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All is not lost that is delayed: overconfidence and investment outcomes

André Betzer[1] · Inga van den Bongard[2] · Felix Schweder[1] · Erik Theissen[2,3] · Christine Volkmann[1]

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Abstract

We use a unique panel data set of private German firms to analyze the relation between managerial overconfidence and investment policy in small and medium-sized firms. We find that overconfident managers invest more, and that this relation is driven by expansion investments. When considering the outcome of investment projects, we find that projects initiated by overconfident managers are less likely to be completed as planned. When we differentiate between three types of non-completion (downsizing, delaying, and abandoning), we find that overconfident managers are more likely to delay, rather than to abandon or downsize a project.

Keywords Overconfidence · Small and medium-sized enterprises · Corporate investment · Private companies

JEL Classification G31 · G32 · O16

✉ André Betzer
betzer@wiwi.uni-wuppertal.de

Inga van den Bongard
ivdb@uni-mannheim.de

Felix Schweder
schweder@wiwi.uni-wuppertal.de

Erik Theissen
theissen@uni-mannheim.de

Christine Volkmann
volkmann@wiwi.uni-wuppertal.de

[1] Bergische Universität Wuppertal – Schumpeter School of Business and Economics, Gaußstr. 20, 42119 Wuppertal, Germany

[2] Finance Area, University of Mannheim, L 9, 1-2, 68161 Mannheim, Germany

[3] Finance Area, and Centre for Financial Research, University of Mannheim, Cologne, Germany

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1 Introduction

Making sound investment decisions may well be the single most important task within corporate financial management. Detailed descriptions of the NPV rule and other criteria to guide capital budgeting decisions abound in corporate finance textbooks, and are a major component of corporate finance courses taught at business schools and universities all over the world. Usually it is implicitly assumed that, once the decision in favor of a particular project has been made, the project is realized as planned. In practice, however, it is a common phenomenon that investment projects are not completed as scheduled. As shown later, 26.6% of planned investment projects in our sample are delayed, scaled down, or abandoned. It is of obvious importance to understand *why* that happens.

To shed light on this question we link the outcome of planned investment projects to measures of managerial overconfidence. We build on prior research suggesting that overconfident managers are too optimistic and, consequently, tend to overinvest if investable funds are available (Malmendier and Tate 2005; Ben-David et al. 2013). Obviously, if overconfident managers invest too much there should be an increased probability that investment projects they plan have to be abandonned, downsized or delayed. The objective of our paper is to analyze whether this is indeed the case.

The evidence on which we build was obtained from samples of large listed firms. In contrast, we analyze a sample of small and medium-sized enterprises (SMEs). SMEs are distinctly different from large listed firms in various respects. SME managers are often a large or even the sole owner of the firm, implying that they have a strong impact on managerial decisions. Furthermore, the absence of separation between ownership and control implies that agency conflicts between owners and managers are largely absent. Generally, SME managers have a stronger position and are exposed to fewer checks and balances than the CEOs of listed corporations. Managerial overconfidence may therefore have a stronger influence on managerial decisions in SMEs than in larger firms, implying that the tendency of overconfident managers to overinvest may be particularly pronounced in SMEs. On the other hand, SME managers are often also the founders of their firms. There may thus be a special attachment to the company and a highly intrinsically motivated interest in its continued existence. Excessive investment entails an increased risk to the survival of the firm in case of failure and owner-managers bear a large portion of this risk, implying that owner-managers of SMEs may invest more cautiously than managers of large listed corporations. Whether the tendency for overconfident managers to overinvest also exists in SMEs is thus an empirical question. To answer it we test the following hypothesis.

Hypothesis 1 *Overconfident managers of SMEs show a tendency to overinvest.*

If overconfident SME managers indeed overinvest, there should be an increased probability that investment projects they initiate are not realized as planned. To analyze whether this is the case we test the following hypothesis.

Hypothesis 2 *Investment projects in firms with overconfident managers are more likely to be abandoned, downsized or delayed than projects in firms with non-overconfident managers.*

We have access to a unique panel data set comprising small and medium-sized German firms and spanning 12 annual surveys starting in 2003. The data set is compiled by Kreditanstalt für Wiederaufbau (KfW) and contains data on financing and investment activities of the responding firms. In particular, we know whether a firm had planned an investment project, whether this project was realized as planned or whether it was downsized, delayed or abandoned. The data set further contains information on expectations on future sales and employment. We follow Landier and Thesmar (2009) and use the expectations data to construct a measure of managerial overconfidence directly inferred from managers' expectations. We then show that overconfident managers invest more. In our main analysis we relate our measure of overconfidence to binomial variables describing the outcome of the planned investment projects while controlling for firm characteristics and socio-demographic characteristics of the CEO.

Our paper makes several contributions to the literature. First, and most importantly, our paper is the first that relates managerial overconfidence to the *outcome* of planned investment projects. So far, the corporate finance literature has only established a link between managerial overconfidence and the firm's investment level (see, among others, Malmendier and Tate 2005; Ben-David et al. 2013).

Our second contribution is to extend the literature on the relation between overconfidence and investment decisions to SMEs. As noted above, SMEs are different from large listed corporations in several important respects, and these differences may affect the link between managerial overconfidence and investment decisions. Therefore, an analysis of SMEs is a valuable complement to the evidence obtained from analyzing large listed corporations.

Finally, ours is the first paper that analyzes the relation between managerial overconfidence and investment policy while differentiating between expansion investments and replacement investments. This is an important aspect because expansion and replacement investment are fundamentally different, yet are usually lumped together in empirical research because disaggregated data on investments is not typically available.

