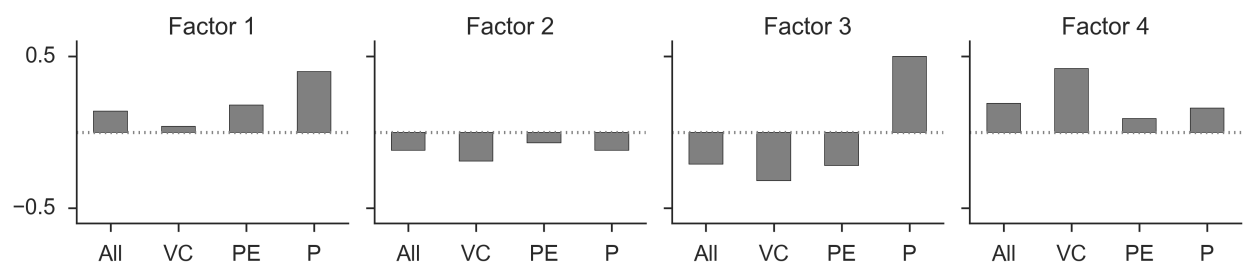
Figure 4: Psychological Assessment of CEO Candidates

Both panels visualize results from the factor analysis in Kaplan and Sorensen (2019). Factors are identified as: talent (+), interpersonal (+) vs. execution skills (–), analytical (+) vs. charisma (–), and strategic skills (+) vs. managerial details (–). (+) and (–) indicate positive and negative factor loadings, respectively.

(a) This heat map visualizes the factor loadings of the four identified factors from Table 5 in Kaplan and Sorensen (2019), and from Table IV in Kaplan et al. (2012) for “Written Communication.” Positive (negative) loadings are displayed in brown (green). Factor loadings smaller than 0.15 (in absolute value) are displayed in gray.



(b) This panel visualizes Table 6, Panels A and B, in Kaplan and Sorensen (2019), showing average factor scores across CEO candidates. “All” refers to average scores across all CEO candidates. “VC” (“PE”, “P”) calculates average scores for CEO candidates at venture capital (private equity, public) firms. Note that factor scores are constructed such that the average score across all candidates (CEO and non-CEO) is zero.



Policy Implications and Managerial Advice

What are some potential overall lessons from this discussion that might be taken to the ‘real world’?

A first step would be an increased awareness of managerial biases. Both the manager aiming to climb the corporate ladder and the employer seeking to fill a top managerial position will benefit if they start accounting for their own and the other party’s biases. The candidate might better identify

suitable employers who hold the promise of a successful career; cf. our discussion of assortative matching and overconfident managers' better career prospects in growth firms, all else equal.

From the perspective of employers seeking a new CEO, one lesson might be the necessity to directly “test” for managers' biases in the selection process; a process which should, ideally, be tailored to the CEO job environment. For example, in fast-changing environments such as the fashion industry or the renewable energy sector, selecting a CEO who systematically under- or overreacts to new information could be particularly costly. One interesting and robust pattern relevant for CEO selection is that managers with a financial background appear to exhibit fewer biases, at least in certain investment and financing contexts. [Malmendier and Tate \(2005\)](#) were the first to show that investment-financing decisions are less biased (less investment-cash flow sensitive) among CEOs with a finance education; that is, with an undergraduate or graduate degree in accounting, finance, business (including an MBA), or economics. Relatedly, [Custódio and Metzger \(2014\)](#) show that a finance background reduces the prevalence of incorrect discount-rate choices (dubbed the “weighted cost of capital (WACC) fallacy,” see also the section ‘[CEO Decisions: Do Biases Affect Corporate Policies?](#)’) and increases CEOs' responsiveness to tax cuts. For example, following the “Bush Tax Cuts” in 2003, financial-expert CEOs increased total payout by 17%, relative to a mean payout ratio of 0.59. At the same time, much of this correlation may reflect selection rather than a causal effect of education.

More research is needed that documents existing and studies optimal organizational approaches to managerial selection in the presence of diverse and biased candidates.

CEO Decisions: Do Biases Affect Corporate Policies?

Having established why biased managers are appointed to the helm of a company, this section turns to CEO decision-making and firm policies. This evidence will challenge the second pillar of the rational-manager paradigm: learning, that is, the notion that managers' experience on the job will improve their decision-making over time and ultimately de-bias them. There are at least four reasons for why learning and de-biasing is limited in the context of top-level decisions.

First, many measurable corporate decisions occur at low frequency. For example, acquisitions are typically rare events during a CEO's tenure, and thus opportunities to learn from previous

mistakes are few and far between.

Second, learning from past decisions is limited as it is difficult to distinguish between causality versus correlation of managerial decisions and outcomes. Output is hard to measure, hard to attribute to specific individual performances, and hard to disentangle from other (firm-specific or economy-wide) events. In the context of mergers and acquisitions (M&A), for example, researchers and practitioners have long struggled to measure the long-run value creation in mergers, that is, to find suitable benchmark performances and counterfactuals (see, e.g., [Loughran and Vijh 1997](#), [Malmendier et al. 2018](#), [Rau and Vermaelen 1998](#), and [Savor and Lu 2009](#)).

Third, evidence on the self-attribution bias indicates that people tend to attribute successes to their own actions but failures to external circumstances—“Heads I win, tails it’s chance.” ([Langer and Roth 1975](#); [Miller and Ross 1975](#)). In other words, even if performance evaluations were accurate, managers might draw wrong inferences, and discount information that could induce learning.

Finally, certain biases might even be reinforced, rather than ameliorated, as top managers overestimate the causal impact of their decisions. For example, psychologists have found that people exhibit higher levels of overconfidence when they are (or perceive to be) in control, and are committed to or emotionally invested in the outcome ([Weinstein 1980](#)). Each of these factors is relevant to the CEO position. As the key corporate decision-makers, CEOs likely believe they are in control, and they are personally invested because firm performance determines their reputation and pay.

With these arguments in mind, the remainder of this section provides a selective discussion of how managerial biases and character traits shape and distort corporate outcomes. The organization follows the general structure of a firm’s balance sheet, distinguishing between *investment* and *financing* activities.

The CEO’s main investment-related decisions include

- the identification of investment projects,
- the allocation of resources across segments,
- the determination of optimal cash reserves, and

- optimal external growth through M&A.

The CEO's main financing-related decisions (in collaboration with the CFO⁹) include

- leverage levels and debt maturity, and
- debt and equity issues and corporate payouts.

The discussion leads with a high-level preview of some overarching themes, and then delves deeper into each CEO decision area.

Preview

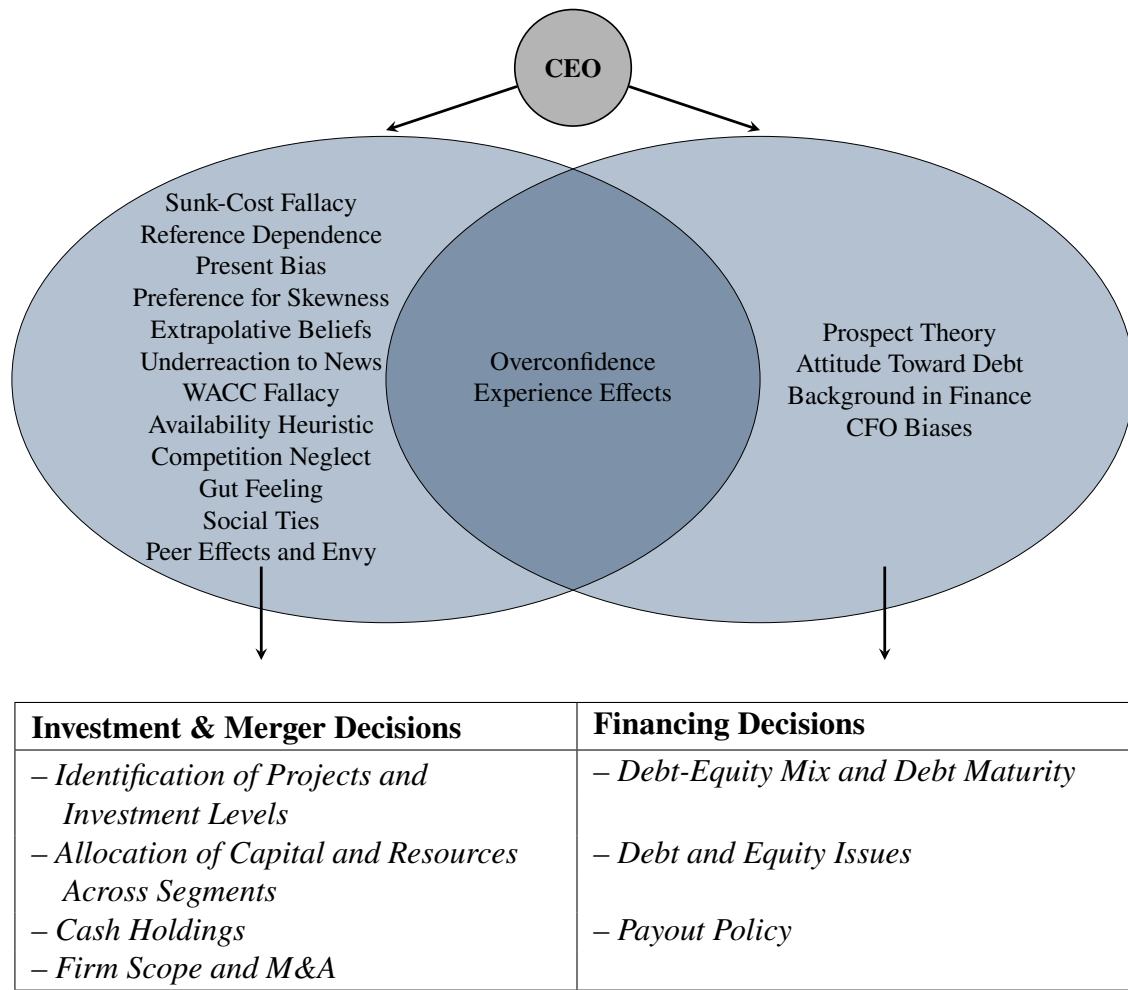
Figure 5 previews the CEO biases that have been found to affect firm outcomes, both for investment and financing decisions. The intersection in the middle shows the two biases that affect both decision areas and have garnered the strongest interest in terms of research output and publications to date: overconfidence and experience effects.

