Board Overconfidence in Mergers & Acquisitions: A Self-Attribution Bias

Axel Kind

University of Konstanz, University of St. Gallen, University of Basel

Torsten Twardawski*

University of Konstanz

This study investigates whether overconfidence of board directors, gained via biased self-attribution in recent M&A deals, influences the quality of corporate acquisitions. We propose an experience-based measure of board overconfidence that complies with established theories in the fields of social psychology and group decision making and is related to the literature on CEO overconfidence and M&A transactions. The measure is found to correlate positively with optimistic insider trading of board directors before M&A deals and is thus a reliable proxy for board overconfidence. Based on a large set of public acquisitions carried out by large U.S. companies, we show that board overconfidence is negatively related to abnormal stock returns upon merger announcements and positively to the premiums paid in such transactions. The results are economically relevant and statistically robust and further suggest that the effect of board overconfidence is distinct from (and adds to) the documented influence of CEO overconfidence on the quality of corporate acquisitions.

Key words: Board of Directors, Mergers and Acquisitions, Overconfidence, Self-Attribution Bias, Group Decision Making, Insider Trading, Corporate Governance

INTRODUCTION

A substantial body of research in the fields of behavioral finance, management science, and strategic management investigates the decision making of managers who deviate from rational expected-utility maximization. A major phenomenon is managerial overconfidence

with its documented impact on corporate investments, such as firm takeovers (see, e.g., Roll, 1986; Hayward and Hambrick, 1997; Malmendier and Tate, 2005, 2008; Billett and Qian, 2008; Doukas and Petmezas, 2008; Ferris et al., 2013). Overconfident CEOs over-estimate their ability to create value in mergers and acquisitions (M&A),[1] which leads them to initiate and carry out deals that destroy shareholder wealth. This instance is particularly detrimental to investors because firms managed by overconfident CEOs tend to engage in multiple acquisitions (Malmendier and Tate, 2008; Billett and Qian, 2008). Findings in the field of experimental and social psychology indicate that overconfidence is not a stable individual trait but arises from positive self-attribution in related prior expe-rience (e.g., Langer and Roth, 1975; Miller and Ross, 1975; Alicke et al., 1995; Babcock and Loewenstein, 1997). Specifically, individuals tend to attribute positive outcomes to their ability, but ascribe failures to external circumstances, which causes them to overes-timate their own competences in future decisions. In the field of financial economics, this self-attribution bias is recognized to matter in the trading behavior of private investors (DeBondt and Thaler, 1995; Daniel et al., 1998; Barber and Odean, 2001; Deaves et al., 2008), the portfolio management of financial institutions (Palomino and Sadrieh, 2011), the composition of CEO compensation contracts (Gervais et al., 2011), as well as analysts' forecasts (Hilary and Menzly, 2006). Accordingly, Billett and Qian (2008) and Doukas and Petmezas (2008) show that CEO overconfidence in M&A activity emerges due to previous experience in such deals. In particular, they evidence that CEOs with recent involvement in M&A transactions tend to acquire other firms in subsequent (higher-order) deals that trigger significantly lower returns to shareholders than first deals.

So far, researchers have not investigated the role of board directors' overconfidence in M&A transactions. This is surprising for at least three reasons. First, legislators around

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[1]Although the term 'acquisition' suggests a hostile character, while 'merger' is usually used to describe a friendly consolidation between two firms, we follow extant literature and use both expressions interchange-ably. We also refer to them as 'M&A deals' and 'corporate takeovers'.

the world typically confer to the board of directors (and not to the CEO) the non-transferable and irrevocable competence of approving large M&A transactions. For example, the Delaware General Corporate Law states that the "board of directors of each corporation which desires to merge or consolidate shall adopt a resolution approving an agreement of merger or consolidation and declaring its advisability" (Title 8, §251, lit. b, DGCL). Based on the existing legal framework, scholars in the field of corporate governance suggest that an effective board should be able to mitigate unfavorable corporate decisions (see, e.g., Fama and Jensen, 1983; Baysinger and Hoskisson, 1989; Shleifer and Vishny, 1997; Jensen and Zajac, 2004) such as overly expensive acquisitions (Kolasinski and Li, 2013).

Second, several research articles convincingly show that specific board characteristics, such as its size and independence (Khorana et al., 2007; Kolasinski and Li, 2013), interlocks (see, e.g., Haunschild, 1993, 1994; Haunschild and Beckman, 1998; Beckman and Haunschild, 2002), and acquisition skills (see, e.g., McDonald et al., 2008), affect the attributes and the performance of M&A deals.

Third, as behavioral biases, such as group polarization (Zhu, 2013) and pluralistic ignorance (Westphal and Bednar, 2005), influence decisions by corporate boards, it seems implausible to assume that their decision quality is unaffected by the directors' overconfidence.

Anecdotal evidence supports the view that board overconfidence is crucial in explaining the occurrence and the performance of M&A deals. For example, after Hewlett Packard (HP), a company characterized by an aggressive acquisition-based growth strategy with mixed performance,[2] replaced in 2010 its incumbent CEO, Mark Hurd, with interim-CEO Cathie Lesjak, HP's acquisition pattern did not change. This is surprising because the mentioned CEO turnover can be viewed as a sudden downward shock to the overconfidence

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[2]According to the New York Times, a Robert W. Baird & Company analyst said about Hewlett Packard: 'They buy at least a company a month, and they have struggled to get this right.'

of HP's highest-ranked executive manager. While Mr. Hurd was arguably an overconfident CEO due to his prior experience in multiple M&A deals (3Com, Palm, Melodea, and Phoenix just in the previous year), Mrs. Lesjak had no prior M&A experience as CEO and was unlikely overconfident.[3] In fact, the next large acquisition of HP under the interim CEO was 3PAR. The deal was announced just two months after the CEO turnover and caused a 4.3 percent decrease in HP's firm value.[4] Interestingly, prior to the announcement, Cathie Lesjak drastically decreased her ownership in HP by selling 10,050 shares worth half a million dollars in a 180-day period preceding the deal. Conversely, over the same period, nine board directors of HP increased their ownership by purchasing a total of 41,448 shares. This trading behavior indicates that the deal was favored by the board directors but not by the CEO.

This paper focuses on the effect of board directors' overconfidence on the quality of corporate M&A activity.[5] It contributes in several ways to the extant literature in the fields of corporate governance, mergers and acquisitions, and group decision making by proposing and testing a measure of board overconfidence and by empirically investigating the effect of board overconfidence on abnormal stock returns upon takeover announcements and acquisition premiums.

First, we build on the research of CEO overconfidence in M&A transactions (Malmendier and Tate, 2005; Billett and Qian, 2008; Doukas and Petmezas, 2008) to derive and test a new empirical proxy of the overconfidence of corporate boards based on directors' positive self attribution in their recent M&A experience. By considering also M&A deals carried out in connection with directors' additional mandates as executives and board members

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[3]Further, several scholars would mention that, all else equal, female CEOs are more risk averse and less overconfident than male CEOs (see e.g. Barber and Odean, 2001; Huang and Kisgen, 2013; Levi et al., 2014).

[4]The Wall Street Journal branded the acquisition of 3PAR by HP a 'windfall for insiders and investors' of the target. HP went in a 'fight [with Dell] to buy a small data-storage company' that ended in a winner's curse for HP.

[5]The research question complies with the suggestion of Hambrick et al. (2008) to consider behavioral biases in corporate boards when studying the quality of firms' strategic decisions.

in other companies, we extend the individual overconfidence measure of Billett and Qian (2008). The procedure used to aggregate individual overconfidence to board overconfidence complies with social identity theory and recent empirical results in the decision making of boards (Tajfel and Turner, 1979; Hillman et al., 2008; Chen et al., 2016).

Second, to test the empirical reliance of the proposed measure, we follow Billett and Qian (2008) and Doukas and Petmezas (2008) and relate the board-overconfidence measure to the directors' insider trading during the 180 days prior to the merger announcements. We show that also in the case of corporate boards, the overconfidence is positively correlated with the Net Purchase Ratio (NPR), i.e., the ratio of purchases minus sales over all transactions with shares of the own company ($\rho = 0.11$, p<0.03).