Our results confirm previous evidence that managerial overconfidence is positively related to the level of investments. We furthermore document that this relation is driven by expansion investments. Our most important result is that managerial overconfidence is positively related to the probability that investment projects are not completed as scheduled. In particular, we find that investment projects planned by overconfident managers are more likely to be delayed than those initiated by their non-overconfident peers.

We argue that the tendency of overconfident managers to delay (rather than to abandon or downsize) an investment project is consistent with the concept of

cognitive dissonance (Festinger 1957).[1] Planning an investment project and then recognizing that it cannot be completed as scheduled causes a feeling of discomfort. Delaying the project (rather than deciding to abandon or downsize it) may help reduce this sense of discomfort and thereby restore internal consistency between managerial actions and beliefs. Because overconfident managers arguably have a stronger belief in their abilities and skills, they are also more likely to reduce cognitive dissonance. This view is consistent with the finding, documented by Gibbons et al. (1997), that high self-esteem individuals are more likely to engage in dissonance reduction strategies than low self-esteem individuals. The idea of a mutual reinforcement between overconfidence and cognitive dissonance was also articulated in Malmendier and Taylor (2015). They also argue that belief-based biases can persist (rather than being "learned away"), for example through avoidance behaviour and/or motivationally driven reattributions of real states of affairs.

The remainder of the paper is organized as follows. Section 2 provides a brief survey of the relevant literature. In Sect. 3 we describe the data set, present descriptive statistics and develop our measure of overconfidence. Section 4 provides evidence that overconfident managers have a higher propensity to invest. The relation between overconfidence and investment outcomes is analyzed in Sect. 5. Section 6 describes the robustness checks we have performed and Sect. 7 concludes.

2 Literature

2.1 Managerial overconfidence and corporate financial decisions

Our work draws on previous research on CEO overconfidence and its relation with corporate financial decision-making (see e.g. Ben-David et al. 2013 and the literature cited therein). The conceptualization of overconfidence is broad in the academic literature (Malmendier and Taylor 2015). In the psychological literature overconfidence is interpreted as either a personal trait or as a behavioral bias (Ben-David et al. 2013; Campbell et al. 2011; Kahnemann and Tversky 1979, Kolasinski and Li 2013; Malmendier and Tate 2005, 2008; Moore und Haley 2008). We are (as is the economic literature more generally, see e.g. Malmendier und Taylor, 2015) agnostic with respect to the psychological nature of the concept. This is inconsequential for our analysis because the economic implications are identical.[2] Overconfidence can manifest both transsituationally and transtemporally (Malmendier and Taylor 2015) in different forms and to different degrees (Malmendier and Tate 2005; Moore and Healy 2008). One manifestation is overoptimism, defined as overestimation of the

[1] With respect to the theory of cognitive dissonance we wish to stress here that our hypotheses do not build on the theory of cognitive dissonance. Rather, we offer cognitive dissonance (only) as one potential explanation for our finding that overconfident managers prefer to declare projects to be delayed (rather than downsized or fully abandoned). We do not intend to claim that it is the only conceivable explanation.

[2] We thank an anonymous referee for pointing out the importance of the different concepts and for sharing her/his profound psychological knowledge with us, over two rounds of revisions.

magnitude and/or frequency of positive outcomes that are perceived to be beyond personal control. Another manifestation is the overestimation of one's own abilities or prospects or, closely related, the overestimation of one's own abilities relative to others (known as the better-than-average effect). In this manifestation of overconfidence the mean of the distribution is overestimated. A third manifestation of overconfidence is the excessive confidence in the correctness of one's own beliefs in the sense of miscalibration (overprecision), resulting in the underestimation of risk. The measure of overconfidence we use captures overoptimism.

Several measures of overconfidence have been proposed in the empirical literature. Indirect measures infer the degree of overconfidence from observable managerial actions such as managers' net purchases of shares, their stock option holdings, and stock option exercising decisions (e.g. Malmendier and Tate 2005; Kolasinski and Li 2013) or use CEO portrayals in the media in order to classify managers as overconfident or non-overconfident (Malmendier and Tate 2008). An alternative approach is to derive a measure of overconfidence from survey data. Ben-David et al. (2013) use CFO forecasts of the S&P 500 in order to establish direct measures of optimism and miscalibration and link both of them to corporate finance and investment decisions. Landier and Thesmar (2009) construct a measure of optimism by relating entrepreneurial expectations about the future of the firm to the actual future development. The advantage of these approaches is that they infer the level of overconfidence directly from self-reported forecasts. Arguably this should lead to lower measurement error. We adopt the approach of Landier and Thesmar (2009) in that we construct a measure of overconfidence from CEO's self-reported sales and employment growth forecasts.