While the list of biases is by no means short, overconfidence and other belief-based biases have, to some extent, overshadowed the importance of nonstandard preferences and heuristics. For example, 50% of the papers on managerial biases published in the top three finance journals between 2000 and 2016 focus on the role of CEO overconfidence in firm decision-making (cf. the summary in [Malmendier 2018](#)). On the one hand, this is an indication of the relevance and importance of the overconfidence bias in practice, and also reflects that theory makes clear-cut and intuitive predictions that overconfidence should affect both CEO selection (see the section ‘[CEO Selection: Who Becomes a CEO?](#)’) and corporate policies. On the other hand, other biases on (and beyond) this list are also *ex ante* plausible and relevant for decision-making at the top level (cf. again the discussion in [Malmendier 2018](#)). Progress on these other classes of biases is needed.

Perhaps the most striking overall insight is how prevalent biases are even among highly educated, financially sophisticated, successful professionals. Behavioral biases emerge as a formalization of how agents are “wired,” rather than as mistakes they make despite a sort of “baseline rational” wiring.

⁹ [Graham et al. \(2015\)](#) argue that the average CEO does not fully delegate financial decisions to the CFO and that there is “an element of CEO dominance ... across all the policies” ([Graham et al. 2015](#), p. 456).

Figure 5: CEO Biases and Corporate Policies



Investment Decisions

Investment Projects: Firms should invest in those projects that have the largest expected stream of cash flows over time, discounted at the appropriate rate. A sizable literature in corporate finance has documented systematic deviations from this investment rule, and the work in behavioral corporate finance has shown that many of these deviations stem from CEO biases, including nonrational expectation formation (overconfidence, experience-based learning, over- or underreaction to news), and nonstandard preferences (present bias).

[Malmendier and Tate \(2005\)](#) were the first to empirically identify a behavioral bias in CEOs—

CEO overconfidence—and directly link it to corporate decision-making. In the context of firm investment, they showed that a significant fraction of CEOs of large (Forbes 500) companies overestimate the returns to their projects and thus perceive the net present value of those future cash flows to be higher than potential lenders and other market participants. In other words, they believe that their firm is systematically undervalued, and as a result that external (stock or debt) financing is too costly. Consequently, they rely as much as possible on internal funds to finance new investment projects, and might even cut investments when they need to access external capital markets. In other words, overconfidence bias is shown to be a significant factor in explaining the widespread phenomenon of investment-cash flow sensitivity, which had previously puzzled researchers, especially when it occurred in large firms with direct access to external capital markets.

[Malmendier and Tate \(2015\)](#) confirm the same investment patterns in more recent data and with improved identification. Following [Almeida et al. \(2012\)](#), they focus on firms that were hit by an adverse credit market shock in 2007, and compare pre-versus-post firm investment behavior of overconfident CEOs, relative to rational CEOs, in a difference-in-differences setting. Consistent with the theoretical predictions of the [Malmendier and Tate \(2005\)](#) overconfidence model, they find that overconfident CEOs curb their investment more in response to the financing shock, reflecting their greater aversion to external financing.

Subsequent papers have corroborated that a significant determinant of corporate investment is the CEO's misperception and overestimation of the value their investment projects will create, and have explored the implications for specific types of firms or industries. [Giat et al. \(2009\)](#) calibrate a structural model to data on 118 pharmaceutical research and development (R&D) projects, and find that R&D managers substantially overestimate the average product output per year compared to estimates of investors (average expected output values of \$77.5 million vs. \$12.5 per year, respectively) and also compared to the true mean (\$24.4 million per year). The work of [Gervais et al. \(2011\)](#) and [Graham et al. \(2013\)](#) emphasizes the bright side of overconfidence and suggests that it might be an attractive feature for risky growth firms, as it counteracts risk aversion. Building on this notion, [Hirshleifer et al. \(2012\)](#) show that innovative activity and innovation quality are higher when firms are run by overconfident CEOs. Their estimates imply that, in firms run by

overconfident CEOs, the R&D/assets ratio is 27% higher, patenting is 9-28% higher, and patents generate 11-40% more citations. Consistent with [Gervais et al.'s \(2011\)](#) selection model, the documented innovation-spurring effect of overconfidence is concentrated in innovative industries with arguably higher growth opportunities.

A second line of research explores how CEOs' investment decisions are shaped by their prior experiences. Here, the overarching theme is that negative formative experiences trigger more cautious behavior later in life. [Schoar and Zuo \(2017\)](#) show that CEOs who started their career during recessions exhibit more conservatism. They estimate reductions in capital expenditures and R&D investments of around 0.4 percentage points of (lagged) total assets as a result of the CEO beginning their career in a recession, controlling for firm fixed effects, birth-decade fixed effects, and industry-year fixed effects.

One concern with interpreting their results as evidence of a *causal* effect of experiences on corporate outcomes is assortative matching (see the section '[CEO Selection: Who Becomes a CEO?](#)'). What if the results are driven by certain firms seeking out conservative leaders, rather than by conservative leaders imprinting their styles? Firm fixed effects are insufficient to address this issue, given their time-invariant nature. [Dittmar and Duchin \(2015\)](#) are able to work around this issue by exploiting exogenous CEO turnovers following death, illness, or scheduled retirement. They show that, conditional on the CEO change being exogenous, there are no abnormal policy changes *on average*, but CEOs who have experienced corporate distress throughout their career decrease capital expenditures by 0.4-0.5 percentage points relative to nondistressed CEOs.

The same identification challenges affect personal life experiences. For example, [Benmelech and Frydman \(2015\)](#) test whether CEOs who have served in the military differ in their corporate policies. Here, an additional hurdle is that, from an *ex ante* perspective, it is not clear whether military experience should spur more conservative policies (military service might instill a sense of duty and caution in CEOs) or more aggressive policies (combat experience might trigger more aggressive and risky behavior). [Benmelech and Frydman \(2015\)](#) estimate an influence toward more conservative policies, including lower levels of capital expenditure and R&D investment. These leanings appear, however, to be context-specific, as discussed below in the analysis of financing decisions, and the discrepancies between more versus less conservatism in investment

versus financing might again reflect differences in assortative matching—who among those serving in the military become CEOs—across different corporate domains.

Another behavioral bias that has been linked to investment decisions is hyperbolic discounting; that is, present-biased preferences. Present bias is one of the most widely studied biases in *behavioral economics*. It describes people’s inclination to value the present over the future by more than what exponential discounting would imply, but to discount exponentially between future periods. As time passes, the hyperbolic agent changes discounting and starts overvaluing payoffs in the now-present period relative to payoffs further in the future, leading to time inconsistencies (Laibson 1997; Thaler and Benartzi 2004).

Grenadier and Wang (2005) show that present-biased preferences distort investment in a standard real-options framework. First, they consider an entrepreneur with an investment opportunity that generates a single payoff in the final period. In such a scenario, present-biased entrepreneurs invest too early as they undervalue the option to wait until uncertainty is resolved. In another scenario, an investment generates a series of future cash flows instead of a single payment. Here, present-biased entrepreneurs invest *later* than time-consistent agents because they discount future cash flows more, lowering their incentives to invest at any point in time. While Grenadier and Wang (2005) derive these predictions in the context of commercial real estate developers, the model is equally relevant for the investment of firms—especially in light of the evidence that CEOs and other C-suite managers tend to be impatient (Graham et al. 2013).

An interesting aspect of applying hyperbolic discounting in corporate finance is that it is easier to draw conclusions about welfare implications than in the typical consumer setting. In general, welfare statements are difficult when agents are present-biased, since some choices are preferred by today’s self but not by tomorrow’s self, or vice versa. In the context of corporate investment decisions, instead, one can simply evaluate the impact of an investment choice on shareholder value. The more the investment behavior of a hyperbolic discounter deviates from the optimum, the more their bias is welfare-reducing for shareholders.