Third, we contribute an empirical study on the impact of board overconfidence on the quality of M&A deals by focusing on abnormal stock returns upon takeover announcements. Based on a sample of 468 public deals performed by U.S. publicly-traded firms in the period 2009-2013, we show that overconfidence of board directors is negatively related to the performance of M&A deals as measured by cumulative abnormal announcement returns. The effect is statistically significant and economically relevant. All else equal, an upward shift in board overconfidence from the 25th to the 75th percentile decreases five-day abnormal returns by 1.9 percentage points on average. The negative impact of board overconfidence remains significant even after controlling for a set of corporate-governance variables (e.g., dual mandates, board independence, and female directors), M&A characteristics (e.g., cash vs. share payment and conglomerate mergers), firm characteristics (e.g., company size, leverage, and Tobin's Q), as well as unobservable time-invariant industry differences and year fixed effects. Importantly, the influence of board overconfidence on abnormal returns remains economically important and statistically significant even after accounting for CEO overconfidence, which indicates that the two effects are distinct and cumulative. The negative relation between board overconfidence and abnormal returns is

found to be fairly stable with respect to different return windows, variations in the definition of overconfidence variables, regression settings, and controls.

Finally, we round up the analysis on the importance of board overconfidence in mergers and acquisitions by investigating the relation between our overconfidence measure and premiums paid for acquiring corporate targets. Indeed, we find premiums to increase with the level of board overconfidence. Multivariate cross-sectional regressions show that (all else equal) acquisition premiums rise by 3.16 percentage points on average if the fraction of overconfident directors is increased by 10%. The positive relation between board overconfidence and acquisition premiums is found to be very robust. In particular, it is qualitatively unaffected by the inclusion of corporate-governance measures, deal characteristics, as well as acquirers' attributes. Interestingly, while board overconfidence contributes in explaining acquisition premiums, CEO overconfidence does not, which complies with the idea that decisions on premiums are usually taken by boards rather than CEOs.

Overall, this study shows the empirical relevance of board overconfidence in explaining the quality of corporate decisions in the area of mergers and acquisitions. The findings advise CEOs and board directors to take into account the potential (adverse) influence of directors' overconfidence when deciding on corporate acquisitions and acceptable takeover premiums. Along the same lines, shareholders should consider directors' overconfidence when monitoring the performance of M&A transactions and making decisions on the (optimal) composition of corporate boards.

THEORY AND HYPOTHESES
Overconfidence Triggered by Self Attribution

Overconfidence is generally defined as a human characteristic that leads individuals to have a subjective confidence in a judgment that exceeds its objective accuracy (see e.g., Klayman et al., 1999). Often, this behavioral bias becomes apparent when individuals overestimate their skills, rely too heavily on their prior experience, or overvalue the general

precision of their private information (Oskamp, 1965; Lichtenstein and Fischhoff, 1977; Larwood and Whittaker, 1977; Svenson, 1981; Moore and Healy, 2008). Rather than being a stable individual trait, such as one of the "Big Five" personality traits, i.e., openness, conscientiousness, extraversion, agreeableness, and neuroticism, overconfidence seems to evolve dynamically over time even in adult age (McCrae and Costa, 1987).[6] In an early study on clinical decisions made by professional psychologists, Oskamp (1965) was able to show that the individual confidence in judgments increases as more information is released, whereas the objective accuracy does not.

An established strand of research in the field of social psychology (see, e.g., Langer and Roth, 1975; Miller and Ross, 1975; Alicke et al., 1995) argues that changes in individual overconfidence can be traced back to a positive self evaluation, more specifically a *self-attribution bias*. According to this theory, people maintain a positive image of themselves and tend to be biased in the causal attribution of personal outcomes: they take personal credit for successes (internal attribution), whereas they deny to take responsibility for failures by attributing them to external factors (external attribution). This self-attribution bias is particularly strong if individuals (i) suffer from an illusion of control (Langer and Roth, 1975; Weinstein, 1980; March and Shapira, 1987), (ii) have prior experience in the relevant task (Weinstein, 1980; Griffin and Tversky, 1992; Kahneman and Tversky, 1979; Menkhoff et al., 2013), (iii) are highly committed to the outcome (Weinstein, 1980; Nisbett and Ross, 1980), and if they have to deal with (iv) difficult tasks (Lichtenstein and Fischhoff, 1977; Dunning et al., 2004) and (v) rare events (Brehmer, 1980; Dunning et al., 2004).

CEO Overconfidence and Corporate Takeovers

Researchers argue that top managers who are involved in the development of the corporate strategy, e.g., those that have to deal with takeover decisions, are particularly prone to

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[6]In particular, McCrae and Costa (1987) show that the Big Five personality traits are stable after the age of 30.

overconfidence (Larwood and Whittaker, 1977; Goel and Thakor, 2008; Malmendier and Tate, 2005, 2008). This assessment is based on the observation that top managers meet important conditions that induce overconfidence: They perceive a high level of control over firm's risk and performance (March and Shapira, 1987; Kahneman and Lovallo, 1993), but they underestimate the actual risk taken, especially in the context of mergers and acquisitions (Lubatkin and O'Neill, 1987). Moreover, they are highly committed to firm success because of their equity-based compensation and their personal responsibility in the decision to acquire a particular target (Haunschild et al., 1994; Malmendier and Tate, 2008).

Overconfidence already occupies a prominent role in explaining deviations from rational behavior in corporate takeovers. In a seminal paper, Roll (1986) claims that managerial hubris may lead firms to overpay for targets. Along this line, Malmendier and Tate (2008) argue that overconfident CEOs believe to be able to manage a given target better than its incumbent management. Thus, they aim to generate excess returns by acquiring firms and replacing their management. Malmendier and Tate (2008) show that managerial overconfidence yields two downside effects. First, firms with overconfident CEOs pay higher takeover premiums, which is also reflected in negative abnormal returns upon takeover announcements. Second, overconfident CEOs are even more detrimental to shareholder value because they acquire companies more frequently than non-overconfident CEOs.

Consistently with research on biased self attribution, Billett and Qian (2008) show that abnormal returns of acquiring firms upon merger announcements are close to zero following first deals in the history of CEO's acquisitions, but significantly negative upon subsequent (higher-order) deals. They argue that a CEO's overconfidence emerges from taking personal credit for the successful completion of the first corporate acquisition. According to Haleblian and Finkelstein (1999), managers overvalue the experience gained in their first acquisitions, independently of the objective and measurable success of those deals. Finally,

Kraehmer (2003) and Doukas and Petmezas (2008) suggest that in the eyes of a manager an acquisition represents per se a victory in a bidder contest and, thus, a success. In this paper, we follow this literature and assume that managerial overconfidence is not a stable individual trait but develops over time through a self-attribution bias in past M&A deals.

The Board's Role in Corporate Takeovers

The majority of scholars in the field of corporate governance agree in considering the monitoring of management as the prime function of corporate boards (e.g., Fama and Jensen, 1983; Eisenhardt, 1989; Boyd, 1994; Hillman and Dalziel, 2003, among others). However, board directors also contribute to the success of corporations by advising executive managers and by taking strategic decisions, such as developing new products, expanding into new markets, or acquiring corporations (e.g., Judge and Zeithaml, 1992; Goodstein et al., 1994; Westphal, 1998; Forbes and Milliken, 1999; Rindova, 1999; Westphal and Fredrickson, 2001; Carpenter and Westphal, 2001; Kor and Misangyi, 2008; Schwartz-Ziv and Weisbach, 2012; Coles et al., 2015, among others).

The strategic competences that firms should transfer to their corporate boards are described in the OECD Principles of Corporate Governance 2004.[7] In the U.S., the competences of corporate boards are defined in the states' Corporation Acts. For example, the Delaware Corporation Act confers boards the explicit duty of approving mergers and acquisitions: "the board of directors ... shall adopt a resolution approving an agreement of merger ... declaring its advisability."[8] Similar articles are included in the Corporation Acts of many other states. In fact, according to the prevailing opinion of law scholars, the board's competence in corporate takeovers is so strong that in the case of a disagreement with the CEO, the board's authority shall prevail (see, e.g., Bainbridge, 2002).

