Do Overconfident CEOs Ignore Toehold Strategies?

Nishad R. Matawlie[1]

Abstract

In a toehold strategy, an acquirer buys a minority stake with the intention to gain control of a target later. Yet despite the claimed advantages toehold strategies offer, acquirers only rarely buy toeholds. This study shows that overconfidence of CEOs causes them to forgo toehold strategies to make immediate controlling acquisitions instead. We present a dynamic model where agents have bounded rationality and find empirical evidence for the model's predictions: there is a negative relation between several measures for CEO overconfidence and the likelihood of acquiring a toehold.

Keywords: Toeholds, Real Options, Dynamic Model, Overconfidence.

EFM Classification Codes: 120, 160, 430, 720

[1]Erasmus School of Economics, Erasmus Research Institute of Management (ERIM), Erasmus University Rotterdam.
Address: Burgemeester Oudlaan 50, 3062 PA, Rotterdam, The Netherlands.
Email: matawlie@ese.eur.nl

1 Introduction

The neglect of toehold strategies - where the bidder acquires a minority stake in a target before making a controlling bid - is considered puzzling in the context of widespread evidence that the majority of direct controlling acquisitions fail to deliver value for the acquirer on announcement[2]. While acquisitions create value overall, the sellers seem to get the better half, with acquirer's announcement returns on average close to zero[3]. Sequencing an acquisition with a toehold may help to even this imbalance and to improve poor acquirer returns, yet toehold strategies are rarely executed. Building on the seminal work of Baldwin (1982) and others on the sequencing of irreversible investment as a real option, this study presents a continuous time dynamic model for sequential toehold strategies. Our model shows that agents with bounded rationality undervalue and therefore neglect toehold strategies relative to immediate controlling acquisitions. Hence the model explains why toehold strategies are rarely adopted despite their advantages and higher returns. We find supporting empirical evidence for the predictions of our model.

A strand of literature shows that a toehold can grant its owner several advantages in acquiring full control of the target[4], which seems to be in conflict with their observed rare use in practice. This phenomenon is part of the *Toehold Puzzle* (Betton, Eckbo, and Thorburn (2009)). At the same time, *'Hubris'* (Roll (1986)) and overconfidence (Camerer and Lovallo (1999), Malmendier and Tate (2005a)) are well documented explanations of decision-maker's behaviour, such as overbidding and excess entry, but until now they have not been proposed as possible explanation for the rare use of toeholds. That while, some financial phenomena can plausibly be understood using models in which some agents are not fully rational (Barberis and Thaler (2003)). Acquirer-CEO's decision-making can be affected by biases, in the sense that merger synergies can be perceived higher and uncertainties can be perceived lower than they in reality are. This study integrates both the behavioural and toehold literature in an attempt to explain the low use of toeholds. In particular we formulate the following research question: *"Can the rare use of toehold acquisitions be explained by CEO overconfidence?"*

To answer this question, we develop a dynamic model of toehold strategies and we empirically test for a relation between the use of toehold strategies and CEO-overconfidence. The immediate plunge in the deep of a full-scale acquisition, contrasts with a toehold strategy which allows for testing the waters first. Buying a toehold in a target company provides a more cautious investment strategy. Hence, in a two-stage acquisition process,

[2]For instance, only 5% of the total acquisitions executed by listed US companies was a toehold in a target company in the period 2004-2013. Source: Thomson One Banker.

[3]E.g., see Bradley, Desai, and Kim (1988); Stulz, Walkling, and Song (1990); Leeth and Borg (2000); Malmendier and Tate (2008).

[4]For instance, it can mitigate the free-rider problem (Shleifer and Vishny (1986)), it increases the probability of a successful offer (Hirshleifer and Titman (1990)) and it can possibly lead to lower bid premiums (Bulow, Huang, and Klemperer (1999); Betton and Eckbo (2000)).

a controlling bid on the remaining shares can be made when uncertainties are resolved. From the model we hypothesize that overconfident CEOs frame their acquisition opportunities differently and consequently are likely to eagerly execute controlling acquisitions, avoiding more vigilant sequential toehold strategies.

To empirically test the validity of the predictions of our model, we use different measures for CEO overconfidence, including external perception of the CEOs reported in news papers. Firstly we rely on measures of overconfidence based on the investment and risk taking behaviour of CEOs: Overconfident CEOs take risk in their option portfolio and similarly take risk in their acquisition behaviour (Malmendier and Tate (2005a))[5]. Next, to examine the robustness of our results obtained with the option-portfolio overconfidence measure and dataset of US companies, we test our findings with a different dataset and a completely different measure of overconfidence, which is based on the external perception of CEOs by high-quality newspapers (Malmendier and Tate (2008)).

We find an economically and statistically significant relationship between measures of CEO overconfidence and the tendency of CEOs to forgo toeholds and do full corporate acquisitions instead. We look at nearly 10,000 acquisitions by S&P1500 companies in the period 2004-2013 and we confirm that overconfident CEOs are less likely to acquire a minority stake and acquire controlling stakes instead. We find similar results with a dataset of UK companies and a different measure of overconfidence based on newspapers, confirming the robustness of our results. Furthermore we find that the overconfidence effect is stronger for same-sector acquisitions and we find higher abnormal announcement returns for toeholds than for immediate controlling acquisitions.

To the best of our knowledge, this study is the first to link the limited use of toehold strategies to CEO overconfidence. This study provides incremental insights and contributions to several strands of the corporate finance literature. First, we develop a dynamic model for toehold strategies, by building on seminal models of sequencing irreversible investment under uncertainty (e.g. Baldwin (1982); Dixit and Pindyck (1994)) and on dynamic acquisition models (e.g. Lambrecht (2004); Morellec and Zhdanov (2005); Toxvaerd (2008)). It is common in the real options literature to analyze phenomena from the perspective of a framework with rational agents. However, we incorporate bounded rationality in this real options model for toehold strategies, by building on the work of Hackbarth (2008, 2009). We find empirical evidence supporting our model's predictions. Our study furthermore relates to the literature on theory and evidence of the uses of toeholds (e.g., Shleifer and Vishny (1986); Hirshleifer and Titman (1990); Burkart (1995); Singh (1998); Bulow et al. (1999) and others), and aims to contribute to this literature by introducing insights from the behavioural literature on CEO overconfidence to a well documented phenomenon as the 'toehold puzzle'. Therefore it also aims to contribute to

[5]Malmendier and Tate link CEO overconfidence, as measured by their option behaviour, to a variety of corporate investment decisions and investment-cash flow sensitivity.

the behavioural finance literature [6] by linking to the toehold literature. Overconfidence not only has implications for overbidding, over-investment, financing and performance, but may also influence the trade-off of a CEO to conduct a toehold strategy or make a controlling bid instead through their perspective of risk taking.

We empirically confirm that overconfident CEOs avoid the more prudent toehold strategies in favour of the immediate controlling acquisition and that this is likely at the expense of the acquirer shareholder returns.

2 A Theory of CEO Overconfidence and Toehold Neglect

2.1 The Benefits of Toehold Acquisition Strategies

As confirmed by the literature, taking a toehold option first can grant its owner several advantages over an immediate full acquisition. In a widely held target firm, other shareholders want to free-ride the synergy value created by a successful takeover. A toehold may mitigate the free-rider problem (Grossman and Hart (1980); Shleifer and Vishny (1986)) because its owner can gain on the shares he already owns and thus benefit from "seller advantages"[7].

A toehold also increases the probability of a successful offer[8]. In common value auctions, it enables its owner to win an auction inexpensively, using her information advantage and potential position as a seller (Bulow et al. (1999)), which allows the acquirer to avoid low returns due to the winners' curse in common value auctions (Thaler (1988)). In addition, a toehold provides an acquirer with the much-needed edge in a takeover battle. Its ownership position sends a clear signal of commitment to potential rivals and conveys a higher bidder valuation of the target[9]. A toehold owner can consequently bid more aggressively, and wins a bidding war far more often than not, which is empirically confirmed (Betton and Eckbo (2000))[10]. This leads to fewer bids by competitors, decreasing the premiums required to capture the target (Bulow et al. (1999); Betton and

[6] CEO overconfidence can for instance account for corporate investment distortions (Malmendier and Tate (2005a)), frequent and unsuccessful merger decisions (Malmendier and Tate (2008)), explain dividend decisions (Deshmukh, Goel, and Howe (2013)) and corporate financing policies (Malmendier, Tate, and Yan (2011)).

[7] A tender offer will not be accepted if the price premium is less than the expected synergy value, thereby seriously limiting the acquirer's profit.

[8] It increases the probability of a successful offer, even if the toehold owner is competing with a stronger rival, (Hirshleifer and Titman (1990); Burkart (1995); Singh (1998)).

[9] As the price is driven up, the minority stake holder pays this premium on a smaller part of the target if he wins.

[10] If the rival ends up with the target, the high premium will also be paid for the minority stake holder. And even when rival bidders also have a toehold, the probability of them winning a bidding war deteriorates in a co-moving fashion with the size of the rival's minority stake (Dasgupta and Tsui (2003); Betton and Eckbo (2000)).

Eckbo (2000))

Given their benefits[11], it is remarkable to observe rare use of minority stakes in practice[12]. Building on Baldwin (1982)'s work on optimal sequential investment under uncertainty, we consider a toehold as a real option to acquire a controlling stake in the target firm. For our model of toehold acquisitions, we build on the reduced-form models for corporate takeovers by Lambrecht (2004) and Morellec and Zhdanov (2005) and extend their framework by incorporating bounded rationality, by building on the work of Hackbarth (2008, 2009). Thus we extend this literature to the context of toehold acquisition strategies under bounded rationality.

We build a dynamic model where, by taking a toehold position, the acquisition is temporarily staged, and the acquirer can benefit from some 'seller advantages' before making a bid on a controlling stake. The model predicts that a biased perception of the synergies by an overconfident CEO, may cause the value of the toehold strategy to be undervalued relative to the direct controlling acquisition.

2.2 A Dynamic Model for Toehold Strategies

In this section we present our dynamic model for toehold acquisition strategies. We assume constant risk-free rate, risk neutral agents, continuous time and consider a complete probability space $(\Omega, \mathcal{F}, \mathcal{F}_{t\geq 0}, \mathbb{P})$.

Consider two firms, the bidder and the target, with cash flows X_t and Y_t, respectively. The cash flows follow independent stochastic processes with the following dynamics, with constant growth rate μ_A and volatility σ_A:

$$dA_t = \mu_A A_t dt + \sigma_A A_t dW_t^A, \qquad A = X, Y \tag{2.1}$$

Despite that the cash flow processes are uncorrelated, this can be perceived differently. Let ρ represent the possible correlation between the Brownian motions W^X and W^Y, such that $dW_t^X dW_t^Y = \rho dt$. The firm values of the bidder $V^B(X)$ and of the target $V^T(Y)$ are

[11] In particular, when the toehold is associated with a board seat it helps to reduce other uncertainties for the bidder. The buyer can exert corporate control even before the full bid has commenced, reduce windowdressing and valuation uncertainty. When associated with a board position a toehold provides an insider position in the target firm and therefore reduces valuation uncertainty. The strongest value enhancements occur for those firms that have a product relation, especially in industries with high uncertainty and corresponding research costs (Allen and Phillips (2000)).

[12] Several reasons presented in literature fail to properly explain the rare use. A reason for not pursuing an initial minority stake is the element of surprise. Legislative rulings such as disclosure rules and antitrust regulations are not a big obstacle. In addition, increased liquidity makes it easier to dispose a stake. Entrenchment and a hostile reception by incumbent target management can form an obstacle. As the purchase portrays a clear and outspoken commitment, this also results in information for rivals, who can now anticipate their bidding strategy. For publicly listed companies, information of this kind can lead to run-ups in stock prices in particular when they are illiquid. Betton, Eckbo, and Thorburn (2008) find that purchases of target stock increases run-ups significantly, however, that same research shows that while this offers a theoretically compelling argument, it is not sufficient to exceed the advantages.

given by:

$$V^B(X) = \frac{X}{r - \mu_X}, \qquad V^T(Y) = \frac{Y}{r - \mu_Y}. \tag{2.2}$$

We follow the reasoning of Shleifer and Vishny (2003) and Morellec and Zhdanov (2005) by assuming that, when the bidder executes a takeover deal (at any time $t > 0$), the value of the merged entity $V^C(X, Y)$ is a linear combination of pre-takeover values. Hence we describe the post-takeover value of the combined firm as:

$$V^C(X, Y) = \alpha V^B + \gamma V^T = \frac{\alpha X}{r - \mu_X} + \frac{\gamma Y}{r - \mu_Y} \tag{2.3}$$

where $(\alpha, \gamma) \geq 1$ can be considered as 'synergy factors'. Let $\phi > \frac{1}{2}$ be the final desired controlling stake in the target. The takeover price is determined as a fraction $(1 - \xi)$ of the combined firm value V^C, such that the target firm receives $\phi(1 - \xi)V^C$. This bid, including the takeover premium, can be made in shares but we can likewise interpret the fraction of the combined firm $\phi(1 - \xi)V^C$ as a bid in cash of this amount. The bidding firm obtains in turn a controlling stake in the target firm and receives the proportional synergies, such that the part of the total takeover gains or surplus to the bidding firm (without toehold) after restructuring satisfies[13]:

$$\text{Bidder Surplus} = \phi V^t + \phi \left[V^C - V^B - V^T \right] - \phi(1 - \xi)V^C = \phi \left[\xi V^C - V^B \right]$$

If the bidder possesses a toehold, it owns a minority stake $\omega < \frac{1}{2}$ in the target firm: ωV^T, which has been acquired against a premium ζ, such that the amount paid was $\omega\zeta V^T$, where ζ typically ranges between $1 \leq \zeta \leq (1 - \xi)\frac{V^C}{V^T}$. Obtaining a controlling stake is considered as the exercise of a option, where the stake size increases from $\omega < \frac{1}{2}$ to $\phi > \frac{1}{2}$. We model the minority stake option analogous to a perpetual American option on a dividend paying stock (e.g., see Dixit and Pindyck (1994)). If the option is exercised, a pay-off is received consisting of the total value including synergies minus the exercise price. The costs of holding the toehold option without exercising, are the lost 'dividends' in the form of (missed) synergies. Let $q_X = f_X(\alpha)$ and $q_Y = f_Y(\gamma)$, with $(\frac{df_X}{d\alpha}, \frac{df_Y}{d\alpha}) > 0$, be the continuous dividend yields. Then for the option value, it is possible using familiar standard arguments, to show that the value of the bidder's toehold option $O^T(X, Y)$ solves the following partial differential equation:

$$(\mu_X - q_X)XO^T + (\mu_Y - q_Y)YO^T + \frac{1}{2}{\sigma_X}^2X^2O^T_{XX} + \frac{1}{2}{\sigma_Y}^2Y^2O^T_{YY} + \rho\sigma_X\sigma_YO^T_{XY} = rO^T, \tag{2.4}$$

where r denotes the risk-free rate and subscripts represent partial derivatives (we have

[13] This can be likewise interpreted as exchanging the own firm V^B for a part ξ in the combined firm V^C as in Morellec and Zhdanov (2005)

omitted the time indicator t for convenience). This PDE is solved subject to the following boundary conditions.

$$\underbrace{O^T(X^*,Y^*)}_{\substack{\text{Option value at}\\ \text{moment of exercise}}} = \underbrace{\phi(V^C(X^*,Y^*) - V^B(X^*) - V^T(Y^*))}_{\text{proportional synergistic value}} \tag{2.5}$$

$$+ \underbrace{(\phi-\omega)V^T(Y^*)}_{\substack{\text{Stand alone value}\\ \text{of remaining target stake}}} - \underbrace{(1-\xi)(\phi-\omega)V^C(X^*,Y^*)}_{\text{'Takeover price'}}$$

$$O_X^T(X^*,Y^*) = \phi\alpha V_X^B(X^*) - (\phi-\omega)(1-\xi)(1+\alpha)V_X^B(X^*) \tag{2.6}$$

$$O_Y^T(X^*,Y^*) = (\phi-\omega)V_Y^T(Y^*) + \phi\gamma V_Y^T(Y^*) - (\phi-\omega)(1-\xi)(1+\gamma)V_Y^T(Y^*) \tag{2.7}$$

Equation (2.5), the value-matching condition, shows that the option value of the minority stake should be equal to the pay-off of the option at the moment of exercise, where (X^*, Y^*) represent the threshold levels of the cash flows at which the option is exercised. The pay-off of the minority stake option consists of the standalone value of the remaining part of the target firm, plus the synergies, which are only obtained after a controlling stake is obtained, minus the acquisition price paid. Without a toehold, the negotiated price is expressed as a fraction $(1-\xi)$ of the combined firm value V^C. However, when the bidder owns a toehold the target cannot make demands over the part (ωV^T) that the toehold owner already possesses. The price is therefore expressed as a fraction equivalent to $(\phi-\omega)(1-\xi)V^C$ allowing the bidder to gain some of the seller advantages over its toehold.