Finally, an example of mistakes in the expectation formation process comes from Greenwood and Hanson’s (2014) evidence of “competition neglect”; that is, the failure of managers to correctly take competitors’ actions into account. Their estimations on data from the shipping industry reveal

that managers overextrapolate the persistence of exogenous demand shocks. They do not internalize the endogenous supply response of their competitors, which triggers overinvestment.¹⁰

Allocation of Capital and Resources Across Segments: Capital has to be allocated not only across projects but also across divisions of a firm. The literature has identified a variety of factors triggering investment distortions in firms with multiple segments, including CEOs' misjudgment of segment risk and characteristics, "people-related factors" such as CEOs' social ties to divisional managers, and even CEOs' gut feeling.

Krüger et al. (2015) provide evidence of a "WACC fallacy": Managers use a single, company-wide rate to discount cash flows to value all projects, rather than a project- or segment-specific rate that appropriately accounts for the risk of the cash flows. Earlier survey evidence by Graham and Harvey (2001) indicates that almost 60% of the 392 surveyed managers exhibit this "WACC fallacy." The evidence in Krüger et al. (2015) shows that, as a result, conglomerate firms discount the projects of risky divisions too little, leading to overinvestment in risky projects, and discount projects of safe divisions too much, leading to underinvestment in safe projects.

Another bias in the cross-segment allocation is a tendency to go for "long shots." Schneider and Spalt (2016) show that CEOs in conglomerate firms allocate substantially more money to segments with more skewed returns. For example, small segments with project returns at the 75th percentile of the skewness distribution invest 7.5% more, relative to the mean, than those at the 25th percentile. Schneider and Spalt (2016) also observe that CEO preferences for skewness are more pronounced when firms are located in counties with a higher gambling propensity.

There is also strong evidence of "people-related" factors. Graham et al. (2015) report that approximately 70% of CEOs allocate capital based on the divisional manager's reputation or confidence in the project. While this finding does not preclude rational decision-making—middle managers with a higher reputation are likely to be more talented, and confidence in projects might signal project quality—complementary evidence from other research points to a behavioral explanation: Duchin et al. (2020) find that CEOs allocate more capital to male divisional managers. On average, male managers obtain \$13-19 million more funds per year than their female peers,

¹⁰ In a similar vein, Ma et al. (2020) show systematic underreaction to new information in managers' sales forecasts in managerial survey data from Italy.

controlling for a wide array of variables including education, age, experience, and even social connections. The authors attribute the majority of the gender gap to family-related, educational, and environmental determinants during a CEO's formative years, such as being born into a male-dominated family where the father was the sole earner and had more education than the mother, or attending an all-male high school.¹¹ The effect of a CEO's gender bias is reduced by up to 35% in more "gender-aware" firms with a female chair of the board.

Another determinant of managerial decisions is that of social connections. In prior work, [Duchin and Sosyura \(2013\)](#) document that shared educational or employment experiences between CEOs and middle managers affect capital allocation. One additional social connection between CEO and middle manager is associated with 7.2% more capital inflow. Such connection-based capital allocation is not always inefficient, though. While it reduces investment efficiency in weak-governance regimes, it turns out to be value-enhancing in environments with high information asymmetries. That is, both biases and misaligned incentives might be at work.

The same is true for other findings on CEO-manager social ties. [Xuan \(2009\)](#) shows that newly appointed CEOs in conglomerates tilt capital flows toward divisions without preexisting ties. He explains the distortion as an attempt to gain approval and cooperation from divisional managers. While moral hazard appears to be at work, it is interesting to note that new CEOs are particularly keen to seek approval if they did not serve in an executive role, such as chief operating officer or president, prior to their appointment to the CEO position.

Using data from just one conglomerate, [Glaser et al. \(2013\)](#) find that well-connected managers obtain inefficiently large amounts of cash after unexpected cash windfalls. The detailed data allow the authors to measure connections based on mentor-mentee relationships and regular lunch or business meetings.

Finally, [Graham et al. \(2015\)](#) present evidence on a much more basic determinant of capital allocation: Almost 50% of surveyed US CEOs view "gut feeling" as an important or very important decision criterion for capital allocation. While not tied to a specific psychological bias, these responses reveal the limitations of the standard rational model of decision-making.

¹¹ [Duchin et al. \(2020\)](#) also show that CEOs' attitudes toward gender impact gender-related policies, such as promotion of women.

Cash Reserves: As in the case of investment, prior formative experiences are also an important factor in explaining the amount of cash reserves a firm holds. Dittmar and Duchin (2015) estimate that prior experiences of distress in previous career positions induce CEOs to increase cash holdings by, on average, 5-12%.¹² Dessaint and Matray (2017) find that, after hurricanes, unaffected firms in the proximity of the disaster increase cash reserves by 1.1 percentage points of assets compared to distant firms. They attribute the overreaction to salient events to managers' availability bias. Bias and Schmid (2019) provide complimentary evidence on the salience of recent employee strikes: CEOs react by increasing cash reserves by about one percentage point. The authors use a clever approach to identification, comparing CEOs who are directors at *other* firms which are hit by a strike to CEOs who are directors at the same firms, but during nonstrike times. The value implications of holding more cash depend on its alternative use. If an additional dollar of cash is more likely paid out as a dividend than invested, its value is diminished by taxes. Consequently, higher cash holdings can be costly for shareholders. The value implications of holding more cash depend on its alternative use. If an additional dollar of cash is more likely paid out as a dividend than invested, its value is diminished by taxes. Consequently, higher cash holdings can be costly for shareholders.¹³

Firm Scope and M&A: Many of the biases that the literature has identified as influencing investment decisions also play a role in mergers, including overconfidence, the "WACC fallacy," and social connections. M&A are, after all, just another type of investment.

Malmendier and Tate (2008) find that CEOs' overconfidence makes them more prone to undertake acquisitions, and that those acquisitions tend to be value-destroying.¹⁴ Compared to earlier work, notably Roll's (1986) hubris hypothesis of corporate takeovers, one of Malmendier and Tate's (2008) main contributions is to embed biased takeover decisions in a market setting. They clarify that overconfidence, or hubris, does *not* imply that CEOs overbid "no matter what." Instead, this depends on the differences in beliefs between the CEO and other market participants. While overconfident CEOs overestimate the value of a merger, they also overestimate their firm's stand-

¹² Schoar and Zuo (2017) find the opposite; that is, that recession CEOs hold less cash. The latter finding is less intuitive, and the authors argue that it needs to be looked at in tandem with tax avoidance practices.

¹³ Faulkender and Wang (2006) estimate a marginal cash value of \$0.77 among financially unconstrained firms.

¹⁴ Similar evidence on the effect of overconfidence on acquisition frequencies and value destruction comes from Huang and Kisgen (2013), who use a gender-based overconfidence proxy, and Benson and Ziedonis (2010) in the context of corporate venture capital acquisitions.

alone value. As a result, they may pass on merger opportunities if they have to access the external capital market; that is, convince other market participants to fund the acquisition, and the financing conditions seem “too expensive.” This logic implies that the effect of overconfidence on merger propensity will be most pronounced for cash deals, which [Malmendier and Tate \(2008\)](#) confirm in the data.

The discussion of the “WACC fallacy” also applies to acquisitions: If managers use their *own* firm’s cost of capital to value acquisition candidates, they will overbid when the target’s cost of capital is higher than theirs. Consistent with this conjecture, [Krüger et al. \(2015\)](#) find that, in acquisitions of targets with a higher cost of capital, acquirers lose on average 0.8% of market capitalization at announcement, which translates into 8% of deal value, or \$16 million, evaluated at an acquisition with average characteristics.