The relevance of the board of directors in corporate acquisitions is underpinned by a number of studies that relate board characteristics to M&A activity. Haunschild (1993)

[7]Part One, Article VI, OECD Principles of Corporate Governance 2004.
[8]Del. Code Ann. tit. 8 §141(a) (2000) or §251 (2004)

shows that the acquisition frequency of acquirers highly correlates with the number of acquisitions experienced by interlocked board directors and that this is due to a transfer of inter-organizational routines. Kolasinski and Li (2013) report that optimally-sized and independent boards are particularly successful in takeover deals as measured by cumulative announcement returns. Further, lower acquisition premiums are found to be paid by boards with a higher fraction of women directors (Levi et al., 2014), boards used to low premiums (Haunschild, 1994; Zhu, 2013), and interlocked boards (Beckman and Haunschild, 2002). Finally, McDonald et al. (2008) detect a weakly positive relation between the success of takeover deals, measured by abnormal announcement returns, and the long-term experience of board directors in M&A transactions.

Directors' Overconfidence and Takeover Decisions - Testable Hypotheses

The fact that CEOs are found to develop overconfidence based on a self-attribution bias in past M&A deals leads us to conjecture that also board directors might become over-confident in the very same way. This rationale is supported by the following arguments and findings. First, laboratory experiments evidence that also group decisions can trigger overconfidence (see Schlenker and Miller, 1977). In this respect, it seems very plausible that board directors take personal credit for successful acquisitions, whereas they deny to take responsibility for board failures. Second, as previously argued, state Corporation Acts assign board directors the competence on firm acquisitions and force them to be committed to the outcome, which is a crucial factor that fosters the development of overconfidence through a self-attribution bias (Weinstein, 1980; Nisbett and Ross, 1980). Third, board directors perceive a high level of control by being in charge of the firm's strategic devel-opment, including decisions on the expansion into new markets, the development of new products, growth by mergers and acquisitions, and the hiring and firing of top executives (Langer and Roth, 1975; Weinstein, 1980). Finally, CEOs and board directors are very likely to share similar personal traits as they are both managers, which make them arguably

comparable in terms of their psychological profile and, thus, their propensity to become overconfident (Larwood and Whittaker, 1977; Goel and Thakor, 2008).

Early work in psychology claims that groups perform better than individuals in a wide set of tasks due to their ability to self correct and avoid errors (see, e.g., Kerr and Tindale, 2004, for a review). However, behavioral biases of individual group members can negatively affect the decision quality (see, e.g., Dunning and Ross, 1992; Tindale, 1993; Westphal and Bednar, 2005; Zhu, 2013). The influence of biased group members on group decisions is particularly severe if the correct solution is not easily identifiable ex-ante (Tindale, 1993; Alicke et al., 1995), which is arguably the case in takeover decisions (Haunschild, 1994).

Advocates of the social identity theory[9] (Tajfel and Turner, 1979) assert that group members with similar characteristics tend to collude and attempt to influence the group decision in the favored direction, which may be detrimental to the decision outcome. In the context of corporate takeovers, the social identity theory suggests that overconfident and non-overconfident directors form opposing coalitions. While the former overestimate their own skills in managing a given target and are thus generally favorable to acquisitions, the latter are more realistic in assessing the existence and value of possible synergies and therefore more cautious. Consequently, the larger the coalition of overconfident directors, the higher the risk of acquiring wrong targets and destroying shareholder value.[10]

To test the impact of directors' overconfidence on board decisions, we follow the related literature (see e.g., Haunschild, 1994; Beckman and Haunschild, 2002; McDonald et al., 2008) and compute cumulative abnormal returns around takeover announcements. By assuming that markets are efficient, the announcement reaction around a merger will capture the value relevance of this event and, thereby, provide estimates of the quality of board decisions. Based on the above arguments, we formulate the following testable hypothesis.

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[9]The social identity theory explains both, the processes by which individuals derive a perceived membership in groups and the impact of groups on interactions among individuals within and between groups.

[10]Westphal and Bednar (2005) and Zhu (2013) emphasize that directors typically do not discuss strategic actions outside the boardroom, which reduces the likelihood that coalitions are dashed through informal communication.

Hypothesis 1. The fraction of overconfident board directors is negatively related with abnormal returns upon takeover announcements.

A crucial part of a takeover decision refers to the price to be paid by the acquirer for a given target. According to Haunschild (1994), this price reflects a fundamental tradeoff. The acquirer's board can offer a low price with the risk of either failing to convince the target's management and shareholders and thus losing the bidding contest to competitors. Alternatively, the board can offer a high price with the risk of overpaying, being subject to the winner's curse, and destroying shareholder value (Slusky and Caves, 1991; Varaiya and Ferris, 1987). As overconfident directors overvalue the cash flows that a certain target can generate under the acquirer's management (Levi et al., 2014; Haunschild, 1994), the coalition of overconfident directors will be willing to pay higher takeover premiums.[11] The propensity of overconfident directors to pay higher premiums leads us to formulate the following testable hypothesis.

Hypothesis 2. The fraction of overconfident board directors is positively related with acquisition premiums.

METHOD AND DATA
Empirical Measure of Board Overconfidence

In analogy with the literature on CEO overconfidence in M&A deals (Billett and Qian, 2008; Doukas and Petmezas, 2008), we distinguish between *frequently* and *infrequently* acquiring directors and consider the former to be overconfident because they attribute their past M&A experience, i.e., the success of winning past bidding contests, to their superior skills (positive self-attribution bias).[12] In particular, we classify individual directors as

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[11]An alternative (but observationally equivalent) explanation for why overconfident managers pay higher premiums is mentioned by Ben-David et al. (2007) and Malmendier and Tate (2008). They argue that overconfident managers apply a lower discount rate to future cash flows, which in turn leads to a higher valuation of the target.

[12]The idea of relating overconfidence to the trading frequency is also well established in the literature on the trading behavior of private investors (see, e.g., Odean, 1998, among others).

overconfident in a given M&A transaction if they won at least one bidding contest, and thus carried out a corporate acquisition, as board member, CEO, or CFO within the previous three years. Three characteristics of this individual overconfidence measure deserve attention.

First, as board directors may have additional mandates as executives and board members in other companies, they are likely to carry over their experience (and thus also their overconfident attitudes) from one firm to another (Schlenker and Miller, 1977; Haunschild, 1993; Beckman and Haunschild, 2002; Kroll et al., 2008; McDonald et al., 2008). Further, an acquisition experience as a CEO or CFO (even without being a board director of the acquiring firm) is comparable to a takeover experience as board director (Ben-David et al., 2007; Malmendier and Tate, 2008; Billett and Qian, 2008; Doukas and Petmezas, 2008). For these reasons, in computing the overconfidence of individual board members, we explicitly take into account M&A deals in other companies whenever a given director was involved therein as either CEO, CFO, or board director. In this respect, the proposed measure extends those of Billett and Qian (2008) and Doukas and Petmezas (2008).

Second, overconfidence of individual directors is triggered by just *one* relevant prior takeover experience within a given time period. This choice is in line with the CEO overconfidence literature (Billett and Qian, 2008) and reflects the argument of Langer and Roth (1975) that positive self attribution quickly induces overconfidence whenever a task is particularly difficult, as in the case of M&A deals. The instance that the first relevant experience is sufficient to induce overconfidence in individuals is suggested in the context of M&A deals also by Haleblian and Finkelstein (1999).

Third, the overconfidence measure does not consider the entire directors' M&A experience but only the most recent one. This allows directors to cease to be overconfident if they stop being involved in corporate acquisitions or if their bids are not successful. Further, the short-term window allows us to disentangle overconfidence from long-term M&A

experience, which McDonald et al. (2008) show to be positively (although weakly) related with mergers' success. Haunschild (1994); Hayward (2002); Malmendier and Tate (2005), and Doukas and Petmezas (2008) argue that a series of deals conducted in short time cannot be the result of insightful analyses based on skills developed through valuable past experience. For this reason, the measure of overconfidence used in this paper will unlikely proxy for valuable managerial experience in M&A activity.