The remaining equations (2.6) and (2.7) are the smooth-pasting conditions, which guarantee optimality by requiring continuity of the slopes at the threshold levels. The last boundary condition requires that the ratio of the option value to the present value of the bidder's cash flows approaches zero, as the ratio of the present value of the bidder's cash flows to the target's cash flows goes to zero (this is also known as the no bubbles condition), that is:

$$\lim_{(X/Y)\longrightarrow 0} \frac{O^T(X,Y)}{X} = 0 \tag{2.8}$$

Since $O^T(X,Y)$ is linearly homogeneous in (X,Y), if we let $R_t = (X_t/Y_t)\Big|_{(t\geq 0)}$, we can describe the bidder's exercise strategy via the threshold R^* at which (and above) it is optimal to exercise the minority stake option (that is, acquire a controlling stake). With use of the boundary conditions we derive the following for the option value of the toehold (for details, see the Appendix A)

$$O^T(R) = \left\{\phi\left[\xi V^C - V^B\right] + \omega\left[(1-\xi)V^C - V^T\right]\right\}\left(\frac{R}{R^*}\right)^{\beta} \tag{2.9}$$

$$O^T(X,Y) = \Bigg[\underbrace{\phi\Big\{\xi V^C(X^*,Y^*) - V^B(X^*)\Big\}}_{\substack{\text{Bidder surplus}\\ \text{without toehold}}} + \underbrace{\omega\Big\{(1-\xi)V^C(X^*,Y^*) - V^T(Y^*)\Big\}}_{\substack{\text{Seller advantages for}\\ \text{toehold holder:}\\ \text{proportion } \omega \text{ of target surplus}}}\Bigg]\left(\frac{X/Y}{X^*/Y^*}\right)^{\beta} \tag{2.10}$$

Equation (2.10) shows the option value of the toehold, which is the discounted value of the surplus that the acquirer obtains by exercising his option. From this expression we clearly see that with a toehold strategy, the bidder gains from some seller advantages. The surplus that the bidder obtains, now also includes components which otherwise would be completely received by the target in the case of an immediate full-scale acquisition strategy. Finally, the exercise threshold value is given by:

$$R^* = \frac{\beta}{\beta-1}\frac{r-\mu_X}{r-\mu_Y}\frac{(\phi-\omega)(1-\xi)(1+\gamma)-\phi\alpha-(\phi-\omega)}{(\phi-\omega)(1-\xi)(1+\alpha)-\phi\alpha} \tag{2.11}$$

and β is the positive root of the following quadratic equation:

$$\frac{1}{2}(\sigma_X^2 - 2\rho\sigma_X\sigma_Y + \sigma_Y^2)\beta(\beta-1) + [(\mu_X - q_X) - (\mu_Y - q_Y)]\beta - [(r-(\mu_Y - q_Y)] = 0 \tag{2.12}$$

The CEO of the bidding firm decides which strategy to follow by comparing the value of both strategies. The surplus of acquiring a controlling stake of size ϕ directly is equal to $\phi\left[\xi V^C - V^B\right]$. The surplus of a two-stage acquisition strategy where the final stake size acquired is also ϕ is equal to the standalone value of the minority stake plus the option value minus the price paid for the toehold:

$$\left\{\phi\left[\xi V^C - V^B\right] + \omega\left[(1-\xi)V^C - V^T\right]\right\}D + \omega V^T - \omega\zeta V^T, \tag{2.13}$$

where $D = \left(\frac{R}{R^*}\right)^{\beta}$ is the stochastic discount factor. Then for the case where the value of the direct acquisition strategy is higher than the value of the toehold strategy we can derive:

$$\begin{aligned} &\textit{Surplus direct strategy} > \textit{Surplus toehold strategy}\\ &\phi\left[\xi V^C - V^B\right] > \left\{\phi\left[\xi V^C - V^B\right] + \omega\left[(1-\xi)V^C - V^T\right]\right\}D + \omega V^T - \omega\zeta V^T\\ \Leftrightarrow\ &(1-D)\phi\left[\xi V^C - V^B\right] > \omega\left\{\left[(1-\xi)V^C - V^T\right]D - (\zeta-1)V^T\right\} \end{aligned} \tag{2.14}$$

From (2.14) we can observe that if the premium paid for the minority stake is at its maximum, i.e. $\zeta = (1-\xi)\frac{V^C}{V^T}$, which means that the bidder executes a controlling acquisition in two stages where the same premium is paid for the minority stake as for

the controlling stake, we obtain:

$$(1-D)\phi\left[\xi V^C - V^B\right] > (D-1)\omega\left\{(1-\xi)V^C - V^T\right\}. \tag{2.15}$$

Since typically $D < 1$, this inequality (2.15) always holds, which means that the value of the direct acquisition is always higher in cases where the price of the toehold is at its maximum. In the special case that $D = 1$ and $\zeta = (1-\xi)\frac{V^C}{V^T}$, we see that the surplus of both strategies is equal, making the CEO indifferent between both strategies.

Next, by rewriting (2.14) into:

$$(1-D)\left\{\phi\left[\xi V^C - V^B\right] - \omega V^T\right\} > \omega\left\{(1-\xi)V^C D - \zeta V^T\right\}, \tag{2.16}$$

we observe that the toehold strategy becomes more valuable relative to the immediate controlling acquisition when the premium ζ paid for the minority stake is low and/or the stochastic discount factor D (which represents the probability of the option becoming in the money) is not too low. In such settings, it can still be the case that the CEO perceives the value of the direct acquisition higher than of the toehold strategy.

Roll (1986) cites optimistic estimates of "economies due to synergy and (any) assessments of weak management" as the primary causes of managerial hubris (Kahneman and Lovallo (1993)). If the CEO is overconfident, such that he believes that under his guidance the takeover will be a great success and his company will contribute significantly to the synergies (i.e. he overestimates the synergy factor α) we can derive that the CEO will overestimate the value of the direct acquisition relative to the toehold strategy value.

Proposition 1. *CEOs who are overconfident are likely to value the direct acquisition higher than the toehold strategy when the opposite holds.*

Proof. Assume a setting in which the value of the toehold strategy is higher relative to the immediate controlling acquisition. It follows from (2.16) that D should be small in order to underestimate the toehold value. It is trivial that the value of the combined firm V^C increases in α. The sign of the derivative $\partial D/\partial\alpha$ is ambiguous (see the Appendix A for details), but can be inferred to be negative. Additionally by applying De L'Hopital's rule, we find that $\lim_{\alpha\to\infty} R^* = C$, where C is a constant and further we see that $\lim_{\alpha\to\infty}\beta = \infty$ such that $\lim_{\alpha\to\infty} D = 0$, since $R < R^*$. This showes that overconfidence is a reason for underestimating the value of a toehold strategy relative to the direct controlling acquisition[14]. □

Besides being overconfident with respect to synergies and uncertainty, CEOs can

[14]Overestimation of the synergy factor of the target γ leads ultimately also to $D \longrightarrow 0$. Hence this form of overconfidence also leads to underestimation of the toehold strategy value. Furthermore it is interesting to notice that $D \longrightarrow 0$ as $\sigma_R \longrightarrow 0$, that is, when volatility is absent, the option has nihil value, which is a well known and intuitive result from general option theory.

also have perceptions of how easy two firms are integratable. This is expressed through the correlation coefficient ρ[15]. Where in fact the two Brownian motions of the cash flow processes dW_t^X and dW_t^Y are independent (i.e. $dW_t^X dW_t^Y = 0$), the CEO can perceive this differently by perceiving $\rho > 0$ if he believes that the target firm is quite alike his own firm and that with his skill it will be easy to integrate and restructure the two firms (self-attribution bias, e.g. Billett and Qian (2008)). This can in its turn even reinforce the believes of the CEO with respect to the synergies. We show that as $\alpha \longrightarrow \infty$ while simultaneously $\rho \longrightarrow 1$, D approaches 0 faster, than when only $\alpha \longrightarrow \infty$ (see Appendix C). Hence a positive perception of correlation reinforces the overconfidence effect of overestimating the direct acquisition strategy value relative to the toehold strategy value.

3 Empirical Predictions: Overconfidence and Toehold Neglect

The choice between a sequential toehold strategy or an immediate controlling acquisition is determined by the CEO's perception of future success of the takeover, translated in the synergies. Overconfident CEOs have the potential to suffer from miscalibration (where they underestimate levels of volatility) and/or overoptimism (where they overestimate future successes, synergies and/or growth) (Hackbarth (2008, 2009))[16]. Immediate controlling acquisitions can therefore follow from beliefs of overconfident executives that they possess superior capabilities compared to target management to run a company[17]. Overconfident executives engage in acquisitions to release target firms from ineffective incumbent management, believing they have the power to improve the firm's performance once they gain control of it (Brown and Sarma (2007)).

Executives prefer full acquisitions when they have overoptimistic expectations (Kah-

[15] Scheinkman and Xiong (2003) investigate a case where perception of correlation is considered overconfidence.

[16] Miscalibration and over-optimism are considered as two sub-dimensions of overconfidence (see Ben-David, Graham, and Harvey (2013)). Over-optimism relates to an individual being irrationally optimistic about uncertain future events. This bias is in line with the better-than-average effect and overestimation effects. By overestimating his own personal skill and the degree of control over future outcomes, a CEO in essence overestimates the mean of possible outcomes. Over-optimism differs from miscalibration, which relates to the over-precision cognitive bias. This is translated into an underestimation of the variance of possible outcomes or having a too narrow confidence interval for an uncertain event.

[17] Positive recent performance or the successful completion of earlier deals can build executive confidence, leading them to underestimate their chances of failure in future acquisitions (Gervais and Odean (2001)). Executive overconfidence can be reinforced by a self-attribution bias (Billett and Qian (2008)), when successes are attributed to personal skills, but failures are seen as stemming from bad luck, a bias that is likely to be reinforced by the successful completion of the deal (Malmendier and Tate (2005b)). Executives whose overconfidence is caused by attribution bias tend to undertake multiple acquisitions within a short time, and are less likely to stage acquisitions - but these subsequent overconfidence driven acquisitions are likely to produce negative outcomes (Doukas and Petmezas (2007); Malmendier and Tate (2008)).

neman and Lovallo (1993); Hayward and Hambrick (1997)) of total synergistic gain. An over-optimistic CEO assesses the synergy factors of the firms to be high, which also leads to an overestimation of future forecasts. For overconfident managers, due to overoptimistic forecasts of environmental, industry and company variables growth, the synergetic value is most likely to be overestimated. In particular, this bias is often used to strengthen the rationale of an acquisition decision when executives are highly committed (Heaton (2002)) and when they believe that the success of the deal is within their personal control (Langer (1975)). These findings all contribute to the overestimation of the synergy factors by a overconfident CEO.

To answer our question: "Can the rare use of toehold acquisitions be explained by CEO overconfidence?" we formulate the following empirically testable hypothesis, which follows directly from the proposition of our theoretic model:

Hypothesis 1. *Overconfident CEOs are less likely to acquire a toehold in a target company compared to a direct controlling acquisition.*

Since our model also predicts that a positive perception of correlation between Brownian motions reinforces the overconfidence effect, we empirically test this by considering the cases where this misperception of correlation is more likely to take place: namely same-sector acquisitions. This leads to the following hypothesis:

Hypothesis 2. *Same-sector acquisitions reinforce the overconfidence effect that leads to a lower likelihood of a toehold strategy.*

3.1 The Implications for Announcement Returns: Toehold vs. Controlling Acquisition

If a CEO is overconfident and commits more investment than rational strategy can allow for, this should have a negative impact on the expected returns of the company. In the model we assume that synergy parameters are known to managers, but investors are not informed about the merger. At announcement, a toehold strategy signals a real option to investors, which is created with the purchase of a minority stake. Investors have an expectation of the minority stake option, where they also take in account the seller advantages. For a minority stake acquisition, the option value therefore causes possible positive abnormal returns. By contrast, the immediate controlling acquisition signals on average overconfidence and while the overconfident executive might perceive opportunities as fruitful: analysts, traders and other investors conduct their own research and should - at least on average - not share the same behavioural bias[18]. Thus in line with the general predictions of our model, companies conducting majority stakes acquisitions

[18]We consider the consequences of biased managers in efficient markets (Barberis and Thaler (2003); Baker, Ruback, and Wurgler (2004) and others).

should on average experience lower announcement returns, when the market is able to recognize the irrational behaviour of CEOs (Malmendier and Tate (2008)). This is in line with empirical findings that acquirer's abnormal returns are often nihil (see e.g. Jensen and Ruback (1983) and others). Therefore we have the following hypothesis:

Hypothesis 3. *Minority stake acquisitions result in higher abnormal returns compared to immediate controlling acquisitions.*

The combination of the hypotheses allow us to distinguish a behavioural view from several alternative theoretical views. First, using several measures for overconfidence, based on the CEO personal portfolio behaviour and external perception, hypothesis 1 is well-suited to compare overconfidence, where managers are unaware of sub-optimal acquisition decisions, to views that build on empire building and agency consideration. Agency considerations including empire-building motives are not likely to lead to sub-optimal execution of their personal portfolio and these predictions are thus different than those of overconfidence[19]. Furthermore, our third hypothesis is well-suited to distinguish the behavioural perspective of CEO overconfidence from rational explanations to make direct controlling acquisitions, as rational explanations would be received more positively by financial markets.

4 Data & Methodology

4.1 Data Collection

Starting point of the data collection process consisted of selecting all companies and their acquisitions that were part of the S&P Composite 1500 index for at least three years during the range of 2004-2013. Further companies that engaged into three or more minority stake transactions in that same period were added. After exclusion of companies due to missing figures for insider transactions and to lack of information on important control characteristics, the resulting total number of companies in the data sample is 1217. The acquisitions by these firms and executives were collected from the ThomsonONE M&A database. This led to a total of 9695 announced acquisitions. These were identified as either majority or minority acquisitions, depending on the fraction acquired. Next, we identified those minority stake acquisitions which had a follow up

[19]Learning-by-doing is a relevant explanation for the higher returns of hypothesis 3 as minority stake specific learning can lead acquirers to assess the threshold size more accurately. Similarly in serial deals learning from investor feedback can help them adjust their future bidding strategies (Aktas, De Bodt, and Roll (2009)). Dai, Gryglewicz, and Smit (2018) show that toeholds are most likely to be utilized in difficult takeovers, those that offer low expected acquirer returns in the first place. If one corrects for the difficult context, toeholds provide a higher return on announcement, which even increases over time. This improvement can be attributed, to a certain extent, to learning. More specifically, acquirers in corporate takeovers "learn by doing"; this learning works when the acquisition experience is toehold specific.

acquisition later on to gain a controlling stake. From these minority stakes we know for sure that they had the purpose to be a toehold. The remaining minority stakes are considered potential toeholds. Deal value information was included, but only available for a limited number of acquisitions (44%).

For every sample year, each company's CEO was selected with the use of Execucomp Database as was also the information on the number of directors. If information on this number of directors was absent, the number is assumed to be the average of all sample years. For companies and years with missing data, the CEO names are hand-collected. Information on the options awarded to the executives of all companies was gathered from the Thomson Reuters Insider Filing Table 2 database. This includes information on the exercise price and the expiry date. Only options[20] were considered, leaving out the granting of ordinary shares, or the issue of restricted stock. Observations with no information on the type of derivative were removed. Observations with no information on the exercise price or expiration date were removed. Furthermore we obtain information on the value and number of the options that are simultaneously in the money and unvested, but not exercised from the Execucomp database. Company financials which are used to construct control variables are collected from the Compustat database (elaboration on control variables follows in section 4.3). Table 2 shows the way in which all sample acquisitions are distributed over the years. Further it shows the average stake sizes, the fraction of minority acquisitions and the average minority stake size. The number of deals shows a drop after 2008 most probably due to the financial crisis. The fraction of toeholds used is relatively low around the 4-6%, with an average toehold size around 20%. Of around 17% of these minority stakes we can verify that they have been utilized as toehold. The remaining minority stakes have not been exercised yet.