Finally, the research on managers’ social ties and networks also applies to merger outcomes. Most of the evidence emphasizes the adverse consequences of managerial ties, which might reflect moral hazard (managers maximizing private benefits, to the detriment of shareholders) and behavioral biases and social preferences.¹⁵

In the context of M&A, [Guenzel \(2020\)](#) shows that managers systematically take sunk costs—that is, unrecoverable costs that are irrelevant for decision-making—into account in their investment decisions. Even though the sunk-cost fallacy is one of the classic mistakes in decision-making ([Thaler 1980](#)) and considered a “common mistake” ([Berk and DeMarzo 2017](#)), documenting it empirically is complicated by selection effects. Applied to firm investment, ruling out that unobserved CEO beliefs or information drive both an initial investment and subsequent behavior is difficult. [Guenzel \(2020\)](#) overcomes this identification challenge by isolating plausibly exogenous

¹⁵ For example, [Fracassi and Tate \(2012\)](#) estimate 100 bp lower announcement returns when CEOs have strong social connections to independent directors, such as shared directorship positions or charity memberships. Conversely, [Schmidt \(2015\)](#) associates connectedness with higher announcement returns in contexts where information sharing and board advice are important. [Ishii and Xuan \(2014\)](#) report a significantly negative effect of social connectedness between acquirer and target management on the combined announcement returns. The mean three-day announcement return to the combined firm is 1% in their sample; a one-standard deviation increase in connectedness lowers announcement returns by 0.6-0.9 percentage points. [El-Khatib et al. \(2015\)](#) show that the acquirer CEO’s centrality in the social network (defined as the universe of directors and executives of US public firms in the BoardEx database) affects merger outcomes. They associate high network centrality with increased decision power and less opposition in the boardroom, and argue that these adverse factors outweigh the information advantages of strong links. As in the literature on social ties and investment decisions, better data and identification are needed to disentangle the competing incentive- and bias-based explanations.

variation in the purchase price in takeovers unfolding after the acquirer has made the purchase decision. Such variation in costs sunk into an acquisition arises in stock acquisitions that fix the number of acquirer shares exchanged in the transaction, and is triggered by aggregate market movements between merger agreement and completion. [Guenzel \(2020\)](#) shows that as an acquisition becomes exogenously more expensive and the amount of sunk costs increases, the acquirer elevates its commitment to the acquired entity, evidenced by lower divestiture rates. While [Guenzel \(2020\)](#) identifies the sunk-cost fallacy in the M&A setting, a wide array of investment decisions can be distorted by managers failing to ignore sunk costs.

Other evidence on biases in M&A decisions reflects that mergers are distinct from other types of investment due to their size and complexity. [Goel and Thakor \(2009\)](#) build on the fact that mergers abruptly increase firm size, and propose that managerial envy is a plausible behavioral motivation for mergers. They design a model of merger waves where CEOs derive utility from higher consumption relative to their CEO peers. Since CEO compensation is tied to firm size, a merger in a CEO's peer group will trigger envy, and an increased desire to also undertake an acquisition.

The evidence in [Shue \(2013\)](#) is broadly in line with this envy-based model of mergers. She identifies peer effects on firm decisions, including acquisitions, using an identification technique first implemented in [Lerner and Malmendier \(2013\)](#): the random assignment of Harvard Business School MBA cohorts to “sections.”¹⁶ Tracking those MBA graduates who end up as executives at an S&P 1500 firm, she estimates that section peers are 11% more similar in their acquisition strategies than class peers from different sections.¹⁷

[Baker et al. \(2012\)](#) study merger negotiations and argue that behavioral biases and shortcuts affect offer prices. They provide evidence that all parties involved—managers, boards, and target shareholders—use previous target-stock peak prices as reference points in the negotiation and assessment of offer terms: There is considerable bunching in the distribution of offer prices around salient peak prices, such as the 52-week high. That is, salient prices appear to serve as a mental

¹⁶ [Lerner and Malmendier \(2013\)](#) find that exposure to section peers with a background in entrepreneurship decreases post-MBA venture activity. Their results are most consistent with learning from peer interactions, where entrepreneurial peers help filter out unpromising business ideas, thereby reducing unsuccessful entrepreneurship.

¹⁷ Consistent with the “keeping-up-with-the-Joneses” interpretation, [Shue \(2013\)](#) finds that peer effects are more than twice as strong following alumni reunions, when social ties (and relative thinking) are likely reinforced.

shortcut in complex negotiations such as mergers.

Financing Decisions

Most of the behavioral research on the financing side has focused on firm leverage, which is persistent and sluggish, with only a few papers providing more “immediate” evidence from new issues and payouts. This work has established important influences of CEO overconfidence, gain-loss thinking, and personal backgrounds, and has also led the way toward a comprehensive behavioral approach that considers CEO-CFO *joint* decision-making.

Debt-Equity Mix and Debt Maturity: As discussed in the context of investment-cash flow sensitivity, overconfidence implies that CEOs perceive their firms to be undervalued by the market and, as a result, prefer internal resources to accessing the external capital market. At the root of this preference is the disagreement between CEO and financiers (banks, investors) about the future stream of cash flows the firm will generate, and thus the appropriate cost of financing. Consistent with this, [Malmendier et al. \(2011\)](#) find higher “debt conservatism” among overconfident CEOs, defined as the amount of additional debt firms can issue before tax benefits diminish ([Graham 2000](#)). In other words, overconfident CEOs display a significant aversion to debt financing and “leave money on the table” in terms of forgoing the tax benefits of debt. At the same time, they are even more averse to stock financing than debt financing. Conditional on accessing external financing, overconfident CEOs lean toward debt, since their disagreement with investors about the cost of financing is even larger for equity financing. As a result, their leverage ratio is 15% higher relative to the mean, even though the absolute amount of debt is already low. CEO overconfidence thus emerges as an explanation for the long-standing puzzle of pecking order preferences in corporate finance, that is, internal > debt > equity financing.

A series of papers complements these insights with corroborating evidence in the contexts of entrepreneurship ([Landier and Thesmar 2008](#)) and of the banking sector ([Ho et al. 2016](#); [Ma 2018](#)).¹⁸

¹⁸ In the context of entrepreneurship, [Landier and Thesmar \(2008\)](#) present a theoretical model of entrepreneurs who have to secure financing for a venture, but can influence the riskiness of their venture at later stages. The main prediction is that overoptimistic entrepreneurs will obtain short-term debt financing because this allows investors to gain control of the firm in case of a bad signal (after which the optimist would still choose too much risk). Using a large data set

Experience effects also affect CEOs' financial policy choices. The notion of experience effects, as first coined by [Malmendier and Nagel \(2011\)](#), captures the phenomenon that personal lifetime experiences tend to have long-lasting effects on individual beliefs and risky choices in the same domains. [Malmendier et al. \(2011\)](#) provide evidence that CEOs who grew up during the Great Depression appear more averse to assuming debt throughout their careers. Related research shows that CEOs hold less debt if they have previously experienced distress ([Dittmar and Duchin 2015](#)) or if they started their career during a recession ([Schoar and Zuo 2017](#)). [Malmendier et al. \(2011\)](#) also associate military experience with more aggressive financial policies and higher leverage. They show that the latter results are driven by CEOs who were veterans of World War II (but not of the Vietnam or Korean wars), suggesting that actual combat and war experience (e.g., winning or losing war), and whether future CEOs were drafted or self-selected into the military play a role. In fact, the most recent research on experience effects reveals that the *direction* of experience-based learning—whether it generates positive or negative attitudes—depends on *how* an individual has emotionally lived through those experiences (emotional-tagging hypothesis; see [Laudenbach et al. 2019a, 2019b](#)).¹⁹

Additionally, personal preferences and career backgrounds appear to influence leverage choices. As discussed in the section 'CEO Selection: Who Becomes a CEO?', [Cronqvist et al. \(2012\)](#) show that CEOs' leverage decisions align with those in their personal life (loan-to-value ratio for primary homes). In addition, [Custódio and Metzger \(2014\)](#) find that CEOs with a background in finance are more sympathetic to debt. They use exogenous shocks to credit markets and CEO turnovers to establish a causal effect.

Related work cautions against focusing solely on the CEO in the context of (biased) financing decisions, in favor of also considering the CFO. While CEOs' decision-making delegation is

on French entrepreneurs, they provide empirical support for their model: There is a significant positive association between entrepreneurs overestimating their firm's growth and using short-term debt. In the context of the banking sector, [Ho et al. \(2016\)](#) provide evidence that precrisis, overconfident bank CEOs increased leverage more than their peers, leaving their banks more vulnerable to negative shocks, and leading to worse performance during the crisis (e.g., more loan defaults and greater likelihood of failure during the crisis). [Ma \(2018\)](#) provides complementary findings that overconfident CEOs increased their exposure to real estate loans 20 pp more than other CEOs, and performed worse during the crisis, by 15 pp in stock returns between 2007 and 2009.

¹⁹ This might explain differences between the estimated increase in aggressiveness as the result of military experience here and the estimated decrease in [Benmelech and Frydman \(2015\)](#), as discussed in the context of investment decisions.

oftentimes limited, it is still stronger in the realm of financing and capital structure decisions than, say, M&A decisions. [Graham et al. \(2015\)](#) report survey results for 950 US CEOs and 525 US CFOs, who were asked to rate their level of involvement on a scale of 1 (high) to 7 (low).²⁰ CEOs' modal rating is 4 for capital-structure decisions, while it is 2 for M&A decisions. In contrast, about 25% of CFOs state that they make capital structure decisions in relative isolation, compared to only about 10% in M&A decisions.

Consistent with these decision weights, [Malmendier et al. \(2018\)](#) confirm that indeed, the biases of the CFO, rather than the CEO, dominate financing outcomes: When regressing leverage on indicators for both CEO and CFO overconfidence, they consistently find that the latter bias dominates. They also show that overconfident CEOs are more likely to appoint like-minded CFOs, intensifying the possibility of misattributing corporate decisions. In light of this recent evidence, further research on the relative importance of different decision-makers and their biases on corporate outcomes is warranted, also in the context of investment decisions.