While the length of the short-term rolling window offers some leeway, we follow Fuller et al. (2002) and Doukas and Petmezas (2008) and choose a three-year window for our baseline specification. To illustrate the measure of overconfidence of individual directors used in this paper, let us consider the example of Mr. Thomson, a fictive manager who has been, starting from January 2002, CEO of Firm B and director in the board of Firm A (and did not hold other positions). Table 1 lists all corporate acquisitions in which Mr. Thomson was involved in between January 2002 and December 2014. In particular, the table provides information on the date of the deal announcement (column 2), the acquiring firm (column 3), Mr. Thomson's position in the acquiring firm (column 4), as well as the *deal order* (introduced by Billett and Qian, 2008; Doukas and Petmezas, 2008). For the purposes of our study, we are interested in detecting the overconfidence of Mr. Thomson as board director in the deals carried out by Firm A (column 6). In accordance with our experience-based measure, Mr. Thomson is viewed as overconfident in Deals 2, 3, and 5: in a three-year window preceding each of those deals, he was directly involved in (at least) one additional acquisition. On the contrary, he is not overconfident in Deals 1 and 4 because he has not experienced a corporate acquisition in the previous three years. It is interesting to note that, in this example, Mr. Thomson's overconfidence in Deal 3 is entirely attributable to his involvement as CEO in a corporate acquisition carried out by another firm (Deal 2 in Firm B).

[INSERT TABLE 1 ABOUT HERE]

In order to measure board overconfidence, we aggregate individual directors' overconfidence prior to each M&A deal and consider the percentage of directors in a board who were involved in at least one acquisition in the preceding three years:

$$\text{Fraction of overconfident directors (FOD)} = \sum_{i=1}^{N} \frac{1_{\text{Deal order of director}_i \geq 1}}{\text{N}},$$

where 'deal order of director$_i$' is the deal order of director i in a board with N directors. Given the development of individual overconfidence from prior experience and the different (and changing) group compositions, the extent to which group decisions are influenced by overconfidence is likely to vary in the cross-section of groups and over time.

Sample and Data

We obtain a sample of successful corporate takeovers from the U.S. Mergers and Acquisitions Database of Thomson One SDC Platinum. The database comprises deal characteristics of domestic and cross-border takeovers that are announced between 1980 and 2014. We retain deals if the following criteria are satisfied:[13]

1. The acquirer is a publicly-traded U.S. company.

2. The target is a publicly-traded domestic or foreign company.

3. The deal value exceeds one million dollars as measured by the total amount paid by the acquirer, excluding fees and expenses.

Further, we consider only corporate acquisitions for which we are able to compute (i) abnormal stock returns (primary dependent variable), (ii) our experienced-based measure of directors' overconfidence (focus variable), and (iii) a set of common controls. The computation of abnormal stock returns requires merging our SDC Platinum sample with the stock database of the Center of Research in Security Prices (CRSP). The measure of directors' overconfidence is computed by using GMI Ratings (MSCI). The database includes annual information on directors and (starting from 2006) also top executives, i.e., CEOs

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[13]In general, the selection criteria follows those of Fuller et al. (2002).

and CFOs, in the Russell 3000 index and thus covers 98% of the market capitalization of publicly-traded U.S. companies. For each director engaged in an acquisition covered by our sample, we measure the number of prior acquisitions (of public, private, and non-public subsidiaries of public and private firms) he or she was involved in within the previous three years as board director, CEO, or CFO that are included in the SDC database and meet point 3 of the previously-mentioned sample-selection criteria.[14]

To isolate the effect of board overconfidence on acquirers' abnormal stock returns upon takeover announcements (*Hypothesis 1*) and acquisition premiums (*Hypothesis 2*) from the influence of other variables that scholars in the field of Mergers and Acquisitions have found to have explanatory power, we include a set of commonly used controls. In particular, we consider (i) deal characteristics, (ii) financial attributes of the acquiring-firm, (iii) governance characteristics of the acquiring firm, as well as (iv) time and industry effects. We include in all regressions the following deal characteristics (as provided by SDC). *Conglomerate* is a dummy variable that equals one if the two digit SICs of the acquirer and the target differ and zero otherwise (see Fowler and Schmidt, 1989; Krishnan et al., 1997). *Cash deal* is a dummy variable that equals one if over half of the payment is in cash. For example, Haleblian and Finkelstein (1999) and Zhu (2013) argue that cash payments signal that the acquirer's firm value is too low, which leads to higher abnormal returns. *Size of the target* measures the log of the targets' asset values. *Competition* is a dummy variable that equals one if competing bidders exist and zero otherwise (see Schwert, 1996). Other dummy variables indicate whether the acquisition was performed via a *tender offer*, by a *financial firm* (acquirer SIC between 6000 and 6999), and whether the deal is *domestic*, i.e., the target is a U.S. company.

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[14]We choose to include acquisitions of private firms and subsidiaries in the measurement of directors' overconfidence because such deals are likely to contribute to the development of overconfidence via a positive self-attribution bias (Billett and Qian, 2008), especially in view of their well-known positive announcement effects (Fuller et al., 2002; Capron and Shen, 2007).

Further, we control for the following financial attributes of the acquiring firm (as obtained from CRSP and Compustat): *Debt to equity* ratio; *Tobin's q*, calculated as total assets minus book equity plus the market value divided by total assets (see Servaes, 1991); *operating cash flow*, which is equal to cash flows from operations (and if this item is not available in the cash-flow statement, operating cash flow is calculated as sales minus the sum of costs of goods sold, SG&A, and changes in working capital); and *size of the acquirer*, measured by the log of the acquirers' asset values. We include the *acquirer's previous-year stock performance* because Haleblian and Finkelstein (1999) suggest that well-performing firms are better acquirers.

Governance characteristics of the acquiring firm are known to be related to the effectiveness of boards as monitors and advisers. To address this issue, we include the following variables (obtained from GMI Ratings) in our cross-sectional regressions: *Board size*, i.e., the number of directors in a given board (see Jensen, 1993; Yermack, 1996; Coles et al., 2008), *CEO duality*, i.e., a dummy equal to one if the CEO also holds the position of the chairman of the board and zero otherwise (see, e.g., Jensen, 1993), and *fraction of independent directors* (see, e.g., Weisbach, 1988; McDonald et al., 2008). Further, we follow McDonald et al. (2008) and run the regressions by including *institutional majority*, a dummy variable which assumes a value of one if the majority of outstanding shares are held by institutional investors and zero otherwise. It is suggested that institutional ownership reduces agency problems and may enhance takeover decisions.

As acquisitions often come in waves (Rhodes-Kropf and Viswanathan, 2004; Harford, 2005) that may also drive the overconfidence of CEOs and directors as measured in this paper, we follow Doukas and Petmezas (2008) and consider the *merger activity* of the previous year - defined as the number of private, public, and subsidiary deals which are used to develop our measure of directors' overconfidence - to account for this possibility. Industry fixed effects address the possible existence of time-invariant differences across industries

that are not already captured by other control variables. Finally, year fixed effects account for economy-wide differences in abnormal announcement returns (and takeover premiums) over time.

After considering the selection criteria and the data availability for computing all the above variables, the final sample consists of 486 public deals in the period 2009-2013.[15]

EMPIRICAL RESULTS
Acquirers' Abnormal Returns Upon Takeover Announcements

In this section, we investigate Hypothesis 1 which predicts that the more overconfident a firm's board the lower its abnormal returns upon takeover announcements. Table 2 presents summary statistics and correlation coefficients between pairs of variables in our final sample.