Based on prior literature we hypothesize that overconfident managers overinvest. (our first hypothesis). The notion that overconfident managers overestimate the return from investment projects and therefore invest too much has been put forward by Roll (1986) and Heaton (2002).[3] Malmendier and Tate (2005) were the first to test this hypothesis explicitly. They find that investment decisions by overconfident managers are more sensitive to changes in cash flows than those of their peers. In a similar vein, Malmendier and Tate (2008) find that overconfident managers are more likely to make acquisitions, and that the stock market reaction to their merger announcements is more negative than for non-overconfident CEOs. The former result is confirmed by Ferris et al. (2013) while the latter finding is confirmed by

[3] There is a substantial literature arguing that managerial overconfidence, even though it affects managerial actions, is not necessarily harmful to shareholders. The model of Goel and Thakor (2008) predicts that overconfident managers have a higher chance of being promoted to CEO than their non-overconfident peers. The finding by Graham et al. (2013) that CEOs are more optimistic than the lay population is consistent with their hypothesis. Gervais et al. (2011) argue that investment decisions by overconfident managers may actually benefit shareholders because overconfidence counterbalances the effect of managerial risk aversion. Campbell et al. (2011) make a similar point and also argue that there is an optimal level of managerial over-optimism that maximizes firm value. Phua et al. (2018) argue that overconfident CEOs induce stronger commitment from employees and other stakeholder. The empirical finding by Galasso and Simcoe (2011) and Hirshleifer et al. (2012) that overconfident CEOs are better at promoting innovation is consistent with the view that overconfidence may be beneficial, as is the evidence in Mace (2017) that stocks of firms with overconfident CEOs earn significant 5-factor alphas.

Doukas and Petmezas (2007). Ben-David et al. (2013) confirm the general finding that overconfident managers tend to overinvest.

Our paper extends the literature exploring the relation between overconfidence and investment in three important ways. First, we show that a positive relation between overconfidence and investment is also observed in our sample of SMEs. This is an important finding in its own right because, as noted above, SMEs are distinctly different from large listed corporations in several important ways, and these differences are likely to affect the relation between managerial overconfidence and corporate decisions. Second, when analyzing the relation between managerial overconfidence and corporate decisions we differentiate between replacement investments and expansion investments. Third, we analyze the impact of managerial overconfidence on the outcome of planned investment projects. (our second hypothesis). We hypothesize that, if firms with overconfident managers invest more, situations in which investment projects are not implemented as scheduled (i.e., are delayed, downsized or abandoned) should arise more frequently in these firms. We are not aware of any previous papers that relate overconfidence to the outcome of planned investment projects (including the outcome of merger attempts).

Several papers have related managerial overconfidence to other corporate financial decisions.[4] Malmendier and Tate (2005) argue that overconfident managers view external funds as overly costly. Consistent with this view Malmendier et al. (2011) report that overconfident managers use less external finance, while Cordeiro (2009) and Deshmukh et al. (2013) find that overconfident managers pay lower dividends, possibly in order to build financial slack. Short-term debt exposes managers to more control by debt holders than long-term debt. Landier and Thesmar (2009) develop a model in which overconfident managers self-select into short-term debt. Consistent with the model's prediction, Landier and Thesmar (2009) and Graham et al. (2013) find evidence that overconfident managers tend to use more short-term debt than non-overconfident managers. Overconfident managers are more likely to consider their firm to be undervalued by the market. Consequently, they are more likely to initiate repurchase programs (Banerjee et al. 2015) and they are more likely to complete repurchase programs (Andriosopoulos et al. 2013). Overconfidence has also been shown to affect accounting choices and voluntary disclosure of earnings forecasts (e.g. Ahmed and Duellman 2013; Hribar and Yang 2015).

2.2 Cognitive dissonance

The information that a planned investment project may not be completed as scheduled causes a feeling of psychological discomfort – a phenomenon in psychology known as cognitive dissonance (Festinger 1957). According to the dissonance theory, individuals seek to reduce conflicting cognitive elements.

There are three basic ways to restore consistency (see also Chang et al. 2016 who relate the theory of cognitive dissonance to the disposition effect). First, individuals

[4] For a survey of the role of overconfidence in entrepreneurial decision making see Shepherd et al. (2015).

can alter their beliefs in order to reconcile the two cognitions. A manager could update her beliefs about her own skills and abilities, thereby recognizing that she is unable to realize the project as planned. This adjustment negatively affects the manager's self-esteem and is thus unlikely to be the method of choice to reduce cognitive dissonance. Second, individuals can restore consistency by acquiring information which outweighs the conflicting elements. If outside financing was necessary to realize the planned project, failure can be blamed on bankers who are not willing to provide funding or, alternatively, it can be blamed on bad economic conditions. Blaming others or external factors for the undesirable outcome provides managers with a convenient excuse and preserves their self esteem. A third way to reduce dissonance is to adjust the importance of one of the cognitions. The dissonance, for instance, will be mitigated by the belief that the problems that arose are temporary in nature, and that the project is only delayed rather than abandoned.

It is conceivable that overconfident managers are more likely to reduce dissonance by either blaming others or by adjusting their cognitions. One explanation for overconfidence that has been developed in the psychological literature is that being confident provides individuals with psychological benefits. In particular, it has been argued that self-confidence improves self-esteem (Alicke 1985). By this argument, one may expect overconfident individuals to be characterized by high self-esteem. Gibbons et al. (1997) argue that high self-esteem individuals are more likely to engage in dissonance reduction strategies than low self-esteem individuals. Consequently, overconfident managers may be more prone to reduce dissonances in order to preserve their positive self-perception. This is consistent with the statement in Malmendier and Taylor (2015, p. 6) that "cognitive dissonance … allows overconfident beliefs to persist."

3 Data

3.1 The KfW survey data

Our analysis is based on a unique data set that contains detailed information on small and medium-sized firms in Germany. The data set is provided by KfW (Kreditanstalt für Wiederaufbau) and is collected in 12 annual surveys starting in 2003. It is based on a representative panel of small and medium-sized firms in Germany and includes privately held firms with annual sales not exceeding € 500 million. Each year questionnaires are sent to 45,000 – 86,000 firms. The response rates range from 15 to 24%. In order to ensure that the panel waves are approximately equally sized over the years, every second year, new firms are added.