Debt and Equity Issues and Corporate Payouts: With regard to new issues, [Malmendier et al. \(2011\)](#) show that, conditional on accessing external financing, overconfident CEOs are 11 percentage points less likely to issue equity. Relatedly, overconfident CEOs are more likely to address their firm's financing deficit with debt rather than equity.²¹ Both findings are consistent with the predicted impact of overconfidence on financing decisions: As overconfident managers perceive their company to be undervalued by the market, they prefer to avoid any external financing—debt and equity—but if they do have use external funds, they prefer debt, as the difference in opinion affects the cost of financing less than in the case of equity (where differences in all states of the world matter). [Malmendier et al. \(2018\)](#) extend this evidence to CFOs, and argue that CFO biases outweigh CEO biases also when it comes to new issue decisions.

Other research explores the role of prospect theory in explaining the pricing of initial public offerings (IPOs). A long-standing empirical puzzle in IPOs has been the substantial underpricing.

²⁰ The survey was conducted in February 2006 and sent to more than 10,000 CEOs and 9,000 CFOs, for a response rate of slightly below 10%.

²¹ If one accepts gender as a proxy for overconfidence, [Huang and Kisgen \(2013\)](#) provide consistent results. Comparing male-female with male-male CEO transitions, they find that female CEOs issue significantly less debt. Of course, females and males differ in many ways, and women who rise to the top are highly selected.

Typically, the first-day return is positive, implying that investor demand would have justified a higher offer price and that the issuer (i.e., the firm offering the shares) “left money on the table.” [Loughran and Ritter \(2002\)](#) argue that, with prospect-theory preferences, pre-IPO owners may nonetheless be satisfied as they do not derive utility from their absolute wealth, but apply a concave function to gains and a convex function to losses. [Loughran and Ritter \(2002\)](#) document that, empirically, IPOs with more money left on the table tend to be those in which the IPO price anticipated in the initial prospectus was substantially lower than the final offer price. If pre-IPO owners use the prospectus price as their reference point, the wealth gain they experience on the shares that they *retain* in the IPO can easily exceed the loss from money left on the table, leading to a perceived *net gain* under prospect-theoretical integration of gain and loss components.²²

With regard to corporate payouts, [Chen and Wang \(2012\)](#) document that firms frequently engage in substantial repurchases even when financially constrained, leading to low cash reserves, reduced investment, and increased distress risk. They hypothesize that overconfidence triggers managers to buy back stock at prices that are seemingly “too low.”

One open question is how overconfident CEOs trade off “cheap” repurchases with investments whose net present value (NPV) they overestimate. Given the strong evidence that overconfident CEOs prefer to use cash for investments, a natural question is why overconfident CEOs would use internal resources for stock repurchases rather than investments. A promising avenue for future research is to jointly look at the different possible uses of internal funds when managers are overconfident or display other biases. A first step in this direction is the analysis of payout and investment decisions in [Banerjee et al. \(2015\)](#). They find that, after improvements in corporate governance (Sarbanes-Oxley Act, see also the discussion in the section ‘[CEO Survival: When Are CEOs Dismissed?](#)’), overconfident CEOs reduce investment and use the freed-up cash flow to raise dividends.

²² Following this logic, [Ljungqvist and Wilhelm \(2005\)](#) estimate the net perceived gain of prospect-theory issuers from their IPO, and show that firms are less likely to switch underwriters in secondary offerings when the net perceived gain is positive. [Loughran and McDonald \(2013\)](#) argue that underwriters might even be able to capitalize on prospect-theory-minded issuers. When an issuer is unsure about firm value as gauged by the level of uncertain language in their prospectus, the underwriter can propose a low-balled initial offer price in the prospectus—thus manipulating the issuer’s reference point—and later only partially revise the final offer price upward. This increases the likelihood that investor demand in the IPO will be high and the issuer will be satisfied in the IPO, as measured by pre-IPO owners experiencing a net gain.

Policy Implications and Managerial Advice

What systematic actions can organizations take to counteract biased decision-making, to the extent that these decisions reduce shareholder value?²³ Despite the abundance of evidence on CEO biases, surprisingly little is known about “corporate repairs.” The section ‘[CEO Survival: When Are CEOs Dismissed?](#)’ will discuss the (limited) evidence on what corporate governance can look like with biased managers. Beyond this, we know little about “best practices” and the pragmatic procedures firms might implement to curb managerial biases. There are two exceptions: First, [Heath et al. \(1998\)](#) conceptually discuss potential approaches such as corrective versus preventative, and domain-specific versus domain-general repairs. And, second, [Camerer and Malmendier \(2007\)](#) suggest a simple three-step procedure that emphasizes the importance of randomized controlled trial (RCT) “thinking.” They suggest that firms (a) need to devote time to identify a common mistake that their managers or other employees make in business-relevant decisions, (b) identify a potential repair, whether via organizational redesign, procedural changes, or different hiring practices, and (c) test its effectiveness, ideally in a randomized fashion.

Take overconfidence as an example. Given that overconfidence can be particularly harmful in firms with abundant cash flows (i.e., those without “correctives” from the market), one potential procedural repair might be to require managers to “have their project’s five most critical assumptions evaluated for plausibility by two uninvolved managers,” at least for projects without interaction with external financiers. Or, taking social ties as another example, a procedural repair might be to “implement a two-stage process for project funding requests, and remove any project-identifying information from spreadsheet in first round.”

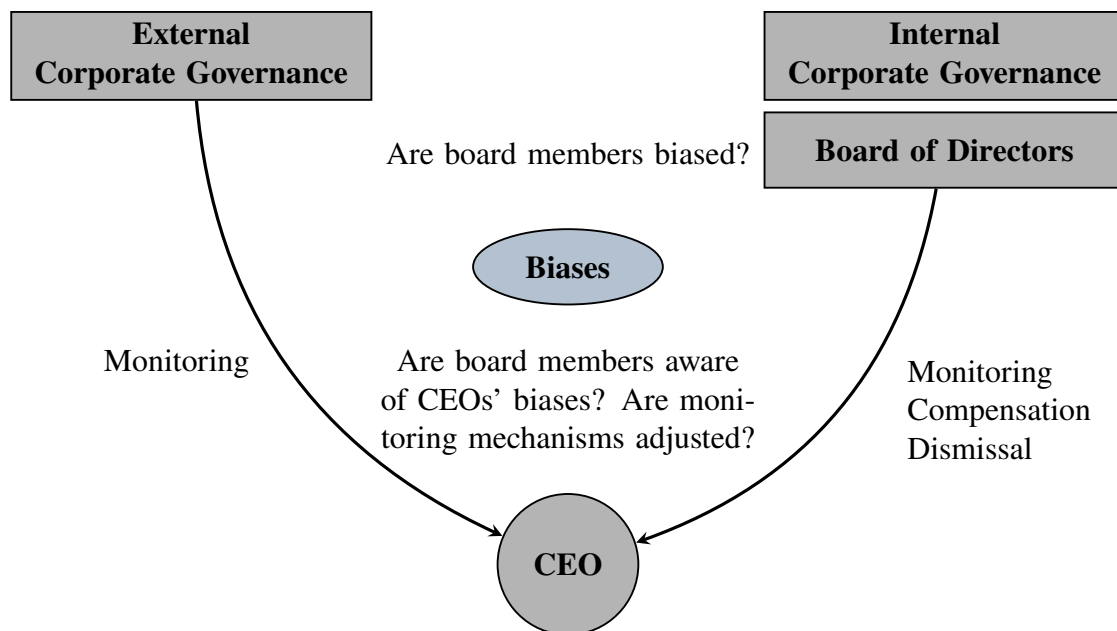
Whether these and other corporate repairs work in practice is an empirical question; and while this discussion thus remains speculative, it underscores the potential of corporate repairs, both in research and for organizational outcomes.

²³ As discussed in the context of CEO selection, value destruction is often implicitly assumed but not necessarily the case, as biases may help to overcome, for example, conservatism and risk aversion.

CEO Survival: When Are CEOs Dismissed?

In light of the far-reaching effects of CEO biases on corporate policies, at least three interrelated questions arise: First, do boards watch out for CEOs' biases, and if so, (how) do they detect them? Second, does corporate governance "step in" and adjust monitoring mechanisms, including CEO compensation and dismissal? And third, what if board members are biased themselves? These questions are at the core of this section (cf. Figure 6). Research on the interplay of CEOs, biases, and governance is slightly less developed, and the discussion in this section more tentative.

Figure 6: CEO Monitoring



Corporate Governance With Biased Managers: A key tool with which to align the interests of managers and shareholders is compensation. Executive compensation is known to have a large manager-specific component (Graham et al. 2012), which could reflect variation in “CEO ability,” but also variation in CEO biases and other CEO characteristics, with corporate monitors tailoring incentives correspondingly. For example, compensation seems to be tailored to individual risk tolerance. Graham et al. (2013) report that 53% of surveyed CEOs with low risk aversion receive

above-mean performance-based compensation, compared to 35% of the highly risk averse CEOs. Similarly, only 42% of CEOs who exhibit high impatience receive above-mean contingent pay, relative to 56% among patient CEOs.