[INSERT TABLE 2 ABOUT HERE]

The average fraction of overconfident directors in a board amounts to 53 percent. The fraction of overconfident CEOs (71 percent) is higher than in Billett and Qian (2008) (ca. 50 percent) because we additionally account for CEO overconfidence developed via self-attribution bias in the boards of other firms. Further, CEOs are more often classified as overconfident than board directors because in our sample they occupy on average more additional mandates as board directors in other firms than directors have additional board mandates . The correlation between CEO overconfidence and board overconfidence is positive but low enough to suggest that the two variables measure related but distinct characteristics and multicollinearity is not an issue in the regressions to follow.[16] Finally, also the correlations between pairs of controls (and focus variables) are low enough to exclude problems of multicollinearity. To estimate daily abnormal stock returns upon

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[15]Due to the fact that our overconfidence measure requires a three-year acquisition history for each board director, the sample of acquisitions we can use for this study begins in 2009, i.e., three years after GMI Ratings started filing information on CEOs, CFOs, and board directors.

[16]In all regressions, the correlation coefficient between board overconfidence and CEO overconfidence is lower than 0.6 and variance inflation factors are lower than 10.

takeover announcements, we follow Fuller et al. (2002) and compute the difference between observed announcement returns of a given firm i and the market return:

$$AR_{it} = R_{it} - R_{mt}, \tag{1}$$

where R_{it} is the return of firm i at date t and R_{mt} is the value-weighed return of the market index at date t as provided by CRSP. This approach assumes a beta of 1 and an alpha of 0 and refrains from estimating such parameters.[17] In our baseline specification, we use a five-day window centered on the announcement day, i.e., [-2 +2], which is long enough to capture all market reactions triggered by the first mention of the merger as well as slightly sluggish or anticipated responses (e.g., due to information leakage):

$$CAR_i([-2+2]) = \sum_{t=-2}^{2} AR_{it}. \tag{2}$$

Table 3 presents a breakdown of acquirers' abnormal announcement returns by board overconfidence (Panel A) and CEO overconfidence (Panel B).

[INSERT TABLE 3 ABOUT HERE]

While the announcement of corporate acquisitions conducted by boards (Panel A) with less than 50% of overconfident directors is followed by positive and significant announcement returns (1.93 percent, $p < 0.001$), takeovers by boards with a majority of overconfident directors trigger a negative (although not statistically significant) stock-price reaction (-0.30 percent). The difference amounts to -2.23 percent and is statistically significant ($p < 0.001$). Similar results hold when comparing highly overconfident boards, i.e., boards in the top quartile of the FOD distribution, to boards in the bottom quartile of the FOD distribution. Interestingly, takeovers approved by highly overconfident boards are followed by negative and significant announcement returns of -0.81 percent ($p < 0.07$) and, thus, destroy shareholder value.

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[17]According to Brown and Warner (1980), adjusting the firm return by an estimated beta may not be beneficial in short-term event studies. In our particular setting, beta estimates might be even biased if a bidder acquired multiple targets during the estimation period.

To put these results into perspective with the extant literature on CEO overconfidence and corporate acquisitions, we replicate the analysis of Billett and Qian (2008) and compare cumulative abnormal returns for acquisitions approved by overconfident and non-overconfident CEOs (Panel B). Announcement returns of takeovers approved by overconfident CEOs are significantly lower than those of non-overconfident CEOs, which confirms and underpins the findings of Billett and Qian (2008). This result is interesting because it is obtained by an enhanced overconfidence measure that (as suggested by Schlenker and Miller, 1977; Haunschild, 1993; Beckman and Haunschild, 2002) also considers the development of CEO overconfidence based on deals approved when serving as board director in other firms.

Cross-Sectional Analysis of Acquirers' Abnormal Returns

In order to disentangle the impact of board overconfidence and CEO overconfidence on announcement returns and to control for other potential explanatory factors, we run cross-sectional regressions on five-day cumulative abnormal returns. Table 4 reports the results of multivariate regressions with robust standard errors in parentheses.

[INSERT TABLE 4 ABOUT HERE]

Model 1 indicates that, even after accounting for a large set of controls, the fraction of board overconfidence has a negative and significant impact on takeover announcement returns (p<0.001). In particular, a change in the fraction of overconfident directors of ten percentage points, e.g., approximately one additional overconfident director, is, all else equal, associated with lower abnormal returns of 0.31 percentage points (p<0.003). The inclusion of year fixed effects and industry fixed effects in Model 2 does not change the results in a relevant manner.

In Model 3, we re-run Model 2 by including CEO overconfidence. Strikingly, the coefficients of both board overconfidence and CEO overconfidence are negative and statistically significant (p<0.03). This indicates that the effect of board overconfidence on the quality

of corporate acquisitions is separate and different from the effect of CEO overconfidence evidenced by Billett and Qian (2008) in the US and Doukas and Petmezas (2008) in the UK.

In a separate (unreported) analysis, we replace the fraction of overconfident directors with a dummy variable that equals one if the number of overconfident board directors exceeds 50% and zero otherwise. This model accounts for the possibility that a majority of overconfident directors is both a necessary and sufficient condition for board overconfidence to matter in acquisition decisions. It complies with the conjecture that a minority of directors will not deviate from the consensus and oppose the majority view (Janis, 1982). Results show that takeover decisions made by boards with a majority of overconfident directors trigger, all else equal, abnormal returns that are 1.55 percentage points lower than those announced by boards with a majority of non-overconfident boards (p<0.04). Further, the regression coefficients reveal that the effect of board overconfidence on abnormal returns is similar in magnitude to the effect of CEO overconfidence (-1.97 percent, p<0.03).

Model 4 re-runs Model 3 by omitting the measure of board overconfidence. Not surprisingly, the coefficient of CEO overconfidence is negative, significant ($\beta = -2.646$, p<0.01), and larger in absolute magnitude than the coefficient in Model 3 ($\beta = -1.804$, p<0.02). This indicates that in Model 4 CEO overconfidence captures some of the effects that should actually be attributed to board overconfidence. In this respect, the results reported in Billett and Qian (2008) and Doukas and Petmezas (2008) are likely to overstate the true influence of CEO overconfidence on shareholder value by capturing some of the effect of board overconfidence. By running the regressions of Table 3 and Table 4 with an alternative three-day event window ([-1 +1]), the results do not change in terms of statistical significance (unreported).

In all regression models, we observe that cash deals are associated with significantly higher abnormal returns. This finding complies with the idea that a corporate acquisition

financed with equity conveys a negative signal about the acquirer's current stock valuation (Haleblian and Finkelstein, 1999; Zhu, 2013). Further, we find support for the argument of Servaes (1991) that high Tobin's Q bidders make better acquisition decisions due to their superior managerial performance.

Acquisition Premium

In this section, we test Hypothesis 2 which states that overconfident board directors do not carefully evaluate the target, overestimate the value of synergies and managerial turnover, and are thus willing to pay higher premiums than non-overconfident directors. In our setting, the acquisition premium is a standardized measure of overpayment that allows us to compare a large number of acquisitions (Haunschild, 1994) and relate them to board overconfidence. For this purpose, we investigate the determinants of the acquisition bid premiums of all public targets included in the SDC database. Acquisition premiums are calculated as the ratio of the final offer price to the targets stock price four weeks prior to the bid minus one. The target's stock price four weeks prior to the acquisition is considered to be a reliable estimate of its market value because it is unlikely affected by acquisition bids and rumors (see e.g., Haunschild, 1994; Hayward and Hambrick, 1997; Beckman and Haunschild, 2002). Due to the additional requirement of measuring acquisition premiums, the sample shrinks from 468 to 401 corporate takeovers.

In addition to the controls used in the cross-sectional analysis of abnormal announcement returns, we also consider in our regressions the *fraction of female directors* on the board. Female directors are found to have a lower level of overconfidence and, thus, pay less for targets (McCarty, 1986; Levi et al., 2014). Additionally, we include two further target-related characteristics that are often used for explaining acquisition premiums (see, e.g., Levi et al., 2014): the *target's return on assets* as a measure of firm profitability and the *target's leverage* ratio. Because of the additional need to measure the fraction of female

directors as well as the target's leverage and return on assets, the sample used in the following regressions comprises 290 corporate takeovers in the time period 2009-2013.[18]

Table 5 presents the regression results. In line with the majority of M&A studies, we find that acquirers pay lower premiums for small targets and higher premiums when there is competition in the bidding contest (see, e.g., Giliberto and Varaiya, 1989; Varaiya and Ferris, 1987; Laamanen, 2007).