[Insert Table 2 about here]

Betton et al. (2009) develop a 'toehold threshold' strategy in equilibrium: acquire either no toehold at all (such that rejection costs are avoided) or acquire a toehold greater than a certain threshold. The threshold is the toehold at which toehold-benefits equal toehold-induced rejection costs. The threshold value is idiosyncratic, however Betton et al. (2009) find that the average toehold threshold value estimated from data is around 9%. We use this percentage as a cut-off point to exclude 'too small' toeholds for robustness purposes. In such a way we also have only those deals with either no toehold or with a toehold larger than the average threshold. Therefore, comparison will take place by testing all hypotheses with a data sample including only stakes sizes of 9% or higher.

[20] Only type 4 forms were included and the following derivative types: OPTNS, ISO, CALL, NONQ, DIRO, DIREO, EMPO and SAR.

4.2 Measuring Overconfidence

In its capacity as behavioural trait, overconfidence is not easily observable[21]. However, previous research has successfully found indirect ways to measure the extent to which behaviour can be deemed overconfident. In this study we use measures based on option behaviour of executives (Malmendier and Tate (2005a, 2008)). Starting point is the level of exposure to risks that executives bear, while they could possibly be mitigated. Idiosyncratic risk-exposure offers an excellent insight into this risk-equation. Normally, CEOs are under diversified because of their human capital investments in the company they work for, as well as their often large holdings of company stock. If they are rational and not risk seeking, they will want to diversify this risk, by selling these holdings. However, if they are overconfident, they expect future returns on their companies to be high, specifically higher than rationally can be accounted for. As a consequence, they will want to keep their company stock, because they believe under their guidance, the company will flourish, and its stock price will continue to rise and outperform. Keeping their risks centred on their company's performance therefore reveals overconfidence, at least on average. To ensure robustness and reliability, we employ two different option-timing-based measures of executive overconfidence, as proposed by Malmendier and Tate: *longholder* and *holder67*.

The *longholder* CEO holds his options although they are in the money. An average option package granted to an executive has a duration of 10 years, with a maximum vesting period of 5 years. According to this measure, a CEO is portrayed as overconfident, if he keeps the options until the final year while being at least 40% in the money. This means he has held on to the options long after the vesting period has ended. This portrays the neglect of the executive to diversify his holdings, even though he is now able to. The *longholder* variable is constructed using the option packages data described in section 4.1. The *longholder* variable is a dummy with a value of 1, if an option is at least 40% in the money and kept until the last year until expiration. A CEO is classified as *longholder* in every year in the sample if the right criteria are met at any point in time.

The *holder67* variable considers the value of options that are kept by the CEO, while both in the money and with an expired vesting period. The *holder67* variable looks at a different aspect of ownership consistence. Whereas the *longholder* variable is, in its essence, focused on a time-oriented bias effect, the *holder67* loosens that restriction. The *holder67* is also a dummy and also uses the moneyness of the options held, but does not require the options to expire within a year. Instead, the *holder67* variable considers all options that are no longer within their vesting period (and can thus be exercised). The

[21] Overconfidence has, in a methodological context (Kahneman and Tversky (1982)), been linked to excess entry into competitive markets (Camerer and Lovallo (1999)), increased trading activity (Deaves, Lüders, and Luo (2008)), and a source of distinction between entrepreneurial and managerial roles within organizations (Busenitz and Barney (1997)). Among other methodology, questionnaires targeted on executives are often used to measure overconfidence.

threshold of the extent to which they are in the money is however, considerably higher. Following Malmendier and Tate (2005a), the threshold is set at 67%[22]. Calculations are similar to the approach adopted for the *longholder* variable. The *holder67* dummy is set at 1 when an executive has met this criterion at least twice in the sample date range[23]. This is supposed to eliminate accidental or coincidental observations, focusing primarily on a consistent effect of a more habitual nature. In contrast with the longholder variable, a CEO is *holder67*-overconfident in every year since the first time he is classified as *holder67*.

For robustness purposes, we also employ an alternative measure of overconfidence, which uses external perception as a proxy for actual overconfidence. Selecting newspaper articles and searching for the combination of the CEOs name and certain keywords[24], CEOs are labelled overconfident if they are portrayed more often as overconfident than cautious in the business press. Malmendier and Tate (2008); Malmendier et al. (2011) use this approach to confirm the relation between overconfidence and acquisition behaviour and early-life experiences respectively.

We analyze the impact of CEO overconfidence on the likelihood of the occurrence and returns of toeholds in a general setting that allows for market inefficiencies, such as information asymmetries, and managerial frictions, such as agency costs and private benefits. Similar to Malmendier and Tate (2008) we assume that these frictions and the quality of merger opportunities do not vary systematically between overconfident and rational CEOs, i.e., that overconfident and rational CEOs sort randomly across firms over time and we account for violations of this assumption using firm and level controls.

4.3 Control Variables

Most control variables used are similar to the ones used in Malmendier and Tate (2005a). Board size could have a material impact on acquisition behaviour, as too small (or too large) board sizes may lead to inefficient decision-making processes. The *CG* (corporate governance) variable is a dummy variable that is activated when the number of board members is between 4 and 12. The amount to which the CEO already owns shares in the company under his supervision could be a source of distorted behaviour as well (Malmendier and Tate (2005b, 2008); Brown and Sarma (2007)). Variable *Owner* is a ratio defined as the CEO's shareholdings divided by the number of outstanding company

[22]This percentage corresponds to a risk-aversion of three in a constant relative risk-aversion specification. The option moneyness thresholds (67% and 40%) are calculated using the Hall and Murphy (2002) framework for optimal option exercise prices given various measures of risk-aversion and portfolio diversification.

[23]This approach neglects the vesting period as a barrier. We also considered the *holder67* in an alternative form, where a CEO is labelled overconfident already after the first time the 67% threshold is crossed. No significant results were found.

[24]Examples are 'confident' or 'optimistic' (positive) and 'conservative' or 'frugal' (negative).

shares. Variable *Size* controls for the acquirer's size and is obtained by taking the natural logarithm of the book value of the assets at year-end. The variable *Q*, representing Tobin's Q approximates the investment opportunities of the acquirer. Tobin's Q is measured as the ratio of the market value of assets and book value of assets. *Market value of assets* is measured by adding the market value of equity to the book value of total liabilities and the value of preferred shares, subsequently subtracting the value of convertible debt and deferred tax assets. The market value of equity is calculated by multiplying the price at the end of the fiscal period with the number of outstanding shares at the end of the fiscal period.

The variable *Cash Flow* is constructed by adding depreciation and amortization to the earnings before extraordinary items and is normalized by the book value of assets at the end of the previous year. The investments variable *Inv* is constructed by normalizing the capital expenditures by the book value of assets at the end of the previous year. The control variable *Cash* indicates the amount of cash and equivalents relative to the book value of assets. It serves as an indicator of the available internal resources. Control variable *Leverage* denotes the acquirers leverage and is obtained by taking the outstanding debt as a fraction of the market value of equity, the latter being calculated as the product of market price at year-end and the total number of shares outstanding. The value of the acquisition is controlled for by variable *Value/MVA* and is scaled by the market value of assets (MVA), to normalize the impact for size distortions. In that context, the variable *Value/stake* looks at deal value when scaled by the fraction of the target that was acquired.

Billett and Qian (2008) found lower returns for frequent acquirers, making it worthwhile to regard the impact of 'heavy' acquirers. This is done by control variable *Prev.acq.all* that looks at the total number of acquisitions engaged into in the last three years. Further, we use a control variable related to the learning effect *Prev.acq.min*, which is similar to *Prev.acq.all*, however now denotes the number of previous minority acquisitions. A geographical effect is controlled for by including a dummy for *Cross-Country* acquisitions, while a sector specific effect is controlled for by the dummy variable *Cross-Sector*, based on 2-digit SIC codes.

Table 2 shows the acquirer characteristics per category of overconfident CEOs. Of all 1643 CEOs, 24% qualifies as *longholder* and 29% as *holder67*. Overconfident CEOs manage companies that are not particularly different in characteristics. As industry leaders are believed to engage into many acquisitions, a small amount of overconfident CEOs in those places could alter the data spread significantly. Because both median and mean of the company size are in a close range when the two groups are compared, this effect does not dominate these results. Overconfident CEOs in our dataset have a slightly higher balance of investments and higher Tobin's Q.

[Insert Table 2 about here]

4.4 Methodology

The first hypothesis examines the relation between overconfident CEOs and toehold strategies. The primary effect tested is the effect of overconfidence, measured by one of the overconfidence measures (*longholder, holder67*) on the likelihood of acquiring a minority stake. This likelihood is denoted trough the dependent binary variable $minority_i$, which takes the value 1 if a minority stake was taken in deal i and 0 in case of a majority stake. A minority stake is defined as a sought stake-size of smaller than 50%, while the total acquired fraction of the target firm is also less than 50%. This results in the following regression equation, with $measure_i$ denoting one of the overconfidence measures *longholder, holder67* for all acquisitions i.

$$H1: \quad minority_i = \beta_0 + \beta_1 \times measure_i + \varepsilon_i \tag{4.1}$$

This equation can be extended naturally by the inclusion of control variables, along with additional variables related to the acquisition value (deal variables) and fixed effects[25]. Including deal value variables leads unfortunately to a loss of almost 50% of the observations due to missing data.

With the second hypothesis we test whether a possible overconfidence effect is reinforced in the case of a same-sector acquisition, due to a possible overestimation of correlation by the CEO. For this purpose we consider the following regression equation, where $Same\text{-}Sector_i$ is a dummy variable, taking the value of 1 if the acquisition is within the same industry (based on 2-digit SIC codes) as the acquiring firm and 0 otherwise:

$$\begin{aligned} H2: \quad minority_i = {} & \beta_0 + \beta_1 \times measure_i + \beta_2 Same\text{-}Sector_i \\ & + \beta_3 measure_i \times Same\text{-}Sector_i + \varepsilon_i \end{aligned} \tag{4.2}$$

The third hypothesis tests the market reaction measured by cumulative abnormal returns (CAR) of minority stakes versus majority acquisitions by overconfident CEOs. Therefore we consider the following regression:

$$H3: \quad CAR_{ik} = \beta_0 + \beta_1 majority_i + \beta_2 measure_i + \beta_3 majority_i \times measure_i + \varepsilon_{ik} \tag{4.3}$$

That is, we regress the CAR of every acquiring company in acquisition i for every relevant window k on a dummy indicating a majority stake, an overconfidence measure (*longholder, holder67*) and the interaction effect between overconfidence and the use of a majority

[25] the industries for industry fixed effects are defined by following the methodology of Malmendier and Tate (2008)

stake. We consider several distinct CAR event windows, which all include the announcement period and also take into account a run-up period and a post-announcement period. The CARs are calculated as in Betton et al. (2009).

5 Results

5.1 Overconfidence and Toeholds

Table 3 (*holder67*) and Table 4 (*longholder*) provide an overview of the regression results conducted on the full sample for testing the first hypothesis. Betton et al. (2009) find that 9% is on average the size of a toehold threshold such that toehold-benefits equal toehold-induced rejection costs. Hence, we compare the results for the several hypotheses also to a data sample including only stakes sizes of 9% or higher, the regression results related to the first hypothesis from this sub-sample are presented in Table 9 (*holder67*) and Table 10 (*longholder*) in the Appendix.

Starting with the first hypothesis, relating overconfidence and the use of a toehold strategy, it turns out that both measures of overconfidence have a significant negative effect on the likelihood of a minority stake transaction in both the full and 9%-sample. This effect is strong for both the *longholder* and *holder67* variable. From the baseline regressions we observe that in general the probability at a minority stake acquisition is around 6%, overconfidence decreases this probability on average with around 2 percentage points which is a relative reduction in probability of around 33%.

[Insert Table 3 and Table 4 about here]

These results confirm the basic existence of a relation, paving the way for an extension by including the formulated control variables, deal variables and industry, year and year-industry fixed effects. The estimated coefficients of the overconfidence measures remain in general negative and statistically significant among several regressions. Thus, the effect is persistent with the inclusion of control variables. The inclusion of deal value variables results in a significant loss of observations, cutting the sample size roughly in half. Similar to the other control measures, this action reduces neither direction nor significance of the main relation. Hence, in general we observe a negative effect of overconfidence on the likelihood of a minority stake acquisition.

Furthermore, we observe that the *cross-country* variable has a significant and relatively large positive coefficient. This is again a confirmation for the value of minority stakes when diversifying geographically (often more difficult acquisitions), which comes with increased levels of uncertainty. Finally, the 'experience' variables *Prev.acq.all* and *Prev.acq.min* show both strong significant effects. The number of all previous acquisitions shows a negative coefficient across all regressions, which indicates that a large number of

conducted acquisitions in general decreases the likelihood of a minority stake acquisition, that is, if a CEO has done a lot of previous acquisitions, it is less likely for him to appeal to a toehold acquisition (either due to experience or to irrational stubbornness). However, the number of previous minority acquisitions, displays a positive coefficient, pointing out a possible learning effect: if a CEO has done a lot of minority stake acquisitions in the past, he is more likely to do so again (Dai et al. (2018)).

Including the deal value variables does not alter the direction with respect to the measures of overconfidence, or their significance. The value/stake variable has a small positive effect, which means that the likelihood for a toehold is larger if the value per cent of the target is higher. Considering the results for the reduced sample (stake sizes $> 9\%$), there changes little to the direction or significance of the different variables [26]. Hence this supports the significant negative relation which is found for the full sample.

Next we run our regressions again, however now we use as dependent variable only those minority stake acquisitions, from which we certainly know that they were exercised at a some point in time, thus confirming their use as a toehold strategy. Tables 11 and 12 in the Appendix display the results for these regressions. Again we observe negative and significant coefficients for the overconfidence measures across all regressions, thus now in fact explicitly confirming the negative relation between overconfidence and toehold strategies. We also include the relative size of the target to the acquirer as an extra control variable, the results are presented in Table 14 in the Appendix. Unfortunately, this data is not available for many acquisitions, however we still find a significant negative relation between overconfidence and the minority stake acquisitions. Lastly we investigate this relation by logistic regression instead of linear regression and by employing a nearest neighbour matching approach on the control variables, with an exact match on acquirer industry. We find significant negative results as displayed in Tables 13 and 15 in the Appendix. This again provides empirical evidence for this relation.

5.1.1 Robustness of the Overconfidence-Toehold Hypothesis

In order to examine the robustness of the relationship between overconfidence and the use of minority stakes in an acquisition, we test our first hypothesis in a completely different setting. We construct an additional dataset consisting of a sample of 360 acquisitions in the period 2003-2013. However now, (i) we require all acquiring companies to be firms from the UK and (ii) use external perception by media as measure for overconfidence.

This country restriction is set to make sure that there are no country specific factors that could drive the relationship between overconfidence and the neglect of minority stakes. The UK is chosen because it is known for having a well-developed financial market, is known for an active M&A market and there is sufficient data available for

[26] we find the same results when considering cut-off points of 10% and 15%

deals in this country. Furthermore, it enables us to compare the results to our main dataset and previous research that mainly focuses on deals in the United States. Finally, a minimum market capitalization of the acquirer of 500 million pound is set as a condition, to make sure there is sufficient media coverage available about the CEO. This dataset only covers acquisitions that are made by listed, public firms.

The media coverage is needed to construct a different overconfidence measure. Following the measure of Malmendier and Tate (2008); Malmendier et al. (2011) we use outsider's perception as a proxy to measure overconfidence. We therefore collect articles from the British newspapers *The Guardian, Daily Telegraph and The Financial Times*. These newspapers are selected because they have a reputation of being 'quality press', and all three newspapers are described as having different political allegiance, which creates a more balanced view on outsiders perspective. Similar to Malmendier and Tate (2008), a CEO is classified as overconfident if he or she is mentioned more often as 'confident' or 'optimistic' than as 'reliable', 'cautious', 'frugal', 'steady', 'conservative' or 'practical'. All references in articles are manually checked, to make sure the articles refer to the CEO.

The final adjustment we make in our setting for testing the hypotheses, is the use of a different smaller set of control variables. The control variables we employ are *Size, Leverage, Cash, Cross-Country and Cross-Sector*. Moreover, it is also expected that minority acquisitions are more likely to be paid with cash, based on the empirical findings of Betton et al. (2009), hence we include *Cash Payment* (a dummy variable that indicates the payment method). Furthermore, we control for year and industry specific effects. The logistic regression results of the minority stake dummy on the external perception measure and additional control variables are displayed in Table 5.