Turning to behavioral components, research has also directly analyzed optimal contract design when managers are biased, in particular when they are overconfident or loss averse. [Gervais et al. \(2011\)](#) consider the compensation contract for a risk averse manager who may be overconfident. The authors show that the optimal compensation in good states of the world is lower when contracting with moderately overconfident relative to rational managers. Intuitively, overconfidence reduces the threshold of undertaking risky investment projects after a good signal. If the manager is strongly overconfident (and not too risk averse), the firm offers instead highly convex pay since the manager puts excess probability on the good payoff state.

The empirical evidence is mixed. [Humphery-Jenner et al. \(2016\)](#) report empirical findings that overconfident CEOs are paid a higher fraction of compensation as contingent pay. On the surface, this finding might seem to back the second prediction of [Gervais et al. \(2011\)](#), which they dub the “exploitation hypothesis.” However, as pointed out by [Malmendier \(2018\)](#), there is a disconnect between model and empirics: The model captures overconfidence about signal precision, whereas the empirical analysis uses the *Longholder* measure of overconfidence about mean expected payoffs.²⁴ In fact, [Otto \(2014\)](#), who also uses a Longholder-based measure, reports *lower option* and *lower total* compensation if CEOs are overconfident. He provides a model that delivers these predictions. Here, overconfident (optimistic) managers overestimate the success probability of the project for which they are hired. Thus, while there is some promising theoretical and empirical work linking overconfidence to governance and compensation responses, future research is warranted to sharpen the findings.

[Dittmann et al. \(2010\)](#) analyze optimal compensation contracts in the presence of prospect-theory-type preferences and loss aversion. They calibrate their model to the compensation data of 595 US CEOs and find that—as long as managers are assumed to have relatively low reference

²⁴ The Longholder measure was introduced in [Malmendier and Tate \(2005\)](#), and refers to CEOs who hold executive stock options all the way until the year of expiration. *HolderXY* refers to CEOs with exercisable stock options that are at least XY% in the money after the vesting period. Also, [Humphery-Jenner et al. \(2016\)](#) find evidence for higher pay convexity across different levels of overconfidence (e.g., *Holder30*, *Holder67*, *Holder100*), in contrast to the prediction in [Gervais et al. \(2011\)](#) that pay structure depends on the degree of overconfidence.

wages—the loss-aversion model matches the data moments much better than a model in which managers are risk averse with constant relative risk aversion (CRRA) utility. Their calibration not only suggests that managers are loss averse with regard to pay and that firms offer contracts that match these preferences, but also provides guidance on the long-standing question of what reference points people have. To the extent that one can draw inferences from the joint hypotheses tested, the observed compensation patterns suggest a reference point closer to the base pay than the market value of total compensation.

Research that explores how governance mechanisms other than compensation can curb adverse effects of managerial biases is still in its infancy. One exception is [Banerjee et al. \(2015\)](#), in which the authors analyze the impact of the Sarbanes-Oxley Act on the corporate policies of overconfident CEOs. The reform, passed in 2002 in response to a series of accounting scandals, aimed to elevate accounting standards and increase board independence and governance stringency. Post-enactment, overconfident CEOs reduce investment-cash flow sensitivities and show improved acquisition performance, among other things. The documented effects are not present among firms who voluntarily complied with the board-independence requirements of the Sarbanes-Oxley Act before its passage, which corroborates the paper’s identification. The authors conclude that corporate governance can mediate the relationship between overconfidence and corporate performance.

CEO Turnover: CEO biases do not necessarily imply a higher rate of dismissal. This depends on several factors. First, it depends on whether a bias is value-destroying or value-enhancing (e.g., since it might counteract risk aversion), as discussed in the section ‘[CEO Selection: Who Becomes a CEO?](#)’ Second, it depends on whether the board appointed a biased CEO deliberately or not, and whether frictions or biases of the board members themselves are at play. Finally, it depends on the firm’s governance.

Starting from the assumption of *unbiased*, value-maximizing boards, research that looks at how such boards evaluate the performance of biased CEOs and decide on their dismissal is scarce. One exception is [Campbell et al. \(2011\)](#), in which the authors theoretically and empirically study CEO overconfidence and forced turnover. Their model predicts an inversely U-shaped relation between overconfidence and forced CEO turnover as, similar to the settings in [Goel and Thakor \(2008\)](#) and [Gervais et al. \(2011\)](#), overconfidence counteracts risk aversion. This prediction is supported in

the data. Both in nonparametric survival plots and hazard models, CEOs with moderate levels of overconfidence have lower dismissal probabilities than those with low and high degrees of confidence.

If board members are *biased*, they might misjudge a CEO's performance and make suboptimal retention and dismissal decisions, independently of whether the CEO is biased or not. Such research is limited to, at best, indirect proxies, and this topic remains a promising avenue for future research.

There is an older literature analyzing how board size affects the effectiveness of board monitoring (see, e.g., [Yermack 1996](#)). This literature has motivated theory work on “conformity” versus “speaking up,” discussed toward the end of this section. Other general board characteristics may also at least indirectly relate to variation in behavioral biases. For example, [Adams and Ferreira \(2009\)](#) find that CEO firing probabilities increase by 1.5 times as much for 40%-female boards relative to all-male boards after stock performance deteriorates by one standard deviation (15.23 vs. 9.87 percentage points). [Lee et al. \(2014\)](#) report a lower likelihood of CEO turnover after bad stock performance when there is greater alignment in political beliefs between the CEO and monitors.²⁵

[Eisfeldt and Kuhnen \(2013\)](#) and [Jenter and Kanaan \(2015\)](#) provide new empirical evidence that CEO turnover is related to overall industry shocks; that is, factors beyond the CEO's control. In particular, [Jenter and Kanaan \(2015\)](#) raise the possibility of biased judgment by boards (relative thinking), as the observed patterns are consistent with boards misattributing bad performance to CEOs rather than industry conditions. While a definitive assessment of the relative importance of attribution bias and other, rational mechanisms—such as bad times being more revealing about CEO ability—is beyond the scope of their paper, research on the interplay of biases, incentives, and performance evaluation is a promising avenue to pursue.

On the theory side, some papers have made progress on biased boards and their effects on firms and CEOs. [Malenko \(2013\)](#) introduces a model of communication and decision-making in corporate boards and shows that directors' conformity biases can increase the effectiveness of communication among directors. In the model, boards operate in two steps. First, directors can

²⁵ Note, however, that the point estimate on the main effect of political alignment is negative and similar in magnitude to the other coefficients of interest (though it is insignificant). In addition, a direct interpretation of interaction terms is in fact invalid in their setting as they estimate a nonlinear (probit) model (see [Ai and Norton \(2003\)](#), and see [Aggarwal et al. \(2011\)](#) for an example of a proper treatment in a finance context).

incur a cost and express their opinion on a given issue; second, they vote. When pressure for conformity at the voting stage is high, directors have higher incentives to discuss their opinions in the first stage in an attempt to convince others of their opinion.

Donaldson et al. (2020) directly link board members' biases to CEO retention decisions. They develop a model in which there can be "deadlock on the board"—directors deciding to retain a CEO they agree is bad. Directors differ in their preferences over the firm's policies; the authors refer to this as a director's "bias" and suggest that it should be interpreted as either private benefits or misspecified beliefs. Deadlock happens when some directors prefer to retain a weak CEO today because this increases the likelihood that they can appoint a CEO with more similar beliefs tomorrow. (While the model features a rational CEO, a biased incumbent or candidate CEO would be a natural extension to study, potentially exacerbating the documented inefficiencies.) Testing these theoretical predictions in the data (especially in the era of big data), as well as digging deeper into the relation between CEO biases and governance responses, are natural opportunities for future research.

Policy Implications and Managerial Advice

Much of this section's discussion on optimal corporate governance with biased CEOs is linked to policy implications. There are at least two broader takeaways. First, traditional governance mechanisms to align managerial and shareholders' incentives may be largely ineffective in terms of curbing certain CEO biases, or may even exacerbate biased decision-making. A key example is option-based compensation for overconfident CEOs. These managers are already (highly!) motivated to pursue projects and acquisitions that they perceive to be value-maximizing. The problem is that their perception is wrong, not that the managers' motivation is low. Other tools, such as the strategic use of debt overhang or procedural changes, are more promising. Second, board members should account for their own potential biases and mistakes in their judgment and evaluation of CEO performance, such as attributional errors and hindsight bias. Corporate repairs and training need to include those who monitor managers, in addition to managers themselves.

Conclusion

Since the mid-to-late 2000s, the field of *behavioral corporate finance* has provided overwhelming evidence that managers are subject to biases that affect corporate outcomes in numerous ways, and do so in each phase in the life cycle of a CEO career. The theoretical and empirical evidence pinpoints the shortcomings of the traditional arguments (selection, learning, and market discipline) for why CEOs are rational decision-makers. Initially, finance researchers only embraced the possibility that individual investors might be subject to psychological biases. By documenting biased decision-making even on the part of CEOs and other top-level managers, behavioral corporate finance has magnified the importance and implications of psychological elements in finance contexts.