[INSERT TABLE 5 ABOUT HERE]

Most importantly, the results evidence that acquisition premiums are positively related to board overconfidence. In all models, the coefficients of board overconfidence are statistically significant (Model 1 and 3: $p < 0.03$, Model 2: $p < 0.10$). In economic terms, a change in the fraction of overconfident directors of ten percentage points, i.e., approximately one additional overconfident director, is, all else equal, associated with higher takeover premiums of 1.97 percentage points (Model 1). The inclusion of year fixed effects and industry fixed effects in Model 2 and CEO overconfidence in Model 3 does not change the results in a qualitative manner. It is worth noting that the effect of board overconfidence on premiums is not driven by a gender effect because we account for the fraction of women directors on boards. However, the negative (and weakly significant) coefficient of this variable supports the recent findings of Levi et al. (2014) that firms with a higher fraction of female directors pay lower premiums. Finally, unlike in the regression based on abnormal returns, the overconfidence of CEOs is not found to be statistically significant (Model 4). Thus, while CEO overconfidence seems to have an impact on the quality of corporate takeover decisions (as perceived by the market), it does not translate into higher premiums.

Robustness

Our measure of directors' overconfidence (and thus, board overconfidence) is developed in accordance with established theories in the field of social psychology and group decision

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[18]To exclude the possibility that the results are driven by idiosyncrasies of the smaller subsample, we re-run the regressions by excluding the additional control variables and using the entire sample of 401 takeovers for which we have premiums.

making and is closely related with the extant literature on CEO overconfidence. However, it still represents a proxy of an unobservable personal characteristic. Thus, to investigate the reliance of our overconfidence measure, we follow the CEO overconfidence literature (Billett and Qian, 2008; Doukas and Petmezas, 2008; Malmendier and Tate, 2008) and study the insider trading of top managers prior to M&A deals. If our measure is reliable and overconfident directors strongly believe to create value through their acquisitions, we should expect directors in boards with a high fraction of overconfident members to be engaged in more optimistic trades than directors in boards with a low fraction of overconfident members.

To test this relationship, we use data on insider trading from Thomson Financial in the time period 2009-2013. The dataset includes all SEC filings of transactions executed by insiders, such as the management or the board of directors, who are subject to disclosure according to the Securities and Exchange Act of 1934, Section 16(a). We follow Seyhun (1990) and create a measure of net purchases. In a first step, we compute the number of stock purchases via open-market or private transactions. In line with Billett and Qian (2008), we add the number of shares obtained by managers through option exercises. In a second step, we deduct the number of sales (both shares owned and shares previously obtained via option exercises) in order to obtain the net number of purchases. Finally, we calculate the *Net Purchase Ratio* (NPR) by dividing net purchases by the number of all transactions, i.e., the number of all sales plus the number of all purchases. To obtain a net purchase ratio that is representative of the trading of a board, we calculate an average NPR of all board directors by summing up the NPRs of board members and dividing this value by the number of board members who have traded. Similar to Billett and Qian (2008) and Doukas and Petmezas (2008), we measure insider trading over a period of 180 days (six months) prior to the announcement of a merger.[19] The Thomson Financial database

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[19]We only include transactions that are verified through a cleansing process by Thomson Reuters and identified by the "Cleanse Indicator" == "R" (high confidence) and "Cleanse Indicator" == "H" (very high confidence).

provides information on directors' insider trading of companies involved in 440 corporate takeovers out of the 468 public deals in our sample.

Table 6 provides statistics on the average insider trading of boards (Panel A) and CEOs (Panel B). Boards with a majority of overconfident directors display positive NPRs that are significantly higher than the NPRs of boards with a minority of overconfident directors. The NPR of boards in the highest quartile of the FOD distribution is twice as large as the NPR of boards in the lowest quartile. Most importantly, we find a positive and significant Pearson correlation coefficient between insider trading and the fraction of overconfident directors ($\rho = 0.11$, p<0.03). This indicates that the measure of board overconfidence proposed in this paper is reflected in directors' insider trading. Similarly, overconfident CEOs have a significantly more optimistic trading behavior than non-overconfident CEOs ($\rho = 0.10$, p<0.04), which confirms the findings of Billett and Qian (2008). The instance that NPRs of board directors are much larger than NPRs of CEOs may be related to the tendency of individuals to be more (over-)confident in a group than in isolation. In fact, researchers on group (over)confidence (see, e.g., Boje and Murnighan, 1982; Sniezek and Henry, 1989; Plous, 1995; Hoelzl and Rustichini, 2005, among others) argue that individuals belonging to a given group (e.g., board directors) tend to overestimate both the individual and the aggregate competences and skills of the own group and its members compared to other groups and their affiliates. In this respect, group overconfidence also complies with the *social identity theory* of Tajfel and Turner (1979), according to which individuals are motivated to maintain a positive impression of their social group that represents an important part of ones' self-concept.

[INSERT TABLE 6 ABOUT HERE]

DISCUSSION

Overall, the findings provide strong evidence that boards of directors become overconfident through the involvement in recent M&A deals. Directors in overconfident boards (measured by their recent experience in M&A transactions) increase their shareholdings prior

to merger deals and are thus highly confident about the outcome. An empirical analysis based on a sample of 468 public acquisitions in the period 2009-2013 shows that board overconfidence is negatively related to abnormal returns upon merger announcements (a measure of a merger's quality) and positively to takeover premiums (a measure of overpayment). These results are robust and hold even after accounting for a large set of controls related to deal characteristics, financial attributes of the acquiring firm, governance characteristics of the acquiring firm, as well as time and industry effects. The study contributes in several ways to the extant literature in the fields of corporate governance, mergers and acquisitions, and group decision making.

First, we propose and validate an empirical measure of board overconfidence with respect to M&A decisions that complies with theories in the fields of group decision making and social psychology, as well as the literature on investment and financing decisions by overconfident CEOs. In this respect, we hope to offer guidance to future studies that require either (i) an aggregate measure for a given board bias that arises from the individual biases of its directors or (ii) a measure of board overconfidence related to other corporate decisions.

Second, while the consequence of CEO overconfidence on the quality of corporate takeovers has been extensively investigated (Billett and Qian, 2008; Doukas and Petmezas, 2008; Malmendier and Tate, 2008, among others), this is (to the best of our knowledge) the first paper to study the effect of board overconfidence on takeover decisions. In particular, we show that the negative influence of board overconfidence on abnormal returns is different from (and adds to) the effect of CEO overconfidence. The inclusion of board overconfidence as an additional explanatory variable might allow future studies in the field of mergers and acquisitions to explain a larger part of the cross-sectional variation of both abnormal returns upon merger announcements and takeover premiums.

Finally, the findings in this study have also implications for research on the optimum composition of corporate boards. In particular, positive board characteristics, such as heterogeneity (Levi et al., 2014), may be offset by behavioral biases. Interestingly, while the

majority of board characteristics is fairly stable over time, our results suggest that directors' overconfidence developed through a positive self-attribution bias induces time variation in their effectiveness as strategic decision makers.

The paper has important consequences for managerial practices and helps highlighting a remarkable paradox. While scholars claim that long-term acquisition experience of board directors can be beneficial for further takeovers (see, e.g., McDonald et al., 2008), we show that the opposite holds true for short-term M&A experience. In this respect, when proposing new board members it should be taken into account that directors with little short-term experience are also less prone to overconfidence and, thus, may prove more effective in handling upcoming corporate takeovers than directors with considerable experience gained in recent years.