The survey includes questions about general company information (e.g. industry sector, number of employees), about financial statement data and about information on investment and financing activities. The respondent is asked to indicate her position in the firm (most importantly whether she is the CEO, and whether she is the (sole or majority) owner of the firm). Further, the survey asks for socio-demographic information on the (sole or majority) owner of the firm (gender, age and education level, tenure within the firm, and an indication whether she founded the

firm, acquired it, or holds a stake in it). Further, the respondent is asked to provide her expectations on the future change in sales and employment of the firm. We only retain cases in our sample in which the respondent indicates that she is the (sole or majority) owner and the CEO of the firm. The CEO status is necessary because, arguably, the CEO has the strongest impact on corporate investment decisions and we therefore use in our analysis the CEO's expectations, not those of an employee. The ownership status is important because the socio-demographic information in the survey relates to the owner of the firm. A second advantage of only retaining owner-managers in our sample is that agency conflicts between owners and managers should be largely absent. Further, we avoid cases (and potential endogeneity problems associated with them) in which owners deliberately hire CEOs with specific characteristics (e.g. overconfidence or a lack thereof).

We use the managerial expectations data to construct our measure of managerial overconfidence and then relate it to the firm's investment decisions. We note that managers (and those of listed corporations in particular) may use forecasts in order to "guide" the expectations of investors. We do not consider this a relevant concern in the present context, though. The survey from which we extract the managerial expectations is anonymous. Further, the SMEs in our sample are unlisted and the CEO is the sole or majority owner. The latter point also implies that the argument, brought forward by Kolasinski and Li (2013), that a strong board may help overconfident managers to avoid mistakes does not apply to our sample.

Socio-demographic information on the owner-manager and firm characteristics are included as control variables. Our data set contains complete observations for all variables for 6,148 firm-years. Table 1 shows the definitions of all variables that we use in our analysis.

The survey contains a question on the amount that has been invested in the previous year. This amount is broken down into expansion and replacement investments. We use the responses to this question to test whether overconfident managers invest more than non-overconfident managers. The survey also questions whether a firm had planned investment projects, and whether these projects were realized as planned or whether at least one project was downsized, delayed or abandoned. We refer to these three cases as investment failures. We use the term "failure" here for ease of exposition; we do not imply that abandoning, delaying, or downsizing an investment project is a bad or irrational decision. In fact, if new information becomes available it may be entirely rational to abandon, delay or downsize a project. We also wish to stress that the fact that a project is not realized as planned does not necessarily imply that the decision to invest was wrong in the first place. Consequently, the "failure rate" (i.e. the fraction of projects that are abandoned, downsized or delayed) would be non-zero even for a fully rational manager. Our main hypothesis states that the failure rate is *higher* for overconfident managers than for their non-overconfident peers.

In our terminology "successful" projects are those that are implemented as planned. The term "successful" thus does not necessarily imply that the project was profitable, or that the cash flows from the project met or exceeded forecasts.

All firms indicating that they had planned an investment project (no matter whether or not it was realized) were asked whether they had entered into

Table 1 Variable list and descriptions

Variable label	Description
Failed	Indicator variable that takes a value of one if a planned investment project failed and that is 0 otherwise
Expectation error (sales)	Difference between managerial sales growth expectations and actual sales growth: $\Delta_S = EXP_{SALES} - 1_{(\Delta \ln(SALES) > CPI\%)}$ EXP_{SALES} is set to 1 if the manager expects sales growth and is set to 0 otherwise. The actual sales growth is set to 1 if the growth rate exceeds the rate of inflation and is set to 0 otherwise (see Landier/Thesmar 2009). The variable is lagged by one period
Expectation error (employment)	Difference between managerial employment growth expectations and actual growth in employment: $\Delta_E = EXP_{EMPLOYMENT} - 1_{(\Delta EMPLOYMENT \geq 1)}$ $EXP_{EMPLOYMENT}$ is set to 1 if the manager expects employment to grow and is set to 0 otherwise. The actual employment growth is equal to 1 if the number of employees increases and is 0 otherwise (see Landier/Thesmar 2009). The variable is lagged by one period
University degree	Indicator variable; takes a value of one if the manager holds a university degree, 0 otherwise
Manager is male	Indicator variable; takes a value of one if the manager is male, 0 otherwise
Experience within the firm (0–5 years)	Indicator variable; takes a value of one if the manager has 0–5 years of experience within the firm, 0 otherwise
Founder status	Indicator variable; takes a value of one if the manager is the founder of the firm, 0 otherwise
Ln(age)	Natural logarithm of the manager's age in years
Financially constrained	Indicator variable; takes a value of one if the manager indicates that the firm is financially constrained i.e. a negotiation with a bank on a loan failed
Ln(# employees)	Natural logarithm of the number of employees
Cash flow	Profit or loss plus depreciation, divided by tangible assets. The variable is winsorized at the 2.5% and 97.5% percentiles
Sales growth	Change in sales in relation to previous year's sales. The variable is winsorized at the 2.5% and 97.5% percentiles
Investment intensity	Investment volume divided by tangible assets. The variable is winsorized at the 2.5% and 97.5 percentiles
Capacity extension intensity	Capacity extension volume divided by tangible assets. The variable is winsorized at the 2.5% and 97.5% percentiles
Replacement intensity	Replacement volume divided by tangible assets. The variable is winsorized at the 2.5% and 97.5% percentiles

negotiations with a bank on a loan, and whether these negotiations resulted in a loan contract. We categorize a firm as financially constrained if the manager indicates that the firm has been negotiating on a loan and the loan has not been granted. This variable is based on a subjective assessment by the manager. We do not claim that

it really captures financial constraints. However, because the manager's actions are likely to be determined by her own perceptions, the categorization is suitable for the purposes of our analysis.