[Insert Table 5 about here]

From Table 5 we observe that the tested hypothesis of the relation between the use of a minority stake and overconfidence of a CEO is again confirmed. For all regressions, we find negative significant coefficients for the overconfidence measure, indicating the negative relation between the likelihood of a minority stake and overconfidence of a CEO[27] This relationship remains consistent when we add control variables and control for industry and year effects. Furthermore, we also observe a negative significant coefficient for the variable Cash Payment, across the several regressions. This indicates a negative relation between the payment method and the likelihood of employing a minority stake strategy, which is in line with the findings of Betton et al. (2009).

[27]Betton et al. (2009) find empirically that toeholds are much more likely in hostile deals (which their model supports as well). One might expect that a CEO needs a certain amount of confidence to initiate a hostile bid. However Dai et al. (2018) find that once one corrects for 'difficult deals' minority stakes result in higher bidder returns, which is inconsistent with overconfidence (e.g. Malmendier and Tate (2008) find that overconfident CEO undertake value destroying acquisitions). Hence our findings rather complement than contradict the findings of Betton et al. (2009) and Dai et al. (2018).

The results indicate that our hypothesis of a negative relation between CEO overconfidence and the use of minority stakes is robust when tested in a different setting. That is, it is robust with respect to a different measure of overconfidence, to a dataset from a different country, to less data and a different set of control variables.

5.2 Reinforcement of the Overconfidence Effect

With the second hypothesis we investigate whether the negative effect of overconfidence on the likelihood of a toehold strategy is reinforced in same-sector acquisitions. The results of the regressions are presented in Tables 6 and 7.

[Insert Tables 6 and 7 about here]

We observe that the coefficients for the overconfidence measure and the interaction effect between overconfidence and same-sector acquisition are both negative and strongly significant across the several regressions. The coefficients are on average equal to around -0.03. This means that CEO overconfidence on average lowers the likelihood of a toehold strategy and that this likelihood becomes even smaller when the CEO is overconfident and the acquisition is in the same-sector. As the coefficients are roughly equal to each other, it is even the case that the decrease in likelihood due to CEO overconfidence is twice as large for a same-sector acquisition as for a cross-industry acquisition. All in all we find empirical evidence for a reinforcement of the overconfidence effect, which also strengthens the validity of our theoretical model, as we find empirical evidence for both of its predictions.

This can be explained in several ways. First, CEOs dealing with a same-sector acquisition can easily overestimate the correlation between both firms, which leads to an easier underestimation of the toehold strategy value, as explained by the model. Furthermore CEOs can more strongly overestimate the synergy value for a target firm which is in the same industry. Otherwise, alternatively we can loosen the assumption of independent stochastic processes in the model and allow for correlation between Brownian motions. This leads to the same prediction though from the model: when correlation is high, an overconfident CEO underestimates the toehold strategy value earlier. Correlation between stochastic processes is likely to be higher when both firms are in the same industry, which would explain why the overconfidence effect is reinforced.

5.3 Overconfidence and Announcement Returns

The third hypothesis revolves around abnormal returns, overconfidence and the acquisition type. The results of the regressions for the several event windows are presented in Table 8.

[Insert Table 8 about here]

Note that the constant represents the reference state, which in this setting is the case of a minority stake combined with a non-overconfident CEO. The additional effects of overconfidence, a majority acquisition and the interaction effect are given by the corresponding coefficients. We observe in general positive cumulative abnormal returns (CAR) for the minority stake acquisitions in several event windows. The coefficients for the majority stake variable are overall negative and significant, indicating on average lower cumulative abnormal returns for majority acquisitions, which is in line with our theory. There are no pronounced effects for the overconfidence measures, indicating that being a biased CEO does not necessarily affect the returns, while the signal of conducting a minority acquisition does. However, we do find some significant negative interaction effects indicating that a majority acquisition by a non-rational CEO lowers the CARs even more, which is in line with the theory that sometimes overconfident CEOs act non-optimally by conducting majority stake acquisitions. Overall, we find a clear relationship between higher cumulative abnormal returns and the use of minority stakes.

6 Conclusion

Do overconfident CEOs ignore minority stakes? This study shows that the answer is likely to be 'yes'. This may be an important insight for bidders as acquisitions tend to provide poor bidder returns. We propose a new behavioural explanation stating that overconfidence of CEOs contributes to neglecting toehold strategies.

We develop a dynamic model for the analysis of toeholds strategies, where agents can be overconfident. We show that this behavioural bias may cause CEOs to have a higher likelihood of underestimating the value of toeholds relative to immediate controlling acquisitions. We empirically test our claims of the impact of CEO-overconfidence on the use of toeholds in acquisition strategies. Absent other market frictions, we find that overconfident CEOs are more likely to ignore minority stake acquisitions and execute controlling acquisitions instead.

Overconfidence is conceptualized through different measures. We use CEOs' private investment decisions to capture their revealed beliefs and measure overconfidence. For robustness and to show that sub-optimal decision-making in the personal portfolio is not a result of errors but of behavioural biases, we use an alternative measure of overconfidence, which is based on the external perception of CEOs by quality newspapers. We obtain the same findings employing both measures.

The main empirical results show economically and statistically strongly significant evidence for a lower likelihood of toeholds strategies among overconfident CEOs. This supports the existence of a relation between behavioural biases and acquisition decisions.

An overconfident CEO is on average less likely to conduct a toehold strategy versus an immediate controlling acquisition. Furthermore we find that the likelihood for a toehold of a overconfident CEO is even lower in the case of an acquisition in the same industry.

Additionally, considering the announcement returns, cumulative abnormal returns are on average higher for minority stake acquisitions than for controlling acquisitions. Furthermore we observe that majority acquisitions by overconfident CEOs lead to even lower abnormal returns. This indicates that the market is able to recognize irrational and sub-optimal behaviour by CEOs.

Evidence that minority stakes perform better than full acquisitions is inconsistent with the neglect of toehold strategies. The implications of our study for contracting and deal execution practices, is that CEOs should focus attention on toehold acquisition strategies as a potential way to improve acquisition performance. Acknowledging the existence of overconfidence in acquisition strategies can offer executives the insights and new organisational processes that could be helpful in efforts to de-bias acquisition strategies.

References

Aktas, Nihat, Eric De Bodt, and Richard Roll, 2009, Learning, hubris and corporate serial acquisitions, *Journal of Corporate Finance* 15, 543–561.

Allen, Jeffrey W, and Gordon M Phillips, 2000, Corporate equity ownership, strategic alliances, and product market relationships, *The Journal of Finance* 55, 2791–2815.

Baker, Malcolm, Richard S Ruback, and Jeffrey Wurgler, 2004, Behavioral corporate finance: A survey, Technical report, National Bureau of Economic Research.

Baldwin, Carliss Y, 1982, Optimal sequential investment when capital is not readily reversible, *The Journal of Finance* 37, 763–782.

Barberis, Nicholas, and Richard Thaler, 2003, A survey of behavioral finance, *Handbook of the Economics of Finance* 1, 1053–1128.

Ben-David, Itzhak, John R Graham, and Campbell R Harvey, 2013, Managerial miscalibration, *The Quarterly Journal of Economics* 128, 1547–1584.

Betton, Sandra, and B Espen Eckbo, 2000, Toeholds, bid jumps, and expected payoffs in takeovers, *The Review of Financial Studies* 13, 841–882.

Betton, Sandra, B Espen Eckbo, and Karin S Thorburn, 2008, Corporate takeovers, *Handbook of Corporate Finance: Empirical Corporate Finance* 2, 291–430.

Betton, Sandra, B Espen Eckbo, and Karin S Thorburn, 2009, Merger negotiations and the toehold puzzle, *Journal of Financial Economics* 91, 158–178.

Billett, Matthew T, and Yiming Qian, 2008, Are overconfident ceos born or made? evidence of self-attribution bias from frequent acquirers, *Management Science* 54, 1037–1051.

Bradley, Michael, Anand Desai, and E Han Kim, 1988, Synergistic gains from corporate acquisitions and their division between the stockholders of target and acquiring firms, *Journal of Financial Economics* 21, 3–40.

Brown, Rayna, and Neal Sarma, 2007, Ceo overconfidence, ceo dominance and corporate acquisitions, *Journal of Economics and Business* 59, 358–379.

Bulow, Jeremy, Ming Huang, and Paul Klemperer, 1999, Toeholds and takeovers, *Journal of Political Economy* 107, 427–454.

Burkart, Mike, 1995, Initial shareholdings and overbidding in takeover contests, *The Journal of Finance* 50, 1491–1515.

Busenitz, Lowell W, and Jay B Barney, 1997, Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making, *Journal of Business Venturing* 12, 9–30.

Camerer, Colin, and Dan Lovallo, 1999, Overconfidence and excess entry: An experimental approach, *American economic review* 89, 306–318.

Dai, Yun, Sebastian Gryglewicz, and Han Smit, 2018, Less popular but more effective toeholds in corporate takeovers, *Working Paper* .

Dasgupta, Sudipto, and Kevin Tsui, 2003, A "matching auction" for targets with heterogeneous bidders, *Journal of Financial Intermediation* 12, 331–364.

Deaves, Richard, Erik Lüders, and Guo Ying Luo, 2008, An experimental test of the impact of overconfidence and gender on trading activity, *Review of Finance* 13, 555–575.

Deshmukh, Sanjay, Anand M Goel, and Keith M Howe, 2013, Ceo overconfidence and dividend policy, *Journal of Financial Intermediation* 22, 440–463.

Dixit, Avinash K, and Robert S Pindyck, 1994, *Investment under Uncertainty* (Princeton university press).

Doukas, John A, and Dimitris Petmezas, 2007, Acquisitions, overconfident managers and self-attribution bias, *European Financial Management* 13, 531–577.

Gervais, Simon, and Terrance Odean, 2001, Learning to be overconfident, *The Review of Financial Studies* 14, 1–27.

Grossman, Sanford J, and Oliver D Hart, 1980, Takeover bids, the free-rider problem, and the theory of the corporation, *The Bell Journal of Economics* 42–64.

Hackbarth, Dirk, 2008, Managerial traits and capital structure decisions, *Journal of Financial and Quantitative Analysis* 43, 843–881.

Hackbarth, Dirk, 2009, Determinants of corporate borrowing: A behavioral perspective, *Journal of Corporate Finance* 15, 389–411.

Hall, Brian J, and Kevin J Murphy, 2002, Stock options for undiversified executives, *Journal of Accounting and Economics* 33, 3–42.

Hayward, Mathew LA, and Donald C Hambrick, 1997, Explaining the premiums paid for large acquisitions: Evidence of ceo hubris, *Administrative Science Quarterly* 103–127.

Heaton, James B, 2002, Managerial optimism and corporate finance, *Financial Management* 33–45.

Hirshleifer, David, and Sheridan Titman, 1990, Share tendering strategies and the success of hostile takeover bids, *Journal of Political Economy* 98, 295–324.

Jensen, Michael C, and Richard S Ruback, 1983, The market for corporate control: The scientific evidence, *Journal of Financial Economics* 11, 5–50.

Kahneman, Daniel, and Dan Lovallo, 1993, Timid choices and bold forecasts: A cognitive perspective on risk taking, *Management Science* 39, 17–31.

Kahneman, Daniel, and Amos Tversky, 1982, Variants of uncertainty, *Cognition* 11, 143–157.

Lambrecht, Bart M, 2004, The timing and terms of mergers motivated by economies of scale, *Journal of Financial Economics* 72, 41–62.

Langer, Ellen J, 1975, The illusion of control., *Journal of personality and social psychology* 32, 311.

Leeth, John D, and J Rody Borg, 2000, The impact of takeovers on shareholder wealth during the 1920s merger wave, *Journal of Financial and Quantitative Analysis* 35, 217–238.

Malmendier, Ulrike, and Geoffrey Tate, 2005a, Ceo overconfidence and corporate investment, *The Journal of Finance* 60, 2661–2700.

Malmendier, Ulrike, and Geoffrey Tate, 2005b, Does overconfidence affect corporate investment? ceo overconfidence measures revisited, *European Financial Management* 11, 649–659.

Malmendier, Ulrike, and Geoffrey Tate, 2008, Who makes acquisitions? ceo overconfidence and the market's reaction, *Journal of Financial Economics* 89, 20–43.

Malmendier, Ulrike, Geoffrey Tate, and Jon Yan, 2011, Overconfidence and early-life experiences: the effect of managerial traits on corporate financial policies, *The Journal of finance* 66, 1687–1733.

Morellec, Erwan, and Alexei Zhdanov, 2005, The dynamics of mergers and acquisitions, *Journal of Financial Economics* 77, 649–672.

Roll, Richard, 1986, The hubris hypothesis of corporate takeovers, *Journal of Business* 197–216.

Scheinkman, Jose A, and Wei Xiong, 2003, Overconfidence and speculative bubbles, *Journal of Political Economy* 111, 1183–1220.

Shleifer, Andrei, and Robert W Vishny, 1986, Large shareholders and corporate control, *Journal of Political Economy* 94, 461–488.

Shleifer, Andrei, and Robert W Vishny, 2003, Stock market driven acquisitions, *Journal of Financial Economics* 70, 295–311.

Singh, Rajdeep, 1998, Takeover bidding with toeholds: The case of the owner's curse, *The Review of Financial Studies* 11, 679–704.

Stulz, René M, Ralph A Walkling, and Moon H Song, 1990, The distribution of target ownership and the division of gains in successful takeovers, *The Journal of Finance* 45, 817–833.

Thaler, Richard H, 1988, Anomalies: The winner's curse, *Journal of Economic Perspectives* 2, 191–202.

Toxvaerd, Flavio, 2008, Strategic merger waves: A theory of musical chairs, *Journal of Economic Theory* 140, 1–26.

A Derivation of Option Value and Exercise Threshold

Denote by $O^T(X,Y)$ the option value of the toehold. Using Itō's lemma we write for the dynamics:

$$dO^t = O^T_X dX + O^T_Y dY + \left[\frac{1}{2}\sigma^2_X X^2 O^T_{XX} + \frac{1}{2}\sigma^2_Y Y^2 O^T_{YY} + \rho\sigma_X\sigma_Y O^T_{XY}\right].$$

In equilibrium it should hold that the expected return on the option is equal to the risk-free rate r. Hence, if combined with above dynamics we arrive at the following PDE:

$$(\mu_X - q_X)XO^T_X + (\mu_Y - q_Y)YO^T_Y + \frac{1}{2}\sigma^2_X X^2 O^T_{XX} + \rho\sigma_X\sigma_Y O^T_{XY} = rO^T,$$

subject to the following boundary conditions:

$$\begin{aligned}
O^T(X^*,Y^*) &= (\phi-\omega)V^T(Y^*) + \phi(V^C(X^*,Y^*) \\
&\quad - V^B(X^*) - V^T(Y^*)) - (\phi-\omega)(1-\xi)V^C(X^*,Y^*) \\
O^T_X(X^*) &= \phi\alpha V^B_X(X^*) - (\phi-\omega)(1-\xi)(1+\alpha)V^B_X(X^*) \\
O^T_Y(Y^*) &= (\phi-\omega)V^T_Y(X^*) + \phi\gamma V^T(Y^*) - (\phi-\omega)(1-\xi)(1+\gamma)V^T_Y(Y^*) \\
\lim_{(X/Y)\to 0}\frac{O^T(X,Y)}{X} &= 0
\end{aligned}$$

It is fairly straightforward to see that the value function $O^T(X,Y)$ is linearly homogeneous in (X,Y). Hence if we let $R = X/Y$, we can describe the option as follow:

$$O^T(X,Y) = YO^T(\frac{X}{Y},1) = YO^T(R)$$

Morellec and Zhdanov (2005) show that the following hold:

$$\begin{aligned}
O^T_X(X,Y) &= O^T_R(R) \\
O^T_Y(X,Y) &= O^T(R) - RO^T_R(R) \\
O^T_{XX}(X,Y) &= O^T_{RR}(R)/Y \\
O^T_{YY}(X,Y) &= R^2 O^T_{RR}(R)/Y \\
O^T_{XY}(X,Y) &= -RO^T_{RR}(R)/Y
\end{aligned}$$

Substituting these in the equilibrium and boundary conditions leads to:

$$\frac{1}{2}\sigma^2_R R^2 O^T_R R + \mu_R R O^T_R = (r - (\mu_Y - q_Y))O^T,$$

with boundary conditions:

$$\begin{aligned} O(R^*) &= (\phi-\omega)V^T(1) + \phi(\alpha V^B(R^*) + \gamma V^T(1)) - (\phi-\omega)(1-\xi)V^C(R^*) \\ O^R(R^*) &= \phi\alpha\frac{1}{r-\mu_X} - (\phi-\omega)(1-\xi)(1+\alpha)\frac{1}{r-\mu_X} \\ \lim_{R\to 0} O^T(R)/R &= 0 \end{aligned}$$