Despite these important advances, the field of behavioral corporate finance is still young, and many important questions remain unanswered. Three sets of questions merit emphasis:

First, with regard to CEO selection, open questions include: What role can “testing” for biases of CEO candidates play in reducing biased decision-making at the top? How do biases correlate with other, potentially performance-enhancing personality traits and skills? Do employers and selection committees value candidate characteristics differently at different stages of the selection process? Do they misvalue certain attributes?

Second, with regard to CEO decision-making, questions for future research include: Is it possible to derive new testable predictions for certain biases when jointly considering all potential uses of funds; that is, investment, accumulation of cash reserves, and payouts to shareholders? Which other managerial biases, especially in the realm of nonstandard preferences and heuristics, affect corporate outcomes? What is the relative importance of different C-suite decision-makers, and their biases, across corporate policies? What could effective corporate repairs look like?

Third, with regard to CEO dismissal: Which governance structures (including, but not limited to, CEO compensation) are optimal when CEOs are subject to biases? How do board members’ biases affect firms and corporate governance effectiveness?

Encompassing many of these questions, a key challenge for the field is to come up with a comprehensive “behavioral approach,” which recognizes that *all* parties involved are possibly subject to biases.

Further Reading

- Banerjee, S., M. Humphery-Jenner, and V. Nanda (2015). Restraining overconfident CEOs through improved governance: Evidence from the Sarbanes-Oxley Act. *The Review of Financial Studies* 28(10), 2812-2858.
- Goel, A. M. and A. V. Thakor (2008). Overconfidence, CEO selection, and corporate governance. *The Journal of Finance* 63(6), 2737-2784.
- Guenzel, M. (2020). In Too Deep: The Effect of Sunk Costs on Corporate Investment. *University of Pennsylvania Working Paper*.
- Jenter, D. and F. Kanaan (2015). CEO turnover and relative performance evaluation. *The Journal of Finance* 70(5), 2155-2184.
- Kaplan S. N. and M. Sorensen (2019). Are CEOs Different? *Columbia Business School Research Paper No. 16-27*.
- Krüger, P., A. Landier, and D. Thesmar (2015). The WACC fallacy: The real effects of using a unique discount rate. *The Journal of Finance* 70(3), 1253-1285.
- Malmendier, U. (2019). Behavioral Corporate Finance. In D. Bernheim, S. DellaVigna, and D. Laibson (Eds.), *Handbook of Behavioral Economics*, Volume 1. Elsevier.
- Malmendier, U., G. Tate, and J. Yan (2011). Overconfidence and Early-Life Experiences: The Effect of Managerial Traits on Corporate Financial Policies. *The Journal of Finance* 66(5), 1687-1733.

References

- Adams, R. B. and D. Ferreira (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics* 94(2), 291–309.
- Aggarwal, R., I. Erel, M. Ferreira, and P. Matos (2011). Does governance travel around the world? Evidence from institutional investors. *Journal of Financial Economics* 100(1), 154–181.
- Ai, C. and E. C. Norton (2003). Interaction terms in logit and probit models. *Economics Letters* 80(1), 123–129.
- Almeida, H., M. Campello, B. Laranjeira, and S. Weisbenner (2012). Corporate Debt Maturity and the Real Effects of the 2007 Credit Crisis. *Critical Finance Review* 1, 3–58.
- Baker, M., X. Pan, and J. Wurgler (2012). The effect of reference point prices on mergers and acquisitions. *Journal of Financial Economics* 106(1), 49–71.
- Baker, M., J. C. Stein, and J. Wurgler (2003). When does the market matter? Stock prices and the investment of equity-dependent firms. *The Quarterly Journal of Economics* 118(3), 969–1005.
- Baker, M. and J. Wurgler (2000). The equity share in new issues and aggregate stock returns. *The Journal of Finance* 55(5), 2219–2257.
- Banerjee, S., M. Humphery-Jenner, and V. Nanda (2015). Restraining overconfident CEOs through improved governance: Evidence from the Sarbanes-Oxley Act. *The Review of Financial Studies* 28(10), 2812–2858.
- Barber, B. M. and T. Odean (2000). Trading is hazardous to your wealth: The common stock investment performance of individual investors. *The Journal of Finance* 55(2), 773–806.

- Benmelech, E. and C. Frydman (2015). Military CEOs. *Journal of Financial Economics* 117(1), 43–59.
- Benson, A., D. Li, and K. Shue (2019). Promotions and the peter principle. *The Quarterly Journal of Economics* 134(4), 2085–2134.
- Benson, D. and R. H. Ziedonis (2010). Corporate venture capital and the returns to acquiring portfolio companies. *Journal of Financial Economics* 98(3), 478–499.
- Berk, J. B. and P. M. DeMarzo (2017). *Corporate Finance* (4th edition). Pearson Education.
- Bias, D. and T. Schmid (2019). Do Outside Directorships Influence CEO Decision Making? Evidence from Labor Strikes. *SSRN Working Paper No. 2888378*.
- Bolton, P., M. K. Brunnermeier, and L. Veldkamp (2013). Leadership, coordination, and corporate culture. *Review of Economic Studies* 80(2), 512–537.
- Camerer, C. and U. Malmendier (2007). Behavioral Economics of Organizations. In P. Diamond and Vartiainen (Eds.), *Behavioral Economics and Its Applications*, 235–290. Princeton University Press.
- Campbell, T. C., M. Gallmeyer, S. A. Johnson, J. Rutherford, and B. W. Stanley (2011). CEO optimism and forced turnover. *Journal of Financial Economics* 101(3), 695–712.
- Chen, S.-S. and Y. Wang (2012). Financial constraints and share repurchases. *Journal of Financial Economics* 105(2), 311–331.
- Cronqvist, H., A. K. Makhija, and S. E. Yonker (2012). Behavioral consistency in corporate finance: CEO personal and corporate leverage. *Journal of Financial Economics* 103(1), 20–40.
- Custódio, C. and D. Metzger (2014). Financial expert CEOs: CEO’s work experience and firm’s financial policies. *Journal of Financial Economics* 114(1), 125–154.
- Dessaint, O. and A. Matray (2017). Do managers overreact to salient risks? Evidence from hurricane strikes. *Journal of Financial Economics* 126(1), 97–121.
- Dittmann, I., E. Maug, and O. Spalt (2010). Sticks or carrots? Optimal CEO compensation when managers are loss averse. *The Journal of Finance* 65(6), 2015–2050.
- Dittmar, A. and R. Duchin (2015). Looking in the rearview mirror: the effect of managers’ professional experience on corporate financial policy. *The Review of Financial Studies* 29(3), 565–602.
- Donaldson, J. R., N. Malenko, and G. Piacentino (2020). Deadlock on the Board. *The Review of Financial Studies*, *Forthcoming*.
- Duchin, R., M. Simutin, and D. Sosyura (2020). The Origins and Real Effects of the Gender Gap: Evidence from CEOs’ Formative Years. *The Review of Financial Studies*, *Forthcoming*.
- Duchin, R. and D. Sosyura (2013). Divisional managers and internal capital markets. *The Journal of Finance* 68(2), 387–429.
- Eisfeldt, A. L. and C. M. Kuhnen (2013). CEO turnover in a competitive assignment framework. *Journal of Financial Economics* 109(2), 351–372.
- El-Khatib, R., K. Fogel, and T. Jandik (2015). CEO network centrality and merger performance. *Journal of Financial Economics* 116(2), 349–382.
- Faulkender, M. and R. Wang (2006). Corporate financial policy and the value of cash. *The Journal of Finance* 61(4), 1957–1990.
- Fracassi, C. and G. Tate (2012). External networking and internal firm governance. *The Journal of Finance* 67(1), 153–194.