3.2 Measuring overconfidence

3.2.1 Definition

Our overconfidence measures are based on survey questions regarding the manager's expectations about the future development of the firm. The manager is asked about her expectations on sales and employment growth. In our main analysis we infer overconfidence from the replies to the question on sales growth. We construct a similar measure from the employment growth expectations. The results are presented as a robustness check in Sect. 6. The question on sales growth is phrased: "How do you expect the company's sales to develop compared to the previous year?", and possible answers are: "The sales will (a) increase, (b) remain constant or (c) decrease". The expectations data allows us to construct measures of managerial overconfidence directly inferred from the manager's beliefs. We follow Landier and Thesmar (2009) and code the manager's expectation as "1" if the manager expects an increase in sales, and code it as "0" otherwise. In order to measure biases in expectations, we need to compare expectations to realizations. Therefore, in a similar way, we set the variable actual sales growth equal to 1 if the growth rate of sales exceeds the rate of inflation, and to 0 otherwise.[5] The expectations error is the difference between the reported subjective expectation and the realization:

$$\Delta_S = EXP_{SALES} - 1_{(\Delta \ln(SALES) > Inflation)}$$

The construction of this measure requires that the firm participates in at least two consecutive panel waves. In our full sample the realization exceeds the expectations in 30% of the cases, meets the expectations in 62% of the cases and falls short of expectations in 8% of the cases.

The expectation error as defined above consists of two components. The first component is the error a rational agent would make and is unpredictable. The second component is the manager's bias in estimation and equals zero only if the manager is rational. In our analysis, we use the expectation error as a proxy for the manager's bias. Obviously, the rational expectation error adds noise to this proxy. To demonstrate that the difference between expectation and realization is indeed a reasonable proxy for the manager's bias, we make use of the panel structure of our dataset. The argument follows Landier and Thesmar (2009) and

[5] The questionnaire does not specify whether the question about sales growth relates to real or nominal growth. Our overconfidence measure, because it defines actual sales growth as growth in excess of the rate of inflation, implicitly assumes that sales growth in real terms matters. If the respondents actually have nominal growth in mind our definition will inflate the number of respondents missing their target. We have re-estimated all regression models with an alternative specification where actual sales growth is defined as growth in nominal terms. The qualitative results do not change.

Table 2 Serial correlation of expectation errors

Dependent variable = expectation error (sales)						
	(1)		(2)		(3)	
Expectation error (sales), t-1	0.0595***	(8.72)	0.0697***	(8.44)	0.0519***	(4.91)
Expectation error (sales), t-2			0.115***	(13.68)	0.104***	(9.71)
Expectation error (sales), t-3					0.0857***	(7.64)
Constant	−0.0924***	(−6.27)	−0.157***	(−8.91)	−0.0206	(−0.95)
Observations	24,150		13,854		8169	
R^2	0.0191		0.0383		0.0460	

The table reports the correlation between current and lagged sales-based expectation errors. The regressions are based on the entire sample. All regressions include year and industry fixed effects. T-statistics are shown in parentheses and are based on standard errors clustered at the firm level. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively

proceeds as follows. By definition, rational expectation errors have a mean of zero conditional on the manager's information at the time when the next period expectation is built. Hence, rational expectation errors should be orthogonal to previous rational errors. This implies that, if expectation errors are correlated, the correlation is due to the bias and not due to the rational errors. In order to explore the serial correlation of the expectations error we regress its current value on lagged values. We estimate three models. In model (1) we regress the expectations error on 1-period lagged expectation errors, in model (2) (model (3)) we include the second lag (the second and third lag) of the expectation errors. Note that the number of observations decreases when more lags are included. The results are reported in Table 2. In all specifications, the coefficients on the lagged expectation errors are significant at the 1% level. These results indicate that the expectation errors are significantly serially correlated, thus providing evidence of the existence of a bias.

The empirical literature has identified several socio-demographic variables which are related to overconfidence. One way to assess the validity of our overconfidence measure is to test whether it is related to these variables in a way that is consistent with the previous evidence. We therefore regress our overconfidence measure on a set of socio-demographic variables. The results are shown in Table 3. They indicate that managers with a university degree, male managers, managers with more experience (i.e. longer tenure) in the firm and managers who are also the founders of their firms are more overconfident while older managers are less overconfident. These results are largely in line with previous research. Huang and Kisgen (2013) and Levi et al. (2014) provide evidence that male managers are more overconfident than their female peers. Forbes (2005) and Lee et al. (2017) find that founder-managers are more overconfident than managers who did not found their firm. Forbes (2005) also reports that younger managers are more overconfident than older managers. Graham et al. (2009) report that better-educated investors are more likely to perceive themselves as competent than less-well educated investors.