The general solution of such a problem is well-known:

$$O^T(R) = AR^\beta + BR^\delta$$

With A and B positive constants and with β and δ respectively the positive and negative roots of the quadratic equation:

$$\frac{1}{2}(\sigma_X^2 + \sigma_Y^2 - 2\rho\sigma_X\sigma_Y)\beta(\beta-1) + [(\mu_X - q_X) - (\mu_Y - q_Y)]\beta - (r - (\mu_Y - q_Y)) = 0$$

From the last boundary condition it follows that $B = 0$. Then we can write:

$$\begin{aligned} AR^{*\beta} &= (\phi-\omega)V^T(1) + \phi(\alpha V^B(R^*) + \gamma V^T(1)) - (\phi-\omega)(1-\xi)V^C(R^*) \\ \beta AR^{*\beta-1} &= \phi\alpha\frac{1}{r-\mu_X} - (\phi-\omega)(1-\xi)(1+\alpha)\frac{1}{r-\mu_X} \\ A &= \left\{(\phi-\omega)V^T(1) + \phi(\alpha V^B(R^*) + \gamma V^T(1)) - (\phi-\omega)(1-\xi)V^C(R^*)\right\}(R^*)^{-\beta} \end{aligned}$$

from which we obtain:

$$O^T(R) = \left\{(\phi-\omega)V^T(1) + \phi(\alpha V^B(R^*) + \gamma V^T(1)) - (\phi-\omega)(1-\xi)V^C(R^*)\right\}\left(\frac{R}{R^*}\right)^\beta,$$

and we can derive that:

$$R^* = \frac{\beta}{\beta-1}\frac{r-\mu_X}{r-\mu_Y}\frac{(\phi-\omega)(1-\xi)(1+\gamma) - \phi\alpha - (\phi-\omega)}{(\phi-\omega)(1-\xi)(1+\alpha) - \phi\alpha}$$

B The effect of overconfidence

Let $D = \left(\frac{R}{R^*}\right)^{\beta}$, we are interested in the sign of the derivative of D with respect to the synergie factor α.

$$\begin{aligned} D &= \left(\frac{R}{R^*}\right)^{\beta} \\ \ln(D) &= \beta[\ln(R) - \ln(R^*)] \\ \frac{\partial \ln(D)}{\partial \alpha} &= \frac{1}{D}\frac{\partial D}{\partial \alpha} \Longleftrightarrow \frac{\partial D}{\partial \alpha} = D \times \frac{\partial \ln(D)}{\partial \alpha} \\ \frac{\partial \ln(D)}{\partial \alpha} &= \frac{\partial \beta}{\partial \alpha}[\ln(R) - \ln(R^*)] + \beta\left[-\frac{1}{R^*}\frac{\partial R^*}{\alpha}\right] \end{aligned}$$

From the quadratic equation we solve for β to find:

$$\beta = \frac{\left(\frac{\sigma_R^2}{2}\right)\sqrt{\left(\mu_R - \frac{\sigma_R^2}{2}\right)^2 + 2\sigma_R^2(r - (\mu_Y - q_Y)}}{\sigma_R^2}$$

If we now let

$$Q(\beta, \mu_R) = \frac{1}{2}(\sigma_X^2 + \sigma_Y^2 - 2\rho\sigma_X\sigma_Y)\beta(\beta - 1) + [(\mu_X - q_X) - (\mu_Y - q_Y)]\beta - (r - (\mu_Y - q_Y)) = 0,$$

we find:

$$\frac{\partial \beta}{\partial \mu_R} = -\frac{\frac{\partial Q}{\partial \mu_R}}{\frac{\partial Q}{\partial \beta}} = -\frac{\beta}{\sigma_R^2\beta - \frac{1}{2}\sigma_R^2 + \mu_R} = -\frac{> 0}{> 0} \Longleftrightarrow \frac{\partial \beta}{\partial \mu_R} < 0.$$

Since by definition we have $\frac{\partial q_X}{\alpha} > 0$ it follows that $\frac{\partial \mu_R}{\partial \alpha} < 0$. Hence, as $\frac{\partial \beta}{\partial \alpha} = \frac{\partial \beta}{\partial \mu_R} \times \frac{\partial \mu_R}{\partial \alpha}$ it ultimately follows that $\frac{\partial \beta}{\partial \alpha} > 0$. Furthermore we have:

$$\begin{aligned} \frac{\partial R^*}{\partial \alpha} = \frac{\partial R^*}{\partial \beta}\frac{\partial \beta}{\partial \alpha} = \left[-\frac{1}{(\beta - 1)^2}\right]\frac{\partial \beta}{\partial \alpha}\frac{\beta - 1}{\beta}R^* + \left[\frac{\beta}{\beta - 1}\right]\left[\frac{r - \mu_X}{r - \mu_Y}\right] \\ \left[\frac{\phi}{(\phi - \omega) + \phi\alpha - (\phi - \omega)(1 - \xi)(1 + \gamma)}R^* - \frac{(\phi - (\phi - \omega)(1 - \xi)}{(\phi\alpha - (\phi - \omega)(1 - \xi)(1 + \alpha)}R^*\right], \end{aligned}$$

which is ambiguous, such that the sign of $\frac{\partial D}{\partial \alpha}$ is not directly clear. However since $R < R^*$ and $\frac{\partial \beta}{\partial \alpha} > 0$, it is safe to say that D decreases as α increases. In extreme form we can show that $D \longrightarrow 0$ as $\alpha \longrightarrow \infty$. It is trivial that $\beta \longrightarrow \infty$ as $\alpha \longrightarrow \infty$, hence $\frac{\beta}{\beta - 1} \longrightarrow 1$. Then if we apply De L'Hopital's rule, we see that

$$R^* \longrightarrow \frac{r - \mu_X}{r - \mu_Y}\frac{\phi}{\phi - (\phi - \omega)(1 - \xi)}.$$

By the same argument that $R < R^*$ and we know that $\beta \longrightarrow \infty$, we find that $D \longrightarrow 0$ as $\alpha \longrightarrow \infty$.

C The effect of perceived correlation

Let $D = \left(\frac{R}{R^*}\right)^{\beta}$, we are interested in the sign of the derivative of D with respect to the correlationcoefficient ρ.

$$
\begin{aligned}
D &= \left(\frac{R}{R^*}\right)^{\beta} \\
\ln(D) &= \beta[\ln(R) - \ln(R^*)] \\
\frac{\partial \ln(D)}{\partial \rho} &= \frac{1}{D}\frac{\partial D}{\partial \rho} \Longleftrightarrow \frac{\partial D}{\partial \rho} = D \times \frac{\partial \ln(D)}{\partial \rho} \\
\frac{\partial \ln(D)}{\partial \rho} &= \frac{\partial \beta}{\partial \rho}[\ln(R) - \ln(R^*)] + \beta\left[-\frac{1}{R^*}\frac{\partial R^*}{\rho}\right]
\end{aligned}
$$

From the quadratic equation we solve for β to find:

$$
\beta = \frac{\left(\frac{\sigma_R^2}{2}\right)\sqrt{\left(\mu_R - \frac{\sigma_R^2}{2}\right)^2 + 2\sigma_R^2(r - (\mu_Y - q_Y)}}{\sigma_R^2}
$$

If we now let

$$
Q(\beta, \sigma_R) = \frac{1}{2}(\sigma_X^2 + \sigma_Y^2 - 2\rho\sigma_X\sigma_Y)\beta(\beta - 1) + [(\mu_X - q_X) - (\mu_Y - q_Y)]\beta - (r - (\mu_Y - q_Y)) = 0,
$$

we find:

$$
\frac{\partial \beta}{\partial \sigma_R} = -\frac{\frac{\partial Q}{\partial \sigma_R}}{\frac{\partial Q}{\partial \beta}} = -\frac{\sigma_R\beta(\beta - 1)}{\sigma_R^2\beta - \frac{1}{2}\sigma_R^2 + \mu_R} = -\frac{> 0}{> 0} \Longleftrightarrow \frac{\partial \beta}{\partial \sigma_R} < 0
$$

Furthermore we have $\frac{\partial \sigma_R}{\partial \rho} < 0$ and since $\frac{\partial \beta}{\partial \rho} = \frac{\partial \beta}{\partial \sigma_R} \times \frac{\partial \sigma_R}{\partial \rho}$, we infer $\frac{\partial \beta}{\partial \rho} > 0$. Furthermore we have:

$$
\frac{\partial R^*}{\partial \rho} = \frac{\partial R^*}{\partial \beta}\frac{\partial \beta}{\partial \rho} = \left[-\frac{1}{(\beta - 1)^2}\right]\frac{\partial \beta}{\partial \rho} < 0
$$

Hence the sign of $\frac{\partial D}{\partial \rho}$ is ambiguous, but can be negative. Interesting however is to investigate the interaction of perception of correlation with overconfidence with respect to synergies. We can infer that an increase in α increases the numerator of β, while an increase in ρ decreases the denominator of β. Hence this interaction causes $\beta \longrightarrow \infty$ faster than the sole effect of α. Since R^* converges to a constant, we find that as $\alpha \longrightarrow \infty$ while simultaneously $\rho \longrightarrow 1$, D approaches 0 faster, then when only $\alpha \longrightarrow \infty$.

D Tables

Table 1: **Corporate takeovers in the period 2004-2013**

Our sample consists of 9646 deals in the period 2004-2013. All the deals are by US acquirers from the S&P1500 composite index. Data on each deal must be available from CRSP and Compustat. This table gives the yearly distribution of deals, the average stake size, the number and percentage of deals with a toehold strategy and the average toehold size. %

Year	No. Of Deals	Average stake size (%)	Fraction of Min. Stakes (%)	Average Min. Stake size (%)
2004	989	95.28	5.39	22.28
2005	1079	95.14	5.47	21.07
2006	1215	95.83	4.28	19.23
2007	1083	95.70	4.62	16.04
2008	1100	93.83	7.18	19.55
2009	694	93.85	7.35	17.32
2010	887	96.14	4.51	22.04
2011	931	96.63	3.97	21.77
2012	961	96.77	3.33	22.29
2013	755	96.14	4.51	22.86
Total	9695	95.38	5.09	20.21

Table 2: **Acquirer descriptive statistics**

This table shows acquirer statistics for the full sample and specified per CEO category. For every characteristic, the mean, median and standard deviation (SD) are displayed. An asterisk (*) denotes that a characteristic is denoted in million dollars.

Acquirer Characteristics						
	Full Sample (n=9695)			*longholder (n = 1636)*		
**In million $*	Mean	Median	SD	Mean	Median	SD
Size*	8.5	8.2	1.8	8.43	8.0	1.8
Cash flow*	0.07	0.07	0.08	0.07	0.07	0.06
Investments*	0.04	0.03	0.08	0.04	0.03	0.05
Cash position*	0.16	0.10	0.18	0.13	0.09	0.14
Tobin's Q	1.8	1.6	1.3	1.9	1.7	0.85
Leverage	0.12	0.14	0.09	0.11	0.09	0.11

	holder67 (n=1763)		
**In million $*	Mean	Median	SD
Size*	8.0	7.9	1.7
Cash flow*	0.07	0.06	0.06
Investments*	0.05	0.03	0.08
Cash position*	0.15	0.10	0.2
Tobin's Q	1.9	1.6	1.0
Leverage	0.13	0.1	0.15

Table 3: **Overview of Holder67 regressions**

This table shows an overview of the relevant coefficients resulting from several regressions. The dependent variable in the regressions is *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise. The main explanatory variable is the *Holder67* measure of overconfidence. Furthermore control variables, deal variables and fixed effects are included.

Dependent variable: *Minority*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Baseline	Control Variables	Deal Variables	Controls FE	Controls FE	Controls FE	Dealvars FE	Dealvars FE	Dealvars FE
Holder67	**-0.0262*** **	**-0.0247*** **	**-0.0262*** **	**-0.0225*** **	**-0.0221*** **	**-0.0199*** **	**-0.0254*** **	**-0.0273*** **	**-0.0259*** **
	(0.00848)	(0.00499)	(0.00754)	(0.00494)	(0.00508)	(0.00500)	(0.00749)	(0.00766)	(0.00757)
Size		0.000632	0.00177	0.00211	-0.000260	0.00126	0.00255	-0.000461	0.000202
		(0.00221)	(0.00347)	(0.00220)	(0.00224)	(0.00224)	(0.00353)	(0.00364)	(0.00366)
Tobins Q		0.00389	0.00826**	0.00373	0.00762**	0.00752***	0.00858**	0.0112***	0.0118***
		(0.00290)	(0.00387)	(0.00282)	(0.00300)	(0.00282)	(0.00375)	(0.00390)	(0.00387)
Cash Flow		0.0238	-0.0275	0.000453	0.0419	0.0201	-0.0372	-0.0218	-0.0446
		(0.0646)	(0.0562)	(0.0617)	(0.0632)	(0.0597)	(0.0559)	(0.0553)	(0.0549)
Investments		0.272***	0.276***	0.266***	0.256***	0.257***	0.270***	0.220***	0.236***
		(0.0593)	(0.0552)	(0.0608)	(0.0626)	(0.0603)	(0.0550)	(0.0714)	(0.0636)
Cash		0.0775***	0.121***	0.0635***	0.0754***	0.0627***	0.105***	0.132***	0.113***
		(0.0256)	(0.0313)	(0.0221)	(0.0250)	(0.0230)	(0.0301)	(0.0305)	(0.0299)
Leverage		0.153***	0.219***	0.128***	0.144***	0.126***	0.191***	0.199***	0.175***
		(0.0359)	(0.0547)	(0.0338)	(0.0335)	(0.0312)	(0.0536)	(0.0525)	(0.0506)
Prev.acq.all		-0.00154***	-0.00280***	-0.00149***	-0.00200***	-0.00200***	-0.00281***	-0.00241***	-0.00236***
		(0.000323)	(0.000658)	(0.000317)	(0.000277)	(0.000268)	(0.000656)	(0.000597)	(0.000591)
Prev.acq.min		0.0544***	0.0630***	0.0536***	0.0501***	0.0482***	0.0633***	0.0591***	0.0579***
		(0.00686)	(0.0106)	(0.00663)	(0.00672)	(0.00657)	(0.0105)	(0.0104)	(0.0101)
CG		-0.0873***	-0.0840**	-0.0843***	-0.0656***	-0.0613***	-0.0849**	-0.0733**	-0.0724**
		(0.0213)	(0.0331)	(0.0214)	(0.0204)	(0.0203)	(0.0333)	(0.0330)	(0.0348)
Cross-Sector		0.00917*	0.0116	0.00865*	0.00916*	0.00964*	0.0111	0.0136	0.0138*
		(0.00503)	(0.00800)	(0.00495)	(0.00518)	(0.00511)	(0.00796)	(0.00827)	(0.00817)
Cross-Country		0.0651***	0.0802***	0.0656***	0.0690***	0.0688***	0.0797***	0.0842***	0.0824***
		(0.00812)	(0.0123)	(0.00804)	(0.00833)	(0.00825)	(0.0123)	(0.0123)	(0.0123)
Owner		0.00505	0.122	0.00772	0.00526	7.05e-06	0.127	0.141	0.140
		(0.0515)	(0.108)	(0.0492)	(0.0449)	(0.0435)	(0.106)	(0.112)	(0.110)
Value/MVA			-0.0456**				-0.0446**	-0.0464**	-0.0451**
			(0.0213)				(0.0203)	(0.0203)	(0.0188)
Value/Stake			0.000799***				0.000781***	0.000791***	0.000776***
			(0.000163)				(0.000165)	(0.000159)	(0.000161)
Constant	0.0643***	0.0616**	0.0346	0.883***	0.0700*	0.945***	0.631***	0.0817	0.518***
	(0.00605)	(0.0308)	(0.0462)	(0.0492)	(0.0396)	(0.0521)	(0.0798)	(0.0626)	(0.177)
Observations	9,695	9,695	4,309	9,695	9,695	9,695	4,309	4,309	4,309
R-squared	0.003	0.127	0.168	0.143	0.137	0.161	0.175	0.174	0.196
Industry FE					YES	YES		YES	YES
Year FE				YES		YES	YES		YES
Year-Industry FE						YES			YES

Note: *p<0.1; **p<0.05; ***p<0.01

CEO-clustered standard errors in parentheses

Table 4: **Overview of Longholder regressions**

This table shows an overview of the relevant coefficients resulting from several regressions. The dependent variable in the regressions is *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise. The main explanatory variable is the *Longholder* measure of overconfidence. Furthermore control variables, deal variables and fixed effects are included.