This study has limitations (some of which we already address) that offer various directions for future research. First, the computation of overconfidence used in this paper relies on assumptions that entail some level of discretion, in particular with respect to the window over which overconfidence builds up. To address the potential critique of arbitrariness, we repeat the key regressions of our paper by considering both a shorter two-year rolling window (over the period 2008-2013, with 602 public deals that fulfill our data requirements) and a longer four-year window (over the period 2010-2013, with 375 public deals). For the former window, the results are very similar to the baseline case, both in terms of significance (Table 3, Model 3: p<0.02; Table 4, Model 3: p<0.02) and magnitude (Table 3, Model 3: $\beta = -2.873$; Table 4, Model 3: $\beta = 0.385$). For the latter window, the coefficients decrease in magnitude and cease to be statistically significant. While this result is partially driven by the smaller number of observations, it also suggests that a longer window might start capturing the beneficial influence of longer-term M&A experience (McDonald et al., 2008) which mitigates the detrimental effect of directors' overconfidence.

Second, although we provide a reliable way to verify the existence of board overconfidence via a positive self-attribution bias in recent M&A deals, future research could explore

different identification strategies. For example, our baseline overconfidence measure postulates that all realized M&A deals are viewed as an individual and group success in the bidding contest. While this view complies with studies on CEO overconfidence and corporate takeovers (Billett and Qian, 2008; Doukas and Petmezas, 2008), it is conceivable that board directors consider the announcement returns associated with past takeovers as an indicator of their success. To address this potential concern, we construct an additional overconfidence measure that only counts recent M&A deals with positive five-day announcement returns. Unreported results confirm that the negative (positive) effect of board overconfidence on abnormal returns (takeover premiums) remains statistically significant and economically relevant (Table 3, Model 3: $\beta = -2.826$, p<0.02; Table 4, Model 3: $\beta = 0.294$, p<0.03).

Further, while our baseline overconfidence measure distinguishes between overconfident and non-overconfident directors, it does not capture different degrees of individual overconfidence. Future research could focus on the intensity of directors' overconfidence and study whether also a minority of (very overconfident) board directors can influence board decisions. This conjecture is plausible as Wittenbaum et al. (1999) and Carpenter and Westphal (2001) have already shown that a group is more likely to follow the opinion of members who are perceived to possess expertise (allegedly) gained in task-specific experience. As overconfidence develops from previous experience (via positive self-attribution bias, see Miller and Ross, 1975), the opinion of overconfident group members might get high consideration by other group members and likely play a particularly important role in the decision-making process. Moreover, overconfident group members often enjoy a high status within the group because their (over)confidence is viewed as a sign of competence and accuracy in judgment (Zarnoth and Sniezek, 1997; Kerr and Tindale, 2004; Anderson et al., 2012), which allows them to be particularly influential.

Third, while this paper studies directors' individual overconfidence by using proxies derived from archival data, future research could exploit laboratory experiments or surveys frequently used in the psychological literature. More specifically, lab experiments are

suitable for obtaining reliable measures of individual overconfidence that could then be related to the outcome of financial decisions made by groups. An experimental framework could even allow researchers to investigate other personality characteristics (e.g., conscientiousness) that moderate the effect of overconfidence.

Fourth, while this study concentrates on boards of large publicly traded U.S. corporations, future research may focus on the impact of overconfidence in non-public firms or firms with fundamentally different governance structures (e.g., two-tier boards in Germany).

Fifth, future studies should explore the impact of directors' overconfidence on other strategic decisions, such as CEO compensation or the nomination of board directors. For example, overconfident directors may tend to promote other overconfident directors.

Finally, we support the view of Zhu (2013) that building and extending social psychological theories on group processes to study collective strategic decisions seems to be a promising avenue for future research.

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Table 1   Development of individual director's overconfidence

Deal	Announcement date of deal	Acquirer	Position of Mr. Thomson	Deal order	Is Mr. Thomson Overconfident?
1	January 6, 2005	Firm A	Director	1	No
2	January 12, 2007	Firm B	CEO	2	Yes
3	October 10, 2008	Firm A	Director	2	Yes
4	December 5, 2012	Firm A	Director	1	No
5	February 21, 2013	Firm A	Director	2	Yes

Table 2   Descriptive statistics and pearson correlations

Variable	Mean	Std	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
1. Cumulative abnormal announcement return	0.72	6.75																					0.15	0.00	-0.03	0.17
2. Fraction of overconfident directors	0.53	0.37	-0.17																				0.03	0.01	-0.03	0.01
3. CEO overconfidence	0.71	0.45	-0.16	0.56																			0.36	0.10	0.13	0.01
4. Size of the acquirer	8.57	1.79	-0.08	0.37	0.29																		0.12	0.03	0.21	0.13
5. Debt to equity	0.33	0.65	0.11	-0.08	-0.05	0.06																	0.06	-0.07	-0.08	0.00
6. Tobin's Q	1.84	1.22	0.10	0.03	-0.01	-0.16	-0.19																0.25	-0.03	0.15	0.08
7. Operating cash flow	0.02	0.07	-0.04	0.19	0.11	-0.06	-0.03	-0.30															0.21	0.07	0.05	-0.03
8. Board size	9.87	2.54	-0.05	0.15	0.17	0.58	0.03	-0.06	0.34														0.04	0.10	0.05	0.05
9. CEO duality	0.49	0.50	-0.04	0.11	0.16	0.13	-0.09	-0.16	0.34	0.12													0.20	0.10	-0.01	-0.03
10. Percentage of independent directors	0.70	0.19	-0.06	0.23	0.13	0.15	-0.02	0.00	0.11	0.18	0.10												0.02	0.00	-0.02	-0.02
11. Institutional majority	0.73	0.45	-0.14	0.17	0.20	0.27	-0.23	-0.05	0.14	0.23	0.06	0.16											0.00	-0.04	0.06	0.04
12. Acquirer's previous-year stock performance	0.17	0.49	-0.03	-0.02	-0.05	-0.08	0.13	0.07	-0.05	-0.08	0.07	0.00	-0.08										-0.06	0.04	-0.09	-0.05
13. Financial firm	0.18	0.39	-0.05	-0.26	-0.14	0.04	0.10	-0.25	-0.01	0.22	-0.05	-0.13	-0.07	-0.03									0.18	0.03	0.02	-0.07
14. Conglomerate	0.36	0.48	-0.02	0.19	0.07	0.17	-0.03	0.05	0.15	0.11	0.09	0.02	0.06	-0.06	-0.08								0.00	-0.13	0.03	0.00
15. Domestic	0.76	0.42	0.01	-0.12	-0.06	0.00	0.10	-0.03	-0.09	0.00	-0.06	-0.02	0.02	-0.04	0.08	0.08							0.03	-0.03	-0.09	0.08
16. Tender offer	0.16	0.37	-0.04	0.13	0.12	0.05	-0.12	0.08	0.04	-0.02	-0.06	0.03	0.07	-0.11	0.14	-0.04	0.06						0.03	-0.03	-0.01	0.06
17. Cash deal	0.55	0.50	0.12	0.15	0.02	0.11	-0.12	0.13	0.12	-0.03	-0.03	0.03	0.03	0.04	-0.17	-0.04	-0.09	0.25					0.15	0.13	0.38	0.07
18. Size of the target	5.97	2.03	0.05	-0.03	0.03	0.43	0.15	-0.17	0.12	0.32	0.09	0.00	0.04	-0.04	0.20	0.10	0.15	-0.06	-0.20				0.15	0.02	0.08	-0.20
19. Competition	0.08	0.27	-0.05	0.01	0.03	-0.07	0.02	0.01	-0.05	-0.07	0.01	-0.03	-0.03	0.13	0.00	-0.14	-0.02	0.00	0.00	0.04			-0.08	-0.09	0.06	0.12
20. Merger activity	798.38	127.84	0.18	0.00	-0.02	0.00	-0.05	0.06	0.04	0.01	-0.09	-0.14	-0.03	-0.33	0.06	0.00	0.04	-0.02	-0.02	0.06	0.00		0.08	0.05	0.14	-0.02
21. Percentage of female directors[a]	0.13	0.09																						0.05	0.14	-0.07
22. Target ROA[a]	-0.02	0.35																							-0.04	-0.30
23. Target leverage[a]	0.18	0.23																								0.09
24. Takeover premium[a]	0.52	0.61																								

N = 468 for variables 1 - 20 (Hypothesis 1)

[a] N = 290 for variables 21 - 24 (Hypothesis 2)

Below-diagonal correlations are based on a sample size of 468 (Hypothesis 1); correlations greater than 0.085 are significant at the 0.05 level.