Table 3 Determinants of overconfidence

Dependent variable = expectation error (sales)		
University degree	0.0318***	(4.80)
Manager is male	0.0216**	(2.19)
Experience within the firm (0–5 years)	0.0309***	(3.91)
Ln(age)	−0.0342**	(−2.04)
Founder status	0.0146**	(2.25)
Constant	−0.139**	(−2.12)
Observations	41,327	
R^2	0.0187	

The table investigates whether overconfidence is explained by the manager's personal characteristics. The regression is based on the entire sample. The definitions of the variables are provided in Table 1. The regression includes year and industry fixed effects. T-statistics are shown in parentheses and are based on standard errors clustered at the firm level. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively

3.2.2 Discussion

Overconfidence is often considered to be a stable personal characteristic (e.g. Johnson and Fowler 2011). The measure we use, on the other hand, is time-varying. In fact, the same person can be categorized as overconfident in one year and as well-calibrated in other years. While using such a measure, we are not claiming that overconfidence itself is time-varying. Rather, we use a noisy measure of the construct we wish to capture. The decomposition of our measure into a rational forecast error and a bias discussed above is based on this insight.[6] We wish to stress that other measures of overconfidence used in the literature share the feature that they may yield different results for the same person at different points in time. This is true for measures of overconfidence inferred from share purchases, stock option holdings and option exercise decisions as used in Malmendier and Tate (2005) or Kolasinski and Li (2013), it is true for measures inferred from portrayals in the media as in Malmendier and Tate (2008), for forecast-based measures such as the one used in Ben-David et al. (2013) and for survey-based measures such as those used by Glaser and Weber (2007).

As mentioned above, our measure of overconfidence captures over-optimism, i.e. the overestimation of the mean of a distribution. Managers may overestimate future sales growth because they have biased beliefs in factors beyond their control, such as the macroeconomic environment, or because they overestimate their own abilities.

[6] As noted above, the existence of the rational forecast error makes our measure of overconfidence noisy. Consequently, repeated measurement may deliver varying results even if the underlying concept is constant. We admit, though, that we cannot preclude that the concept we try to measure (i.e., overconfidence) varies over time. Our sample is too short to perform statistical tests (e.g. on structural breaks).

We are agnostic as to what causes over-optimism. In both cases we would expect overconfident managers to invest more, and we would expect a larger fraction of their investment projects to be abandoned, downsized or delayed.

A potential concern is that the response rate of overconfident managers may be different from the rate of their non-overconfident peers. We cannot control for this possibility because we do obviously not have access to information on non-responding firms. However, we can test whether the attrition rate (i.e. the probability that an initial responder stops to respond to the survey) depends on the degree of overconfidence. We estimate a logit model (not tabulated) in which we regress an attrition dummy on our overconfidence measure. The coefficient is close to zero (0.0014) with a t-statistic of 0.07. We thus conclude that the attrition rate is not related to our measure of overconfidence.

4 Do overconfident managers invest more?

Our main argument is based on the presumption that overconfident managers, because they are overly optimistic, invest more, and that therefore investment projects initiated by overconfident managers are more likely to fail. Based on Tobit regressions, we first test whether overconfident managers indeed invest more. The dependent variable is investment intensity, defined as the amount invested scaled by tangible assets. We estimate separate models for total investment, expansion investments, and replacement investments.

The main independent variable is the lagged expectations error Δ_S. It can take on three values, namely 1 (if the manager expects that the firm grows but it does not), 0 (if the manager's expectation is correct) and -1 (if the manager does not expect the firm to grow but it does). In order to avoid endogeneity, we use the lagged expectations error throughout.[7] In Model (1) we include the expectations error as defined above. In model (2) we split the expectations error into two dummy variables, one identifying firm-year observations with positive expectations errors and one identifying observations with negative expectations errors. We refer to these cases as "overconfidence" and "underconfidence", respectively.

We include as controls other variables which are likely to have an impact on the investment intensity. Specifically, we include the cash flow, the sales growth, and the natural logarithm of the number of employees as a measure of firm size. We further include a dummy variable that indicates whether the manager perceives the firm to be financially constrained in the respective year. As our sample consists of private firms, we cannot include variables based on market capitalization, such as Tobin's

[7] The sales forecast for year t issued in year t-1 may be affected by investment projects planned in year t, such that there might be a spurious relation between the expectations error and investment. By using the lagged expectations error, we consider the sales forecast for year t-1 issued in year t-2 and relate it to investments in year t. The implicit assumption here is that the lagged expectations error is a valid instrument for current managerial overconfidence.

Table 4 Tobit models of investment intensity using *sales-based expectation errors*

	(1)		(2)	
Dependent variable = investment intensity				
Expectation error (sales)	0.0405**	(2.25)		
Expectation error = -1 (underconfidence)			−0.000765	(−0.03)
Expectation error = 1 (overconfidence)			0.122***	(3.19)
Cash flow	0.208***	(13.20)	0.209***	(13.27)
Sales growth	0.108**	(2.43)	0.108**	(2.45)
Ln (# employees)	−0.0272***	(−2.97)	−0.0267***	(−2.92)
Financially constrained	−0.367***	(−8.01)	−0.366***	(−7.99)
Observations	3828		3828	
Dependent variable = capacity expansion intensity				
Expectation error (sales)	0.039*	(1.84)		
Expectation error = -1 (underconfidence)			−0.010	(−0.38)
Expectation error = 1 (overconfidence)			0.091**	(2.21)
Cash flow	0.083***	(5.05)	0.083***	(5.07)
Sales growth	0.217***	(4.06)	0.217***	(4.08)
Ln (# employees)	−0.129	(−1.17)	−0.012	(−1.12)
Financially constrained	−0.141***	(−3.10)	−0.141***	(−3.10)
Observations	2321		2321	
Dependent variable = replacement intensity				
Expectation error (sales)	−0.025**	(-2.02)		
Expectation error = -1 (underconfidence)			0.046***	(2.70)
Expectation error = 1 (overconfidence)			0.015	(0.69)
Cash flow	0.073***	(7.13)	0.073***	(7.13)
Sales growth	−0.068**	(−2.31)	−0.067**	(−2.31)
Ln (# employees)	−0.003	(−0.41)	−0.002	(−0.35)
Financially constrained	−0.025	(−0.86)	−0.024	(−0.85)
Observations	2307		2307	

Panel A of this table presents average marginal effects of tobit models of investment intensity. Panel B and C report separate results for capacity expansion and replacement investment intensity. The definitions of the variables are provided in Table 1. All regressions include year and industry fixed effects. T-statistics are shown in parentheses and are based on standard errors clustered at the firm level. Standard errors are obtained using the delta method. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively

q. We also do not have data on earnings growth expectations, a variable Gennaioli et al. (2016) found to be a good predictor of investment activity.