Dependent variable: *Minority*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Baseline	Control Variables	Deal Variables	Controls FE	Controls FE	Controls FE	Dealvars FE	Dealvars FE	Dealvars FE
Longholder	**-0.0200*** **	**-0.0143*** **	**-0.0295*** **	**-0.0138*** **	**-0.0156*** **	**-0.0154*** **	**-0.0289*** **	**-0.0304*** **	**-0.0300*** **
	(0.00475)	(0.00444)	(0.00734)	(0.00443)	(0.00448)	(0.00453)	(0.00731)	(0.00738)	(0.00744)
Size		0.000166	0.00139	0.00174	-0.000694	0.000911	0.00223	-0.000794	-6.20e-05
		(0.00177)	(0.00312)	(0.00177)	(0.00178)	(0.00178)	(0.00317)	(0.00326)	(0.00331)
Tobins Q		0.00395	0.00834	0.00374	0.00788**	0.00770**	0.00857*	0.0114**	0.0119**
		(0.00344)	(0.00507)	(0.00347)	(0.00347)	(0.00352)	(0.00513)	(0.00516)	(0.00531)
Cash Flow		0.0178	-0.0281	-0.00497	0.0383	0.0169	-0.0382	-0.0217	-0.0454
		(0.0491)	(0.0596)	(0.0486)	(0.0487)	(0.0483)	(0.0596)	(0.0592)	(0.0593)
Investments		0.271***	0.281***	0.264***	0.256***	0.256***	0.275***	0.221***	0.237***
		(0.0363)	(0.0414)	(0.0377)	(0.0402)	(0.0413)	(0.0419)	(0.0584)	(0.0558)
Cash		0.0784***	0.119***	0.0643***	0.0748***	0.0618***	0.103***	0.130***	0.111***
		(0.0175)	(0.0268)	(0.0166)	(0.0176)	(0.0171)	(0.0267)	(0.0268)	(0.0268)
Leverage		0.154***	0.223***	0.129***	0.145***	0.126***	0.195***	0.205***	0.181***
		(0.0266)	(0.0436)	(0.0257)	(0.0262)	(0.0256)	(0.0432)	(0.0430)	(0.0426)
Prev.acq.all		-0.00145***	-0.00286***	-0.00140***	-0.00195***	-0.00194***	-0.00287***	-0.00249***	-0.00242***
		(0.000184)	(0.000634)	(0.000183)	(0.000203)	(0.000206)	(0.000636)	(0.000635)	(0.000644)
Prev.acq.min		0.0542***	0.0624***	0.0533***	0.0496***	0.0477***	0.0627***	0.0584***	0.0573***
		(0.00544)	(0.00861)	(0.00540)	(0.00539)	(0.00532)	(0.00856)	(0.00863)	(0.00825)
CG		-0.0936***	-0.0902***	-0.0898***	-0.0704***	-0.0656***	-0.0904***	-0.0797***	-0.0782***
		(0.0188)	(0.0279)	(0.0189)	(0.0190)	(0.0191)	(0.0281)	(0.0283)	(0.0290)
Cross-Sector		0.00862*	0.0121	0.00809*	0.00875*	0.00923**	0.0116	0.0142*	0.0145*
		(0.00442)	(0.00748)	(0.00440)	(0.00462)	(0.00460)	(0.00746)	(0.00773)	(0.00769)
Cross-Country		0.0652***	0.0803***	0.0657***	0.0691***	0.0691***	0.0799***	0.0841***	0.0825***
		(0.00582)	(0.00982)	(0.00581)	(0.00591)	(0.00591)	(0.00980)	(0.00994)	(0.00992)
Owner		0.00616	0.134	0.00944	0.00946	0.00497	0.139	0.154	0.154
		(0.0395)	(0.104)	(0.0392)	(0.0397)	(0.0397)	(0.104)	(0.105)	(0.103)
Value/MVA			-0.0462**				-0.0452**	-0.0470**	-0.0458**
			(0.0226)				(0.0219)	(0.0222)	(0.0218)
Value/Stake			0.000822***				0.000803***	0.000815***	0.000799***
			(0.000171)				(0.000172)	(0.000167)	(0.000170)
Constant	0.0596***	0.0655**	0.0404	0.892***	0.0748**	0.951***	0.637***	0.0910*	0.538***
	(0.00281)	(0.0257)	(0.0407)	(0.0372)	(0.0304)	(0.0462)	(0.0722)	(0.0499)	(0.169)
Observations	9,695	9,695	4,309	9,695	9,695	9,695	4,309	4,309	4,309
R-squared	0.002	0.125	0.168	0.142	0.136	0.160	0.175	0.174	0.196
Industry FE					YES	YES		YES	YES
Year FE				YES		YES	YES		YES
Year-Industry FE						YES			YES

Note: *p<0.1; **p<0.05; ***p<0.01

CEO-clustered standard errors in parentheses

Table 5: **Logistic regressions with the external perception measure**

This table shows the regression results of *Minority* on the external perception overconfidence measure with additional control variables and year and industry effects. The dependent variable in the regressions is *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise. The dummy variable *Overconfident* takes value 1 if a CEO is classified as overconfident, based on outsiders perception measured by media coverage. Articles that classify a CEO as cautious consist on or more of the following keywords: 'reliable', 'cautious', 'frugal', 'steady', 'conservative' and 'practical', referring to the CEO of interest. Articles that classify a CEO as overconfident consist one or more of the following keyword: 'confident' and 'optimistic', referring to the CEO of interest. Articles are obtained from The Guardian, Financial Times and The Daily Telegraph, and are manually checked to make sure the article is referring to the CEO. If a CEO is more often described as confident than cautious, the CEO is classified as overconfident

	Dependent variable: Minority				
	Full sample				
	(1)	(2)	(3)	(4)	(5)
Overconfident	-0.567**	-0.638**	-0.687**	-0.677**	-0.772**
	(0.260)	(0.314)	(0.339)	(0.330)	(0.362)
Size		0.058	0.067	-0.017	-0.011
		(0.082)	(0.088)	(0.089)	(0.096)
Leverage		-0.489	-0.516	-0.050	0.081
		(0.671)	(0.704)	(0.746)	(0.787)
Cash		-0.597	-0.075	-0.834	-0.248
		(1.615)	(1.603)	(1.661)	(1.660)
Cash Payment		0.651**	0.676**	0.800**	0.810**
		(0.303)	(0.312)	(0.320)	(0.330)
Cross-Country		0.184	0.282	0.342	0.385
		(0.358)	(0.378)	(0.377)	(0.393)
Cross-Sector		0.564	0.546	0.551	0.546
		(0.355)	(0.374)	(0.364)	(0.387)
Constant	-0.899***	-1.740**	-1.576*	-1.050	-0.716
	(0.200)	(0.813)	(0.970)	(0.905)	(1.083)
Observations	361	297	297	297	297
Year effects	no	no	yes	no	yes
Industry effects	no	no	no	yes	yes
Log Likelihood	-188.598	-146.247	-140.721	-141.091	-135.76

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6: **Overview of Interaction with Holder67 regressions**

This table shows an overview of the relevant coefficients resulting from several regressions. The dependent variable in the regressions is *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise. The main variables of interest are the *Longholder* measure of overconfidence and the interaction effect with *Same-Sector* (a dummy variable taking the value of 1 if the acquisition is in the same industry as the acquiring firm). Furthermore control variables, deal variables and fixed effects are included.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Baseline	Control Variables	Deal Variables	Controls FE	Controls FE	Controls FE	Dealvars FE	Dealvars FE	Dealvars FE
Same-Sector	-0.0237***	-0.00940	-0.0219**	-0.00916	-0.00721	-0.00828	-0.0219**	-0.0220**	-0.0242**
	(0.00910)	(0.00679)	(0.0109)	(0.00679)	(0.00669)	(0.00675)	(0.0109)	(0.0108)	(0.0107)
Holder67	**-0.0333****	**-0.0262*****	**-0.0360*****	**-0.0249*****	**-0.0212*****	**-0.0208*****	**-0.0352*****	**-0.0360*****	**-0.0362*****
	(0.0130)	(0.00704)	(0.0110)	(0.00698)	(0.00698)	(0.00697)	(0.0110)	(0.0111)	(0.0109)
Same-Sector × Holder67	**-0.0420*****	**-0.0309*****	**-0.0332*****	**-0.0304*****	**-0.0281*****	**-0.0283*****	**-0.0348*****	**-0.0354*****	**-0.0375*****
	(0.00975)	(0.00678)	(0.0106)	(0.00678)	(0.00709)	(0.00715)	(0.0107)	(0.0113)	(0.0113)
Size		0.00161	0.00235	0.00170	0.000621	0.000706	0.00228	-0.000253	-0.000565
		(0.00222)	(0.00341)	(0.00227)	(0.00223)	(0.00230)	(0.00347)	(0.00359)	(0.00358)
Tobins Q		0.00440	0.00875**	0.00422	0.00831***	0.00837***	0.00854**	0.0120***	0.0124***
		(0.00283)	(0.00377)	(0.00291)	(0.00292)	(0.00288)	(0.00380)	(0.00378)	(0.00382)
Cash Flow		0.0241	-0.0363	0.0262	0.0425	0.0453	-0.0366	-0.0315	-0.0463
		(0.0644)	(0.0552)	(0.0645)	(0.0630)	(0.0622)	(0.0557)	(0.0538)	(0.0539)
Investments		0.273***	0.282***	0.268***	0.258***	0.260***	0.277***	0.225***	0.235***
		(0.0593)	(0.0550)	(0.0595)	(0.0624)	(0.0586)	(0.0539)	(0.0713)	(0.0637)
Cash		0.0747***	0.119***	0.0750***	0.0732***	0.0735***	0.117***	0.132***	0.127***
		(0.0265)	(0.0305)	(0.0263)	(0.0257)	(0.0265)	(0.0310)	(0.0296)	(0.0303)
Leverage		0.157***	0.229***	0.153***	0.148***	0.146***	0.224***	0.209***	0.205***
		(0.0363)	(0.0548)	(0.0362)	(0.0337)	(0.0328)	(0.0553)	(0.0525)	(0.0516)
Prev.acq.all		-0.00148***	-0.00270***	-0.00148***	-0.00196***	-0.00203***	-0.00269***	-0.00224***	-0.00211***
		(0.000336)	(0.000666)	(0.000335)	(0.000279)	(0.000277)	(0.000664)	(0.000599)	(0.000581)
Prev.acq.min		0.0539***	0.0619***	0.0536***	0.0494***	0.0482***	0.0615***	0.0579***	0.0555***
		(0.00685)	(0.0107)	(0.00679)	(0.00672)	(0.00668)	(0.0106)	(0.0103)	(0.0100)
CG		-0.0810***	-0.0817**	-0.0760***	-0.0585***	-0.0511**	-0.0840**	-0.0702**	-0.0700**
		(0.0219)	(0.0327)	(0.0221)	(0.0208)	(0.0207)	(0.0329)	(0.0327)	(0.0345)
Cross-Country		0.0664***	0.0829***	0.0672***	0.0704***	0.0707***	0.0826***	0.0869***	0.0859***
		(0.00808)	(0.0123)	(0.00807)	(0.00826)	(0.00824)	(0.0122)	(0.0122)	(0.0121)
Owner		0.0154	0.120	0.0120	0.0175	0.00719	0.125	0.147	0.154
		(0.0519)	(0.103)	(0.0499)	(0.0446)	(0.0454)	(0.103)	(0.109)	(0.109)
Value/MVA			-0.0452**				-0.0446**	-0.0460**	-0.0437**
			(0.0207)				(0.0202)	(0.0198)	(0.0184)
Value/Stake			0.000804***				0.000794***	0.000797***	0.000789***
			(0.000162)				(0.000164)	(0.000158)	(0.000162)
Constant	0.0733***	0.0507	0.0362	0.954***	0.0568	0.956***	0.971***	0.0857	0.958***
	(0.00866)	(0.0317)	(0.0462)	(0.0415)	(0.0400)	(0.0560)	(0.0541)	(0.0629)	(0.0896)
Observations	9,695	9,695	4,308	9,695	9,695	9,695	4,308	4,308	4,308
R-squared	0.005	0.136	0.180	0.148	0.147	0.169	0.191	0.187	0.216
Industry FE					YES	YES		YES	YES
Year FE				YES		YES	YES		YES
Year-Industry FE						YES			YES

Note: *p<0.1; **p<0.05; ***p<0.01
CEO-clustered standard errors in parentheses

Table 7: **Overview of Interaction with Longholder regressions**

This table shows an overview of the relevant coefficients resulting from several regressions. The dependent variable in the regressions is *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise. The main variables of interest are the *Longholder* measure of overconfidence and the interaction effect with *Same-Sector* (a dummy variable taking the value of 1 if the acquisition is in the same industry as the acquiring firm). Furthermore control variables, deal variables and fixed effects are included.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Baseline	Control Variables	Deal Variables	Controls FE	Controls FE	Controls FE	Dealvars FE	Dealvars FE	Dealvars FE
Same-Sector	-0.0203**	-0.00650	-0.0149	-0.00695	-0.00500	-0.00616	-0.0160	-0.0146	-0.0165*
	(0.00862)	(0.00631)	(0.00997)	(0.00630)	(0.00631)	(0.00638)	(0.00989)	(0.0100)	(0.00982)
Longholder	**-0.0244***	**-0.0115**	**-0.0320*****	**-0.0135***	**-0.0103**	**-0.0127***	**-0.0314*****	**-0.0297****	**-0.0285****
	(0.0134)	(0.00829)	(0.0120)	(0.00822)	(0.00748)	(0.00752)	(0.0119)	(0.0119)	(0.0116)
Same-Sector x Longholder	**-0.0329*****	**-0.0201*****	**-0.0385*****	**-0.0213*****	**-0.0218*****	**-0.0242*****	**-0.0383*****	**-0.0415*****	**-0.0428*****
	(0.0106)	(0.00757)	(0.0107)	(0.00751)	(0.00733)	(0.00744)	(0.0107)	(0.0117)	(0.0117)
Size		0.00115	0.00179	0.00131	0.000227	0.000354	0.00180	-0.000745	-0.000985
		(0.00226)	(0.00347)	(0.00230)	(0.00225)	(0.00231)	(0.00351)	(0.00364)	(0.00362)
Tobins Q		0.00444	0.00886**	0.00420	0.00857***	0.00856***	0.00857**	0.0122***	0.0125***
		(0.00287)	(0.00374)	(0.00296)	(0.00296)	(0.00292)	(0.00378)	(0.00375)	(0.00378)
Cash Flow		0.0180	-0.0372	0.0206	0.0387	0.0419	-0.0381	-0.0319	-0.0479
		(0.0647)	(0.0548)	(0.0647)	(0.0630)	(0.0622)	(0.0554)	(0.0534)	(0.0535)
Investments		0.272***	0.286***	0.267***	0.259***	0.260***	0.280***	0.228***	0.237***
		(0.0609)	(0.0561)	(0.0612)	(0.0640)	(0.0601)	(0.0552)	(0.0728)	(0.0649)
Cash		0.0755***	0.116***	0.0758***	0.0727***	0.0728***	0.114***	0.129***	0.124***
		(0.0259)	(0.0305)	(0.0258)	(0.0253)	(0.0261)	(0.0310)	(0.0298)	(0.0303)
Leverage		0.158***	0.235***	0.153***	0.149***	0.147***	0.230***	0.215***	0.211***
		(0.0366)	(0.0543)	(0.0364)	(0.0339)	(0.0331)	(0.0549)	(0.0520)	(0.0512)
Prev.acq.all		-0.00139***	-0.00279***	-0.00139***	-0.00191***	-0.00197***	-0.00278***	-0.00234***	-0.00221***
		(0.000380)	(0.000688)	(0.000379)	(0.000279)	(0.000272)	(0.000689)	(0.000614)	(0.000598)
Prev.acq.min		0.0537***	0.0613***	0.0534***	0.0490***	0.0478***	0.0609***	0.0572***	0.0549***
		(0.00717)	(0.0110)	(0.00709)	(0.00695)	(0.00689)	(0.0109)	(0.0107)	(0.0103)
CG		-0.0870***	-0.0875***	-0.0817***	-0.0626***	-0.0551***	-0.0893***	-0.0760**	-0.0753**
		(0.0223)	(0.0325)	(0.0224)	(0.0211)	(0.0210)	(0.0328)	(0.0326)	(0.0344)
Cross-Country		0.0665***	0.0828***	0.0674***	0.0706***	0.0709***	0.0827***	0.0868***	0.0859***
		(0.00812)	(0.0122)	(0.00811)	(0.00830)	(0.00828)	(0.0122)	(0.0122)	(0.0120)
Owner		0.0169	0.130	0.0148	0.0221	0.0138	0.135	0.159	0.166
		(0.0554)	(0.111)	(0.0533)	(0.0455)	(0.0450)	(0.110)	(0.117)	(0.117)
Value/MVA			-0.0457**				-0.0450**	-0.0465**	-0.0442**
			(0.0211)				(0.0204)	(0.0202)	(0.0187)
Value/Stake			0.000825***				0.000815***	0.000819***	0.000811***
			(0.000161)				(0.000163)	(0.000157)	(0.000161)
Constant	0.0665***	0.0525*	0.0410	0.961***	0.0590	0.956***	0.964***	0.0922	0.951***
	(0.00833)	(0.0319)	(0.0465)	(0.0382)	(0.0404)	(0.0577)	(0.0548)	(0.0637)	(0.0889)
Observations	9,695	9,695	4,308	9,695	9,695	9,695	4,308	4,308	4,308
R-squared	0.003	0.134	0.180	0.146	0.146	0.168	0.190	0.187	0.216
Industry FE					YES	YES		YES	YES
Year FE				YES		YES	YES		YES
Year-Industry FE						YES			YES