Above-diagonal correlations are based on a sample size of 290 (Hypothesis 2); correlations greater than 0.095 are significant at the 0.05 level.

Table 3   Acquirers' abnormal returns by CEO and Board overconfidence

Subsample	N	CAR	*t*-value
Panel A: Board overconfidence			
Less than 50% overconfident directors	214	1.93%***	3.78
More than 50% overconfident directors	254	-0.30%	-0.80
Difference	468	-2.23%***	-3.60
Low fraction of overconfident directors (below 25% quantile)	124	2.76%***	3.71
High fraction of overconfident directors (above 75% quantile)	110	-0.81%*	-1.53
Difference	234	-3.58%***	3.82
Panel B: CEO overconfidence			
Non-overconfident CEOs	135	2.45%**	3.69
Overconfident CEOs	333	-0.02%	-0.07
Difference	468	-2.43%***	3.56

*** p<0.01, ** p<0.05, * p<0.1; n = 468

Table 4   Multivariate regressions of acquirers' abnormal returns

Variables	Model 1	Model 2	Model 3	Model 4
Fraction of overconfident directors	-3.076***	-3.601***	-2.566**	
	(1.032)	(1.140)	(1.152)	
CEO overconfidence			-1.804**	-2.646***
			(0.845)	(0.843)
Size of the acquirer	-0.237	-0.182	-0.123	-0.313
	(0.272)	(0.319)	(0.318)	(0.306)
Debt to equity	1.372***	0.790	0.795	0.850
	(0.480)	(0.635)	(0.629)	(0.634)
Conglomerate	0.092	-0.141	-0.113	0.067
	(0.627)	(0.678)	(0.668)	(0.664)
Financial firm	-1.269	3.487*	3.321	3.435*
	(0.796)	(1.896)	(2.050)	(2.073)
Domestic deal	-0.272	-0.761	-0.730	-0.564
	(0.694)	(0.698)	(0.683)	(0.682)
Tender offer	-1.184	-1.074	-0.923	-0.954
	(0.925)	(0.997)	(0.995)	(0.995)
Cash deal	2.416***	2.571***	2.412***	2.410***
	(0.745)	(0.809)	(0.803)	(0.811)
Tobin's Q	0.553**	0.611**	0.618***	0.625***
	(0.218)	(0.243)	(0.238)	(0.239)
Operating cash flow	-1.565	-1.836	-2.773	-2.531
	(3.193)	(4.193)	(4.223)	(4.218)
Board size	0.115	0.007	0.031	0.059
	(0.152)	(0.185)	(0.185)	(0.188)
CEO duality	-0.541	-0.048	0.091	0.152
	(0.653)	(0.672)	(0.677)	(0.673)
Percentage of independent directors	0.846	2.375	2.165	1.706
	(1.710)	(1.922)	(1.870)	(1.846)
Institutional majority	-1.096	-0.296	-0.050	-0.056
	(0.762)	(0.896)	(0.915)	(0.930)
Merger activity	0.010***	0.046***	0.051***	0.052***
	(0.002)	(0.017)	(0.018)	(0.018)
Acquirer's previous-year stock performance	-0.091	-1.608	-1.796	-1.889
	(1.046)	(1.314)	(1.328)	(1.305)
Size of the target	0.330**	0.242	0.228	0.264
	(0.162)	(0.181)	(0.179)	(0.181)
Competition	-1.494	-1.576	-1.462	-1.461
	(1.475)	(1.363)	(1.369)	(1.385)
Constant	-7.950**	-39.892**	-43.518***	-43.755***
	(3.128)	(15.940)	(16.155)	(16.254)
Industry fixed effect	No	Yes	Yes	Yes
Year fixed effect	No	Yes	Yes	Yes
R-squared	0.135	0.279	0.287	0.278

*** $p<0.01$, ** $p<0.05$, * $p<0.1$; robust standard errors in parentheses; n = 468

Table 5   Multivariate regressions of takeover premiums

Variables	Model 1	Model 2	Model 3	Model 4
Fraction of overconfident directors	0.197**	0.173*	0.316**	
	(0.081)	(0.103)	(0.142)	
CEO overconfidence			-0.212	-0.085
			(0.122)	(0.093)
Size of the acquirer	0.015	-0.034	-0.028	-0.009
	(0.028)	(0.038)	(0.037)	(0.034)
Debt to equity	0.307	0.328	0.306	0.328
	(0.290)	(0.270)	(0.250)	(0.264)
Conglomerate	-0.040	0.003	-0.008	0.010
	(0.074)	(0.092)	(0.092)	(0.092)
Financial firm	0.109	0.207	0.186	0.126
	(0.092)	(0.195)	(0.169)	(0.167)
Domestic deal	0.115	0.076	0.072	0.074
	(0.102)	(0.120)	(0.113)	(0.117)
Tender offer	0.056	-0.048	-0.041	-0.033
	(0.091)	(0.100)	(0.099)	(0.098)
Cash deal	0.012	0.053	0.024	0.035
	(0.071)	(0.088)	(0.094)	(0.092)
Tobin's Q	0.026	0.018	0.005	0.009
	(0.043)	(0.045)	(0.040)	(0.042)
Operating cash flow	0.500	3.047	2.732	2.792
	(0.938)	(2.198)	(2.146)	(2.148)
Board size	-0.001	-0.003	-0.003	-0.004
	(0.021)	(0.017)	(0.017)	(0.018)
CEO duality	0.074	-0.003	0.018	0.008
	(0.069)	(0.068)	(0.071)	(0.070)
Percentage of independent directors	-0.076	-0.055	-0.065	-0.016
	(0.178)	(0.220)	(0.219)	(0.215)
Institutional majority	0.096	0.053	0.066	0.077
	(0.117)	(0.108)	(0.108)	(0.114)
Merger activity	-0.0001*	-0.0001	0.0001	0.0001
	(0.000)	(0.002)	(0.002)	(0.002)
Acquirer's previous-year stock performance	-0.210	-0.138	-0.147	-0.156
	(0.182)	(0.147)	(0.147)	(0.153)
Size of the target	-0.096***	-0.059*	-0.058*	-0.065**
	(0.031)	(0.030)	(0.031)	(0.030)
Competition	0.238*	0.327**	0.328**	0.360**
	(0.131)	(0.152)	(0.149)	(0.152)
Fraction of female directors	-0.578	-1.029*	-1.053**	-1.046**
	(0.420)	(0.527)	(0.519)	(0.527)
Target ROA	-0.469*	-0.376	-0.386	-0.388
	(0.273)	(0.247)	(0.246)	(0.262)
Target leverage	0.414	0.385	0.402	0.390
	(0.349)	(0.343)	(0.342)	(0.342)
Constant	0.916**	0.664	0.419	0.217
	(0.397)	(1.425)	(1.458)	(1.486)
Industry fixed effect	No	Yes	Yes	Yes
Year fixed effect	No	Yes	Yes	Yes
R-squared	0.244	0.363	0.374	0.359

*** $p<0.01$, ** $p<0.05$, * $p<0.1$; robust standard errors in parentheses; n = 290

Table 6   Insider trading prior to acquisitions

Subsample	N	NPR	t-value
Panel A: Net Purchase Ratio of Boards			
Less than 50% overconfident directors	191	0.212***	4.50
More than 50% overconfident directors	249	0.337***	9.35
Difference	440	0.125**	2.14
Low fraction of overconfident directors (below 25% quantile)	112	0.155**	2.46
High fraction of overconfident directors (above 75% quantile)	108	0.332***	6.17
Difference	220	0.177**	2.12
Panel B: Net Purchase Ratio of CEOs			
Non-overconfident CEOs	122	-0.078	-1.43
Overconfident CEOs	318	0.047*	1.55
Difference	440	0.125**	2.10

*** p<0.01, ** p<0.05, * p<0.1; n = 440