Since there are many firm-year observations with zero investments, we estimate Tobit regressions. We include year and industry fixed effects and cluster standard errors at the firm level. The results are shown in Table 4. Panel A shows the results for total investments. We find a statistically significant relation between investment intensity and overconfidence. In specification (1) the coefficient on the expectations error variable is 0.041 and is significant at the 5% level. When splitting up the

expectations error in specification (2), we find that the entire effect is driven by overconfident managers. The coefficient on the underconfidence dummy is close to zero, with a t-statistic of 0.03. The coefficients on the control variables reveal that firms with higher cash flows and higher sales growth invest more, while larger firms and financially constrained firms invest less. The coefficients on all control variables are remarkably similar in specifications (1) and (2).

The results for expansion investments in Panel B are qualitatively similar to those for total investment intensity. We still find a positive relation between the expectations error and investment intensity which is driven by overconfident managers. The results for the control variables are also qualitatively similar to those in Panel A. However, the relation between the number of employees and investment intensity is no longer significant.

The results for replacement investments in Panel C are remarkable. The relation between the expectations error and investment intensity is now negative and significant. The results for specification (2) reveal that this is because underconfident managers invest more in replacements than overconfident managers. In fact, the coefficient for overconfident managers, albeit positive, is insignificant.[8]

Our results confirm the finding of previous papers (e.g. Malmendier and Tate 2005; Ben-David et al. 2013) that overconfident managers invest more. This relation is driven by expansion investments. Having established that overconfident managers indeed invest more we now turn to our main question whether investment projects initiated by overconfident managers are more likely to subsequently be delayed, downsized or abandoned.

5 Overconfidence and investment outcomes

We restrict our attention to firms that had planned to make an investment. As noted earlier the survey contains questions on whether all investment projects were completed as planned, or whether at least one project was delayed, downsized, or abandoned. Table 5 presents summary statistics for firms with failed and successfully completed investment projects and tests for differences in the means between the two subgroups (see Table 1 for variable definitions). We only include observations for which all variables used in the main analysis are available, resulting in 4,515 firm-year observations with successfully completed projects and 1,633 firm-year observations with failed projects. These figures correspond to a failure rate of 26.6% (The failure rate in the full sample is very similar, at 28.5%.). Of the failed projects, 28% were abandoned, 59% were delayed and 13% were downsized.

[8] The coefficient on the expectation error is negative in model (1) while both coefficients are positive in model (2). From the coefficients of model (2) it follows that investment intensity is highest when the expectation error is -1, is lowest when the expectation error is 0, and is at an intermediate level when the expectation error is 1. Consequently, when we include separate dummies for expectations errors equal to -1 and 1, respectively, we obtain positive coefficients. In model (1), however, the large investment intensity for underconfident managers dominates the estimate, resulting in a negative coefficient.

Table 5 Summary statistics for firms with failed and successfully completed investment projects

	Completed			Failed		
	#	Mean	Std. Dev	#	Mean	Std. Dev
Expectation error (sales)	4515	−0.202	0.589	1633	−0.156***	0.585
Expectations error (employment)	4427	−0.082	0.556	1481	−0.051*	0.559
University degree (D)	4515	0.481	0.500	1633	0.482	0.450
Manager is male (D)	4515	0.919	0.273	1633	0.906	0.292
Experience within the firm (0–5 years) (D)	4515	0.069	0.254	1633	0.108***	0.310
Founder status (D)	4515	0.459	0.498	1633	0.552***	0.497
Age	4515	52.328	10.195	1633	50.488***	9.979
Financially constrained (D)	4515	0.064	0.244	1633	0.402***	0.491
# Employees	4515	42.075	67.750	1633	28.484***	39.993

The table shows means and standard deviations of the independent variables used in the subsequent regression analysis, separately for cases in which planned investment projects were completed as planned and failed, respectively. The number of observations for the expectations error (employment) is different because it relates to the regression, reported in Sect. 6, that uses the expectations error employment instead of the expectations error sales as dependent variable. Variables marked (D) are dummies. Their means can thus be interpreted as percentages in the respective category. The definitions of the variables are provided in Table 1. t-tests are conducted to test for differences between the means for firms with successfully completed and firms with failed investment projects. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively

The main variable of interest is the lagged overconfidence measure directly inferred from managers' expectations. Table 5 provides strong evidence that overconfidence plays an important role for the outcome of an investment project. The average managerial expectation error is -0.202 in the group with successfully completed investment projects and -0.156 in the group of firms with investment failure. The fact that both values are negative is most likely due to our sample period which includes the financial crisis. The difference between the mean expectation errors is statistically significant at the 1% level. This result provides first evidence that a relation exists between managerial overconfidence and the outcome of investment projects. We further find that 55.2% of the managers in firms with failed investment projects state that they are also the founder of the firm whereas only 45.9% of the managers in firms with successfully completed investment projects indicate that they founded the company. The difference between these percentages is highly (at the 1% level) significant. As previous research (e.g. Forbes 2005; Lee et al. 2017) documents that founders are substantially more overconfident than non-founders, this finding further supports our hypothesis that overconfidence is an important driver of investment outcome.