Note: *p<0.1; **p<0.05; ***p<0.01
CEO-clustered standard errors in parentheses

Table 8: **CAR regressions**

This table shows the results of several linear regressions with CAR (cumulative abnormal returns) as dependent variable. The regressions are executed on several CAR intervals: [t-1,t+1], [t-5,t+10], [t-5,t+20] and [t-10,t+20], where t denotes the announcement date of the acquisition. The explanatory variables are the type of acquisition (majority/minority), a measure of overconfidence (Longholder, Holder67) and interaction effects between the acquisition type and overconfidence. The constant represents the reference class, that is a minority acquisition without overconfident CEO.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	CAR[-1,1]	CAR[-5,10]	CAR[-5,20]	CAR[-10,20]	CAR[-1,1]	CAR[-5,10]	CAR[-5,20]	CAR[-10,20]
Majstake	-0.000821	-0.00873*	-0.0153**	-0.0169*	0.000718	-0.00507	-0.0117*	-0.0108
	(0.00220)	(0.00505)	(0.00774)	(0.00871)	(0.00192)	(0.00422)	(0.00662)	(0.00718)
Holder67	-0.00137	-0.0101	-0.0153	-0.0223*				
	(0.00327)	(0.00786)	(0.0112)	(0.0133)				
Majstake × Holder67	0.000695	-0.00919*	-0.0135*	-0.0156*				
	(0.00213)	(0.00505)	(0.00777)	(0.00874)				
Longholder					0.00299	0.00750	-0.00262	-0.000169
					(0.00418)	(0.0110)	(0.0151)	(0.0192)
Majstake × Longholder					0.00120	-0.00203	-0.00756	-0.00685
					(0.00194)	(0.00434)	(0.00676)	(0.00732)
Constant	0.00376*	0.0132***	0.0174**	0.0195**	0.00269	0.00849**	0.0135**	0.0128*
	(0.00203)	(0.00491)	(0.00762)	(0.00858)	(0.00177)	(0.00409)	(0.00651)	(0.00706)
Observations	9,516	9,516	9,516	9,516	9,516	9,516	9,516	9,516
R-squared	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.001
Note:								*p<0.1; **p<0.05; ***p<0.01

A Additional tables

Table 9: **Overview of Holder67 regressions for acquired stakesize > 9%**

This table shows an overview of the relevant coefficients resulting from several regressions. The dependent variable in the regressions is *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise. The main explanatory variable is the *Holder67* measure of overconfidence. Furthermore control variables, deal variables and fixed effects are included.

Dependent variable: *Minority*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Baseline	Control Variables	Deal Variables	Controls FE	Controls FE	Controls FE	Dealvars FE	Dealvars FE	Dealvars FE
Holder67	**-0.0191*** **	**-0.0191*** **	**-0.0201*** **	**-0.0170*** **	**-0.0176*** **	**-0.0157*** **	**-0.0194*** **	**-0.0212*** **	**-0.0202*** **
	(0.00395)	(0.00388)	(0.00649)	(0.00386)	(0.00389)	(0.00386)	(0.00651)	(0.00656)	(0.00654)
Size		-0.000449	0.00176	0.000966	-0.000986	0.000483	0.00256	0.000274	0.000877
		(0.00165)	(0.00301)	(0.00164)	(0.00165)	(0.00165)	(0.00305)	(0.00314)	(0.00319)
Tobins Q		0.00324	0.00257	0.00322	0.00553*	0.00543*	0.00276	0.00448	0.00477
		(0.00307)	(0.00391)	(0.00309)	(0.00311)	(0.00315)	(0.00402)	(0.00404)	(0.00419)
Cash Flow		0.0515	0.0230	0.0260	0.0645	0.0394	0.00939	0.0248	0.00653
		(0.0480)	(0.0561)	(0.0472)	(0.0478)	(0.0471)	(0.0556)	(0.0562)	(0.0560)
Investments		0.227***	0.228***	0.218***	0.221***	0.212***	0.224***	0.182**	0.195**
		(0.0456)	(0.0596)	(0.0473)	(0.0523)	(0.0556)	(0.0606)	(0.0832)	(0.0873)
Cash		0.0506***	0.0944***	0.0350**	0.0492***	0.0349**	0.0761***	0.103***	0.0849***
		(0.0156)	(0.0256)	(0.0142)	(0.0157)	(0.0146)	(0.0245)	(0.0256)	(0.0246)
Leverage		0.151***	0.206***	0.126***	0.142***	0.123***	0.176***	0.185***	0.161***
		(0.0251)	(0.0419)	(0.0238)	(0.0247)	(0.0237)	(0.0404)	(0.0409)	(0.0395)
Prev.acq.all		-0.00116***	-0.00204***	-0.00110***	-0.00148***	-0.00144***	-0.00201***	-0.00178***	-0.00172***
		(0.000161)	(0.000601)	(0.000160)	(0.000177)	(0.000179)	(0.000602)	(0.000607)	(0.000611)
Prev.acq.min		0.0402***	0.0494***	0.0394***	0.0375***	0.0360***	0.0496***	0.0472***	0.0469***
		(0.00520)	(0.00838)	(0.00517)	(0.00517)	(0.00510)	(0.00832)	(0.00843)	(0.00809)
CG		-0.0633***	-0.0720***	-0.0609***	-0.0493***	-0.0481***	-0.0734***	-0.0656**	-0.0681**
		(0.0175)	(0.0270)	(0.0176)	(0.0178)	(0.0180)	(0.0273)	(0.0274)	(0.0280)
Cross-Sector		0.00546	0.00608	0.00494	0.00614	0.00682	0.00487	0.00836	0.00831
		(0.00406)	(0.00691)	(0.00403)	(0.00424)	(0.00420)	(0.00688)	(0.00711)	(0.00705)
Cross-Country		0.0510***	0.0645***	0.0513***	0.0542***	0.0536***	0.0643***	0.0679***	0.0660***
		(0.00534)	(0.00917)	(0.00531)	(0.00545)	(0.00541)	(0.00914)	(0.00933)	(0.00928)
Owner		0.00119	0.106	0.00417	-0.000539	-0.00486	0.111	0.110	0.109
		(0.0346)	(0.0949)	(0.0343)	(0.0351)	(0.0353)	(0.0944)	(0.0955)	(0.0949)
Value/MVA			-0.0289				-0.0274	-0.0292*	-0.0263
			(0.0178)				(0.0170)	(0.0173)	(0.0168)
Value/Stake			0.000347				0.000318	0.000349	0.000292
			(0.000227)				(0.000227)	(0.000224)	(0.000224)
Constant	0.0486***	0.0470**	0.0323	0.904***	0.0462*	0.979***	0.695***	0.0594	0.600***
	(0.00281)	(0.0236)	(0.0383)	(0.0320)	(0.0281)	(0.0468)	(0.0677)	(0.0484)	(0.169)
Observations	9,563	9,563	4,231	9,563	9,563	9,563	4,231	4,231	4,231
R-squared	0.002	0.089	0.114	0.111	0.095	0.124	0.123	0.119	0.141
Industry FE					YES	YES		YES	YES
Year FE				YES		YES	YES		YES
Year-Industry FE						YES			YES

Note: *p<0.1; **p<0.05; ***p<0.01

CEO-clustered standard errors in parentheses

Table 10: **Overview of Longholder regressions for acquired stakesize > 9%**

This table shows an overview of the relevant coefficients resulting from several regressions. The dependent variable in the regressions is *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise. The main explanatory variable is the *Longholder* measure of overconfidence. Furthermore control variables, deal variables and fixed effects are included.

Dependent variable: *Minority*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Baseline	Control Variables	Deal Variables	Controls FE	Controls FE	Controls FE	Dealvars FE	Dealvars FE	Dealvars FE
Longholder	**-0.0180*** **	**-0.0139*** **	**-0.0245*** **	**-0.0131*** **	**-0.0146*** **	**-0.0140*** **	**-0.0238*** **	**-0.0248*** **	**-0.0247*** **
	(0.00411)	(0.00396)	(0.00667)	(0.00394)	(0.00399)	(0.00404)	(0.00664)	(0.00668)	(0.00670)
Size		-0.000842	0.00142	0.000669	-0.00136	0.000186	0.00227	-2.98e-05	0.000626
		(0.00166)	(0.00302)	(0.00165)	(0.00166)	(0.00165)	(0.00305)	(0.00315)	(0.00319)
Tobins Q		0.00334	0.00265	0.00326	0.00579*	0.00562*	0.00276	0.00461	0.00484
		(0.00308)	(0.00390)	(0.00310)	(0.00312)	(0.00315)	(0.00400)	(0.00403)	(0.00418)
Cash Flow		0.0479	0.0229	0.0228	0.0625	0.0375	0.00909	0.0252	0.00614
		(0.0478)	(0.0556)	(0.0471)	(0.0476)	(0.0470)	(0.0551)	(0.0557)	(0.0556)
Investments		0.224***	0.230***	0.215***	0.219***	0.210***	0.226***	0.178**	0.191**
		(0.0463)	(0.0594)	(0.0481)	(0.0531)	(0.0565)	(0.0603)	(0.0835)	(0.0878)
Cash		0.0508***	0.0926***	0.0352**	0.0484***	0.0340**	0.0745***	0.101***	0.0831***
		(0.0156)	(0.0256)	(0.0142)	(0.0157)	(0.0146)	(0.0245)	(0.0256)	(0.0246)
Leverage		0.152***	0.210***	0.126***	0.144***	0.124***	0.180***	0.190***	0.166***
		(0.0252)	(0.0417)	(0.0238)	(0.0247)	(0.0237)	(0.0403)	(0.0408)	(0.0394)
Prev.acq.all		-0.00109***	-0.00208***	-0.00103***	-0.00144***	-0.00140***	-0.00204***	-0.00183***	-0.00177***
		(0.000159)	(0.000600)	(0.000158)	(0.000176)	(0.000178)	(0.000601)	(0.000605)	(0.000609)
Prev.acq.min		0.0400***	0.0489***	0.0391***	0.0370***	0.0356***	0.0492***	0.0467***	0.0464***
		(0.00521)	(0.00838)	(0.00517)	(0.00518)	(0.00510)	(0.00832)	(0.00844)	(0.00809)
CG		-0.0682***	-0.0767***	-0.0651***	-0.0530***	-0.0513***	-0.0775***	-0.0705**	-0.0726***
		(0.0175)	(0.0270)	(0.0176)	(0.0177)	(0.0179)	(0.0273)	(0.0275)	(0.0280)
Cross-Sector		0.00496	0.00645	0.00446	0.00576	0.00645	0.00524	0.00884	0.00883
		(0.00406)	(0.00692)	(0.00403)	(0.00424)	(0.00420)	(0.00689)	(0.00712)	(0.00706)
Cross-Country		0.0510***	0.0646***	0.0514***	0.0543***	0.0537***	0.0645***	0.0679***	0.0661***
		(0.00534)	(0.00917)	(0.00531)	(0.00545)	(0.00541)	(0.00914)	(0.00933)	(0.00928)
Owner		0.00558	0.117	0.00872	0.00568	0.00138	0.121	0.121	0.121
		(0.0347)	(0.0951)	(0.0344)	(0.0352)	(0.0355)	(0.0946)	(0.0958)	(0.0953)
Value/MVA			-0.0294				-0.0280	-0.0298*	-0.0269
			(0.0179)				(0.0170)	(0.0174)	(0.0170)
Value/Stake			0.000367				0.000338	0.000369*	0.000313
			(0.000226)				(0.000226)	(0.000223)	(0.000224)
Constant	0.0460***	0.0510**	0.0377	0.911***	0.0511*	0.984***	0.700***	0.0681	0.616***
	(0.00251)	(0.0238)	(0.0383)	(0.0320)	(0.0283)	(0.0469)	(0.0674)	(0.0487)	(0.168)
Observations	9,563	9,563	4,231	9,563	9,563	9,563	4,231	4,231	4,231
R-squared	0.002	0.088	0.115	0.110	0.094	0.124	0.124	0.119	0.142
Industry FE					YES	YES		YES	YES
Year FE				YES		YES	YES		YES
Year-Industry FE						YES			YES

Note: *p<0.1; **p<0.05; ***p<0.01

CEO-clustered standard errors in parentheses

Table 11: **Overview of certain Toeholds on Holder67 regressions**

This table shows an overview of the relevant coefficients resulting from several regressions. The dependent variable in the regressions is *Toehold*, a binary variable taking the value of 1 if the acquired minority stake was indeed used as a toehold and 0 otherwise. The main explanatory variable is the *Holder67* measure of overconfidence. Furthermore control variables, deal variables and fixed effects are included.