- Gervais, S., J. B. Heaton, and T. Odean (2011). Overconfidence, compensation contracts, and capital budgeting. *The Journal of Finance* 66(5), 1735–1777.
- Giat, Y., S. T. Hackman, and A. Subramanian (2009). Investment under uncertainty, heterogeneous beliefs, and agency conflicts. *The Review of Financial Studies* 23(4), 1360–1404.
- Glaser, M., F. Lopez-De-Silanes, and Z. Sautner (2013). Opening the black box: Internal capital markets and managerial power. *The Journal of Finance* 68(4), 1577–1631.
- Goel, A. M. and A. V. Thakor (2008). Overconfidence, CEO selection, and corporate governance. *The Journal of Finance* 63(6), 2737–2784.
- Goel, A. M. and A. V. Thakor (2009). Do envious CEOs cause merger waves? *The Review of Financial Studies* 23(2), 487–517.
- Gompers, P. A., V. Mukharlyamov, and Y. Xuan (2016). The cost of friendship. *Journal of Financial Economics* 119(3), 626–644.
- Graham, J. R. (2000). How big are the tax benefits of debt? *The Journal of Finance* 55(5), 1901–1941.
- Graham, J. R. and C. R. Harvey (2001). The theory and practice of corporate finance: Evidence from the field. *Journal of Financial Economics* 60(2-3), 187–243.
- Graham, J. R., C. R. Harvey, and M. Puri (2013). Managerial attitudes and corporate actions. *Journal of Financial Economics* 109(1), 103–121.
- Graham, J. R., C. R. Harvey, and M. Puri (2015). Capital allocation and delegation of decision-making authority within firms. *Journal of Financial Economics* 115(3), 449–470.
- Graham, J. R., S. Li, and J. Qiu (2012). Managerial attributes and executive compensation. *The Review of Financial Studies* 25(1), 144–186.
- Greenwood, R. and S. G. Hanson (2014). Waves in ship prices and investment. *The Quarterly Journal of Economics* 130(1), 55–109.
- Grenadier, S. R. and N. Wang (2005). Investment timing, agency, and information. *Journal of Financial Economics* 75(3), 493–533.
- Guenzel, M. (2020). In Too Deep: The Effect of Sunk Costs on Corporate Investment. *University of Pennsylvania Working Paper*.
- Heath, C., R. P. Larrick, and J. Klayman (1998). Cognitive repairs: How organizational practices can compensate for individual shortcomings. In *Review of Organizational Behavior*. Citeseer.
- Hilary, G. and K. W. Hui (2009). Does religion matter in corporate decision making in America? *Journal of Financial Economics* 93(3), 455–473.
- Hirshleifer, D., A. Low, and S. H. Teoh (2012). Are overconfident CEOs better innovators? *The Journal of Finance* 67(4), 1457–1498.
- Ho, P.-H., C.-W. Huang, C.-Y. Lin, and J.-F. Yen (2016). CEO overconfidence and financial crisis: Evidence from bank lending and leverage. *Journal of Financial Economics* 120(1), 194–209.
- Huang, J. and D. J. Kisgen (2013). Gender and corporate finance: Are male executives overconfident relative to female executives? *Journal of Financial Economics* 108(3), 822–839.
- Humphery-Jenner, M., L. L. Lisic, V. Nanda, and S. D. Silveri (2016). Executive overconfidence and compensation structure. *Journal of Financial Economics* 119(3), 533–558.
- Ishii, J. and Y. Xuan (2014). Acquirer-target social ties and merger outcomes. *Journal of Financial Economics* 112(3), 344–363.

- Jenter, D. and F. Kanaan (2015). CEO turnover and relative performance evaluation. *The Journal of Finance* 70(5), 2155–2184.
- Kaplan, S. N., M. M. Klebanov, and M. Sorensen (2012). Which CEO characteristics and abilities matter? *The Journal of Finance* 67(3), 973–1007.
- Kaplan, S. N. and M. Sorensen (2019). Are CEOs Different? *Columbia Business School Research Paper No. 16-27*.
- Krüger, P., A. Landier, and D. Thesmar (2015). The WACC fallacy: The real effects of using a unique discount rate. *The Journal of Finance* 70(3), 1253–1285.
- Laibson, D. (1997). Golden eggs and hyperbolic discounting. *The Quarterly Journal of Economics* 112(2), 443–478.
- Lamont, O. A. and R. H. Thaler (2003). Can the market add and subtract? Mispricing in tech stock carve-outs. *Journal of Political Economy* 111(2), 227–268.
- Landier, A. and D. Thesmar (2008). Financial contracting with optimistic entrepreneurs. *The Review of Financial Studies* 22(1), 117–150.
- Langer, E. J. and J. Roth (1975). Heads I win, tails it's chance: The illusion of control as a function of the sequence of outcomes in a purely chance task. *Journal of Personality and Social Psychology* 32(6), 951.
- Laudenbach, C., U. Malmendier, and A. Niessen-Ruenzi (2019a). Emotional tagging and belief formation: The long-lasting effects of experiencing communism. In *AEA Papers and Proceedings*, Volume 109, pp. 567–71.
- Laudenbach, C., U. Malmendier, and A. Niessen-Ruenzi (2019b). The Long-lasting Effects of Experiencing Communism on Attitudes towards Financial Markets. *SSRN Working Paper No. 3638044*.
- Lee, J., K. J. Lee, and N. J. Nagarajan (2014). Birds of a feather: Value implications of political alignment between top management and directors. *Journal of Financial Economics* 112(2), 232–250.
- Lerner, J. and U. Malmendier (2013). With a little help from my (random) friends: Success and failure in post-business school entrepreneurship. *The Review of Financial Studies* 26(10), 2411–2452.
- Ljungqvist, A. and W. J. Wilhelm (2005). Does prospect theory explain IPO market behavior? *The Journal of Finance* 60(4), 1759–1790.
- Loughran, T. and B. McDonald (2013). IPO first-day returns, offer price revisions, volatility, and form S-1 language. *Journal of Financial Economics* 109(2), 307–326.
- Loughran, T. and J. R. Ritter (2002). Why don't issuers get upset about leaving money on the table in IPOs? *The Review of Financial Studies* 15(2), 413–444.
- Loughran, T. and A. M. Vijh (1997). Do long-term shareholders benefit from corporate acquisitions? *The Journal of Finance* 52(5), 1765–1790.
- Ma, Y. (2018). Bank CEO optimism and the financial crisis. *SSRN Working Paper No. 2392683*.
- Ma, Y., D. A. Sraer, D. Thesmar, and T. Ropele (2020). A Quantitative Analysis of Distortions in Managerial Forecasts. *NBER Working Paper No. 26830*.
- Malenko, N. (2013). Communication and decision-making in corporate boards. *The Review of Financial Studies* 27(5), 1486–1532.
- Malmendier, U. (2018). Behavioral Corporate Finance. In D. Bernheim, S. DellaVigna, and D. Laibson (Eds.), *Handbook of Behavioral Economics*, Volume 1. Elsevier.

- Malmendier, U., E. Moretti, and F. S. Peters (2018). Winning by Losing: Evidence on the Long-Run Effects of Mergers. *The Review of Financial Studies* 31(8), 3212–3264.
- Malmendier, U. and S. Nagel (2011). Depression Babies: Do Macroeconomic Experiences Affect Risk-Taking? *The Quarterly Journal of Economics* 126(1), 373–416.
- Malmendier, U., V. Pezone, and H. Zheng (2018). Managerial Duties and Managerial Biases. *CEPR Discussion Paper No. DP14929*.
- Malmendier, U. and G. Tate (2005). CEO overconfidence and corporate investment. *The Journal of Finance* 60(6), 2661–2700.
- Malmendier, U. and G. Tate (2008). Who makes acquisitions? CEO overconfidence and the market's reaction. *Journal of Financial Economics* 89(1), 20–43.
- Malmendier, U. and G. Tate (2015). Behavioral CEOs: The Role of Managerial Overconfidence. *Journal of Economic Perspectives* 29(4), 37–60.
- Malmendier, U., G. Tate, and J. Yan (2011). Overconfidence and Early-Life Experiences: The Effect of Managerial Traits on Corporate Financial Policies. *The Journal of Finance* 66(5), 1687–1733.
- Miller, D. T. and M. Ross (1975). Self-serving biases in the attribution of causality: Fact or fiction? *Psychological Bulletin* 82(2), 213.
- Otto, C. A. (2014). CEO optimism and incentive compensation. *Journal of Financial Economics* 114(2), 366–404.
- Rau, P. R. and T. Vermaelen (1998). Glamour, value and the post-acquisition performance of acquiring firms. *Journal of Financial Economics* 49(2), 223–253.
- Roll, R. (1986). The hubris hypothesis of corporate takeovers. *Journal of Business* 59, 197–216.
- Savor, P. G. and Q. Lu (2009). Do stock mergers create value for acquirers? *The Journal of Finance* 64(3), 1061–1097.
- Schmidt, B. (2015). Costs and benefits of friendly boards during mergers and acquisitions. *Journal of Financial Economics* 117(2), 424–447.
- Schneider, C. and O. Spalt (2016). Conglomerate Investment, Skewness, and the CEO Long-Shot Bias. *The Journal of Finance* 71(2), 635–672.
- Schoar, A. and L. Zuo (2017). Shaped by booms and busts: How the economy impacts CEO careers and management styles. *The Review of Financial Studies* 30(5), 1425–1456.
- Shue, K. (2013). Executive networks and firm policies: Evidence from the random assignment of MBA peers. *The Review of Financial Studies* 26(6), 1401–1442.
- Thaler, R. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behavior & Organization* 1(1), 39–60.
- Thaler, R. H. and S. Benartzi (2004). Save more tomorrow™: Using behavioral economics to increase employee saving. *Journal of Political Economy* 112(S1), S164–S187.
- Weinstein, N. D. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology* 39(5), 806–820.
- Xuan, Y. (2009). Empire-building or bridge-building? Evidence from new CEOs' internal capital allocation decisions. *The Review of Financial Studies* 22(12), 4919–4948.
- Yermack, D. (1996). Higher market valuation of companies with a small board of directors. *Journal of Financial Economics* 40(2), 185–211.