Dependent variable: *Toehold*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Baseline	Control Variables	Deal Variables	Controls FE	Controls FE	Controls FE	Dealvars FE	Dealvars FE	Dealvars FE
Holder67	**-0.00776*** **	**-0.00872*** **	**-0.0126*** **	**-0.00689*** **	**-0.00817*** **	**-0.00609*** **	**-0.0121*** **	**-0.0128*** **	**-0.0118*** **
	(0.00226)	(0.00256)	(0.00356)	(0.00242)	(0.00248)	(0.00232)	(0.00351)	(0.00365)	(0.00356)
Size		-0.00508***	-0.00384**	-0.00378***	-0.00511***	-0.00377***	-0.00314*	-0.00396*	-0.00304
		(0.00133)	(0.00188)	(0.00118)	(0.00135)	(0.00120)	(0.00181)	(0.00204)	(0.00198)
Tobins Q		-0.00178	-0.00101	-0.00155	-0.00135	-0.00138	-0.000416	-0.000921	-0.000688
		(0.00165)	(0.00206)	(0.00127)	(0.00168)	(0.00124)	(0.00193)	(0.00200)	(0.00184)
Cash Flow		0.163***	0.148***	0.131***	0.164***	0.132***	0.129**	0.146***	0.124**
		(0.0467)	(0.0539)	(0.0401)	(0.0472)	(0.0402)	(0.0514)	(0.0549)	(0.0483)
Investments		0.127**	0.0896*	0.117*	0.166**	0.171**	0.0834*	0.114	0.141*
		(0.0634)	(0.0497)	(0.0615)	(0.0761)	(0.0732)	(0.0495)	(0.0735)	(0.0735)
Cash		0.0404**	0.0654**	0.0216*	0.0382*	0.0190	0.0389**	0.0655**	0.0359**
		(0.0192)	(0.0280)	(0.0120)	(0.0196)	(0.0123)	(0.0171)	(0.0289)	(0.0170)
Leverage		0.0689***	0.0750**	0.0425***	0.0674***	0.0421***	0.0383*	0.0710**	0.0338*
		(0.0226)	(0.0370)	(0.0152)	(0.0220)	(0.0152)	(0.0214)	(0.0352)	(0.0203)
Prev.acq.all		-0.000313***	-0.000705**	-0.000222**	-0.000429***	-0.000314***	-0.000598**	-0.000692**	-0.000631**
		(0.000119)	(0.000299)	(9.63e-05)	(0.000129)	(0.000103)	(0.000293)	(0.000301)	(0.000295)
Prev.acq.min		0.00947***	0.0120*	0.00817***	0.00883***	0.00763**	0.0120*	0.0117*	0.0121**
		(0.00332)	(0.00635)	(0.00301)	(0.00322)	(0.00299)	(0.00616)	(0.00623)	(0.00590)
CG		-0.0383***	-0.0391*	-0.0369***	-0.0330**	-0.0313**	-0.0392*	-0.0365*	-0.0325
		(0.0138)	(0.0216)	(0.0139)	(0.0136)	(0.0137)	(0.0218)	(0.0211)	(0.0213)
Cross-Sector		0.00255	0.000669	0.00198	0.00153	0.00101	-0.00109	0.00104	-0.00157
		(0.00266)	(0.00383)	(0.00240)	(0.00282)	(0.00240)	(0.00371)	(0.00386)	(0.00366)
Cross-Country		0.00338	0.00700	0.00357	0.00388	0.00390	0.00709	0.00800*	0.00765
		(0.00304)	(0.00464)	(0.00263)	(0.00325)	(0.00281)	(0.00449)	(0.00483)	(0.00481)
Owner		-0.0431**	-0.0542	-0.0360**	-0.0417**	-0.0342**	-0.0478	-0.0625*	-0.0538
		(0.0184)	(0.0346)	(0.0154)	(0.0192)	(0.0159)	(0.0337)	(0.0348)	(0.0340)
Value/MVA			-0.00350				-0.00211	-0.00362	-0.00351
			(0.00409)				(0.00316)	(0.00383)	(0.00321)
Value/Stake			-4.51e-05				-5.78e-05	-3.80e-05	-4.37e-05
			(3.96e-05)				(3.86e-05)	(4.00e-05)	(4.06e-05)
Constant	0.0122***	0.0615***	0.0518**	0.985***	0.0356	0.988***	0.925***	0.0359	0.921***
	(0.00198)	(0.0190)	(0.0264)	(0.0226)	(0.0218)	(0.0216)	(0.0403)	(0.0304)	(0.0421)
Observations	9,254	9,254	4,040	9,254	9,254	9,254	4,040	4,040	4,040
R-squared	0.002	0.052	0.058	0.162	0.055	0.170	0.110	0.059	0.127
Industry FE					YES	YES		YES	YES
Year FE				YES		YES	YES		YES
Year-Industry FE						YES			YES

Note: *p<0.1; **p<0.05; ***p<0.01

CEO-clustered standard errors in parentheses

Table 12: **Overview of certain Toeholds on Longholder regressions**

This table shows an overview of the relevant coefficients resulting from several regressions. The dependent variable in the regressions is *Toehold*, a binary variable taking the value of 1 if the acquired minority stake was indeed used as a toehold 0 otherwise. The main explanatory variable is the *Longholder* measure of overconfidence. Furthermore control variables, deal variables and fixed effects are included.

Dependent variable: *Minority*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Baseline	Control Variables	Deal Variables	Controls FE	Controls FE	Controls FE	Dealvars FE	Dealvars FE	Dealvars FE
Longholder	**-0.00767*** **	**-0.00832*** **	**-0.0123*** **	**-0.00699*** **	**-0.00821*** **	**-0.00682*** **	**-0.0116*** **	**-0.0119*** **	**-0.0111*** **
	(0.00221)	(0.00262)	(0.00345)	(0.00231)	(0.00265)	(0.00234)	(0.00333)	(0.00345)	(0.00325)
Size		-0.00528***	-0.00402**	-0.00392***	-0.00530***	-0.00390***	-0.00328*	-0.00410**	-0.00313
		(0.00135)	(0.00189)	(0.00120)	(0.00137)	(0.00122)	(0.00181)	(0.00204)	(0.00197)
Tobins Q		-0.00173	-0.000995	-0.00153	-0.00121	-0.00129	-0.000452	-0.000882	-0.000683
		(0.00163)	(0.00203)	(0.00126)	(0.00168)	(0.00124)	(0.00190)	(0.00197)	(0.00181)
Cash Flow		0.161***	0.147***	0.130***	0.163***	0.131***	0.128**	0.146***	0.124***
		(0.0464)	(0.0533)	(0.0399)	(0.0470)	(0.0400)	(0.0509)	(0.0542)	(0.0477)
Investments		0.124**	0.0895*	0.115*	0.163**	0.168**	0.0830*	0.110	0.137*
		(0.0626)	(0.0493)	(0.0609)	(0.0757)	(0.0729)	(0.0492)	(0.0731)	(0.0731)
Cash		0.0402**	0.0647**	0.0215*	0.0376*	0.0184	0.0384**	0.0647**	0.0352**
		(0.0191)	(0.0280)	(0.0118)	(0.0195)	(0.0121)	(0.0171)	(0.0289)	(0.0170)
Leverage		0.0691***	0.0778**	0.0426***	0.0680***	0.0423***	0.0410*	0.0743**	0.0370*
		(0.0226)	(0.0371)	(0.0152)	(0.0221)	(0.0152)	(0.0217)	(0.0354)	(0.0206)
Prev.acq.all		-0.000276**	-0.000738**	-0.000193*	-0.000406***	-0.000295***	-0.000631**	-0.000734**	-0.000669**
		(0.000122)	(0.000296)	(9.88e-05)	(0.000122)	(9.74e-05)	(0.000288)	(0.000293)	(0.000284)
Prev.acq.min		0.00939***	0.0121*	0.00809***	0.00866***	0.00748**	0.0120*	0.0117*	0.0121**
		(0.00335)	(0.00650)	(0.00302)	(0.00325)	(0.00299)	(0.00629)	(0.00638)	(0.00601)
CG		-0.0408***	-0.0415*	-0.0388***	-0.0349**	-0.0327**	-0.0413*	-0.0389*	-0.0346
		(0.0140)	(0.0218)	(0.0141)	(0.0138)	(0.0138)	(0.0220)	(0.0214)	(0.0214)
Cross-Sector		0.00228	0.000858	0.00174	0.00131	0.000827	-0.000902	0.00128	-0.00132
		(0.00265)	(0.00384)	(0.00238)	(0.00281)	(0.00239)	(0.00372)	(0.00386)	(0.00366)
Cross-Country		0.00336	0.00707	0.00360	0.00390	0.00395	0.00720	0.00797*	0.00769
		(0.00304)	(0.00464)	(0.00263)	(0.00325)	(0.00282)	(0.00450)	(0.00483)	(0.00481)
Owner		-0.0387**	-0.0507	-0.0321**	-0.0368*	-0.0300*	-0.0446	-0.0595*	-0.0506
		(0.0190)	(0.0345)	(0.0159)	(0.0193)	(0.0162)	(0.0336)	(0.0349)	(0.0340)
Value/MVA			-0.00368				-0.00228	-0.00378	-0.00371
			(0.00413)				(0.00316)	(0.00387)	(0.00323)
Value/Stake			-3.46e-05				-4.79e-05	-2.84e-05	-3.43e-05
			(3.81e-05)				(3.67e-05)	(3.84e-05)	(3.89e-05)
Constant	0.0113***	0.0643***	0.0537**	0.988***	0.0389*	0.991***	0.926***	0.0392	0.926***
	(0.00179)	(0.0191)	(0.0265)	(0.0222)	(0.0219)	(0.0214)	(0.0403)	(0.0307)	(0.0417)
Observations	9,254	9,254	4,040	9,254	9,254	9,254	4,040	4,040	4,040
R-squared	0.001	0.051	0.057	0.161	0.055	0.170	0.109	0.058	0.126
Industry FE					YES	YES		YES	YES
Year FE				YES		YES	YES		YES
Year-Industry FE						YES			YES

Note: *p<0.1; **p<0.05; ***p<0.01

CEO-clustered standard errors in parentheses

Table 13: **Overview of Logit regressions**

This table shows an overview of the relevant coefficients resulting from several regressions. The dependent variable in the regressions is *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise. The main explanatory variable is the measure of overconfidence (*Holder67, Longholder*). Furthermore control variables, deal variables and fixed effects are included.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Baseline	Control Variables	Deal Variables	Baseline	Control Variables	Deal Variables
Holder67	**-0.552*** **	**-0.591*** **	**-0.583*** **			
	(0.193)	**(0.128)**	**(0.162)**			
Longholder				**-0.429** **	**-0.425*** **	**-0.665*** **
				(0.214)	**(0.157)**	**(0.215)**
Size		0.0725	0.00964		0.0705	-0.00202
		(0.0465)	(0.0611)		(0.0478)	(0.0616)
Tobins Q		0.0476	0.0571*		0.0492	0.0579**
		(0.0299)	(0.0300)		(0.0325)	(0.0293)
Cash Flow		0.323	-0.700		0.341	-0.696
		(0.935)	(0.736)		(1.000)	(0.800)
Investments		3.603***	3.522***		3.575***	3.619***
		(0.708)	(0.758)		(0.698)	(0.783)
Cash		1.126***	1.491***		1.138***	1.454***
		(0.354)	(0.397)		(0.344)	(0.410)
Leverage		2.045***	2.664***		2.010***	2.707***
		(0.447)	(0.555)		(0.466)	(0.541)
Prev.acq.all		-0.0583***	-0.0534**		-0.0610***	-0.0559**
		(0.0152)	(0.0214)		(0.0158)	(0.0226)
Prev.acq.min		0.431***	0.396***		0.425***	0.382***
		(0.0733)	(0.0958)		(0.0808)	(0.103)
CG		-0.853***	-0.547*		-1.000***	-0.727***
		(0.205)	(0.287)		(0.217)	(0.278)
Cross-Sector		0.176	0.130		0.174	0.129
		(0.112)	(0.151)		(0.113)	(0.151)
Cross-Country		1.259***	1.213***		1.254***	1.200***
		(0.129)	(0.168)		(0.129)	(0.168)
Owner		0.0356	2.509		-0.0876	2.640
		(1.767)	(1.975)		(1.813)	(2.163)
Value/MVA			-8.598**			-8.664**
			(4.053)			(3.955)
Value/Stake			0.0116***			0.0122***
			(0.00393)			(0.00366)
Constant	-2.677***	-3.834***	-3.263***	-2.759***	-3.748***	-3.029***
	(0.100)	(0.528)	(0.720)	(0.0981)	(0.533)	(0.711)
Observations	9,695	9,695	4,309	9,695	9,695	4,309
Note:						*p<0.1; **p<0.05; ***p<0.01
						CEO-clustered standard errors in parentheses

Table 14: **Overview of regressions with relative size as extra control**

This table shows an overview of the relevant coefficients resulting from several regressions, where the relative size (target size/acquirer size) is added as extra control variable. The dependent variables in the regressions are *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise and *Toehold*, a binary variable taking the value of 1 if the acquired minority stake was indeed used as a toehold and 0 otherwise. The main explanatory variable is the *Holder67* measure of overconfidence. Furthermore additional control variables, deal variables and fixed effects are included.

	Minority Stakes				Toeholds			
VARIABLES	Controls	Controls FE	Controls FE	Controls FE	Controls	Controls FE	Controls FE	Controls FE
Holder67	**-0.144****	**-0.146****	**-0.148****	**-0.150****	**-0.182*****	**-0.189*****	**-0.178****	**-0.222*****
	(0.0634)	(0.0658)	(0.0637)	(0.0729)	(0.0641)	(0.0543)	(0.0684)	(0.0653)
Size	0.0734***	0.0640***	0.0704***	0.0990***	0.0528**	0.0394*	0.0508**	0.0538**
	(0.0204)	(0.0208)	(0.0193)	(0.0205)	(0.0214)	(0.0206)	(0.0225)	(0.0224)
Relative Size	0.0197*	0.0129	0.0168	0.0134	0.0451**	0.0283*	0.0440**	0.0141
	(0.0106)	(0.0115)	(0.0104)	(0.0132)	(0.0180)	(0.0144)	(0.0184)	(0.0126)
Tobins Q	0.0886**	0.0893**	0.0984***	0.145***	-0.00294	-0.0180	-0.0129	0.0528
	(0.0343)	(0.0371)	(0.0357)	(0.0482)	(0.0363)	(0.0361)	(0.0413)	(0.0549)
Cash Flow	0.0900	0.0620	0.0725	-0.0149	1.617***	1.602***	1.633***	1.366***
	(0.271)	(0.237)	(0.247)	(0.266)	(0.326)	(0.324)	(0.360)	(0.423)
Investments	0.418**	0.421*	0.510**	0.737**	0.142	0.398**	0.204	0.569*
	(0.212)	(0.239)	(0.207)	(0.325)	(0.170)	(0.191)	(0.198)	(0.288)
Cash	0.296*	0.307*	0.255*	-0.115	0.345**	0.408***	0.381**	0.168
	(0.153)	(0.164)	(0.149)	(0.183)	(0.132)	(0.119)	(0.151)	(0.177)
Leverage	-0.0441	-0.0751	-0.0960	-0.524**	-0.0392	-0.167	-0.0442	-0.252
	(0.190)	(0.211)	(0.185)	(0.230)	(0.188)	(0.167)	(0.195)	(0.255)
Prev.acq.all	-0.0160***	-0.0159***	-0.0143***	-0.0127**	-0.00733**	-0.00579	-0.00771**	-0.00180
	(0.00383)	(0.00409)	(0.00405)	(0.00553)	(0.00317)	(0.00411)	(0.00305)	(0.00513)
Prev.acq.min	0.0544***	0.0585***	0.0410*	0.0321	0.0217	0.0132	0.0204	-0.0340
	(0.0184)	(0.0185)	(0.0209)	(0.0266)	(0.0255)	(0.0219)	(0.0295)	(0.0309)
CG	0.122	0.145*	0.151*	0.264***	0.0283	0.0745	0.0404	0.235***
	(0.0883)	(0.0809)	(0.0905)	(0.0847)	(0.0794)	(0.0651)	(0.0833)	(0.0898)
Cross-Sector	0.149**	0.120*	0.154**	0.0973	0.0262	-0.00969	0.0171	-0.0111
	(0.0647)	(0.0631)	(0.0691)	(0.0720)	(0.0603)	(0.0581)	(0.0653)	(0.0624)
Cross-Country	0.274***	0.304***	0.275***	0.350***	-0.00326	0.0210	-0.000893	0.0428
	(0.0645)	(0.0673)	(0.0653)	(0.0767)	(0.0667)	(0.0609)	(0.0656)	(0.0673)
Owner	0.126	0.283	0.545	1.056	-0.546	-0.215	-0.551	0.186
	(0.742)	(0.692)	(0.760)	(0.780)	(0.620)	(0.514)	(0.575)	(0.536)
Constant	-0.447**	0.106	-0.435*	-1.484***	0.0192	0.706***	-0.0680	-0.320
	(0.225)	(0.236)	(0.233)	(0.355)	(0.242)	(0.230)	(0.250)	(0.381)
Observations	259	259	259	259	153	153	153	153
R-squared	0.311	0.388	0.333	0.554	0.534	0.669	0.539	0.810
Industry FE		YES		YES		YES		YES
Year FE			YES	YES			YES	YES
Year-Industry FE				YES				YES
Note:								*p<0.1; **p<0.05; ***p<0.01
								CEO-clustered standard errors in parentheses

Table 15: **Overview of nearest neighbour matching results**

This table shows an overview of the nearest neighbour matching results and displays the average treatment effect (ATE). The outcome variables are *Minority*, a binary variable taking the value of 1 if a minority stake is acquired and 0 otherwise and *Toehold*, a binary variable taking the value of 1 if the acquired minority stake was indeed used as a toehold and 0 otherwise.The treatment variables are the overconfidence measures. The control variables are Size, Tobin's Q, Cash Flow, Investments, Cash, Leverage, Prev.acq.all, Prev.acq.min, CG, Cross-Industry, Cross-Country and Owner. An exact match on the industry of the acquirer is required. The number of required matches is 1 or 5.

		Coeff		Robust Std. Error	P-value	Obs	Required matches
Minstake ATE	*Holder67*	-0.0198	***	0.0048	0.000	9695	1
	Longholder	-0.0120	*	0.0062	0.051	9668	1
	Holder67	-0.0229	***	0.0039	0.000	9695	5
	Longholder	-0.0172	***	0.00463	0.000	9668	5
Toehold ATE	*Holder67*	-0.0076	***	0.0017	0.000	9283	1
	Longholder	-0.0057	***	0.0019	0.003	9257	1
	Holder67	-0.0079	***	0.0017	0.000	9283	5
	Longholder	-0.0047	***	0.0015	0.001	9257	5

Note: *p<0.1; **p<0.05; ***p<0.01