Not surprisingly, the univariate analysis provides strong evidence that managers of firms with failed investment projects more often indicate that their firm is financially constrained than managers of firms with successful investment projects. Among the firms with successfully completed investment projects, only 6.4% indicate that they are constrained. In contrast, 40.2% of the firms with failed investment projects indicate that they were financially constrained. The difference in means

between the two subgroups is significant at the 1% level. This result indicates that the outcome of planned investment projects is related to the availability of funds. Note, though, that we are unable to make a statement on causality because we do not observe the quality of the planned projects. We can therefore not distinguish between cases in which a positive NPV project is not realized because of funding constraints and cases in which funds are denied because the project is unprofitable.

Furthermore, we find interesting and statistically significant socio-demographic differences (all significant at the 1% level) between managers of firms with failed and firms with successfully completed investment projects. First, managers in firms with successfully completed projects are on average older (mean: 52.3 years vs. 50.5 years) and have gained more experience in the respective company compared to managers in firms with failed investment projects (6.9% of the managers have worked for less than 5 years vs. 10.8%). We do not find significant differences between the two groups of firms with respect to gender and the proportion of managers holding a university degree.

Finally, we find that firms with successful projects are, on average, larger than firms with failed projects. We measure size by the number of employees and find highly significant differences in the mean values (means are 42.08 and 28.48, respectively).

We next analyze the determinants of the outcome of investment projects in a multivariate framework using binary and multinomial regressions. In a first step we do not distinguish between the different categories of failing (downsizing, delaying or abandoning a project) and estimate logit models in which we relate the outcome of planned investment projects to firm characteristics, socio-demographic characteristics of the CEO such as age, gender and education, and our overconfidence measure. In this approach, the dependent variable is equal to one if the firm planned investment projects and at least one project failed, and is zero if no failure occurred.

We estimate two logit models. In the first model, we only include our treatment variable, the overconfidence measure. In the second model, we add the socio-demographic variables and the firm characteristics. Panel A of Table 6 shows the coefficient estimates of the logit models whereas Panel B displays the corresponding marginal effects.

When we only include our measure of overconfidence, the expectations error, on the right-hand side, we find that overconfidence significantly (at the 1% level) increases the probability of failure. The marginal effect shown in Panel B reveals that investment projects in firms with overconfident managers are 3.21% more likely to fail as compared to projects in firms ran by non-overconfident managers. This finding is confirmed when we add the socio-demographic variables as controls (model 2). While the magnitude of the coefficient on the overconfidence measure is reduced once the controls are added, the coefficient is still significant at the 5% level. The coefficients for the socio-demographic control variables imply that the probability of failure increases when the manager holds a university degree, when the manager is also the founder of the firm, and when the manager is younger. The firm characteristics also significantly affect the probability of failure. In particular, the probability is higher in financially constrained firms and in smaller firms (where size is measured by the number of employees). Inspection of the marginal effects in

Table 6 Logit models of investment project failure using *sales-based expectation errors*

Dependent variable = project failure				
	(1)		(2)	
Panel A: Logit estimates				
Expectation error (sales)	0.172***	(3.19)	0.121**	(2.05)
University degree			0.173**	(2.14)
Manager is male			−0.0553	(-0.41)
Experience within the firm (0–5 years)			0.136	(1.03)
Founder status			0.286***	(3.55)
Ln(age)			−0.501**	(−2.29)
Financially constrained			2.107***	(22.93)
Ln(# employees)			−0.108***	(−3.34)
Constant	−1.512***	(−12.53)	0.442	(0.51)
Observations	6148		6148	
Pseudo R^2	0.0335		0.148	
Panel B: Average marginal effects				
Expectation error (sales)	0.0321***	(3.20)	0.0191**	(2.06)
University degree			0.0274**	(2.13)
Manager is male			−0.00875	(-0.41)
Experience within the firm (0–5 years)			0.0215	(1.03)
Founder status			0.0453***	(3.56)
Ln(age)			−0.0794**	(−2.30)
Financially constrained			0.334***	(27.68)
Ln(# employees)			−0.0170***	(−3.37)
Observations	6148		6148	

Panel A of this table presents coefficient estimates of logit models of investment failure. The dependent variable is equal to one if the planned investment project failed and zero otherwise. Panel B presents average marginal effects. The definitions of the variables are provided in Table 1. All regressions include year and industry fixed effects. Standard errors are obtained using the delta method. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively

panel B reveals that financial constraints are an important determinant on investment outcome.

In a next step, we distinguish between the different categories of failing (downsizing, delaying or abandoning investment projects) in order to get a more detailed picture of why investment projects fail. We estimate multinomial logit models and consider four outcome categories, namely, abandoned, delayed, downsized and successfully implemented investment projects. The dependent variables are dummy variables which are set to one when a firm had planned investment projects and at least one project was abandoned, delayed or downsized, respectively. Observations

where the respondent indicated more than one reason for the failure of a project[9] are excluded from the sample. The base category are firm-year observations without investment failure.

Panel A of Table 7 shows the coefficient estimates while panel B reports the corresponding marginal effects. In each panel, we first show the results for abandoned versus successful projects, followed by those for delayed versus successful projects and finally those for downsized versus successful projects. The results for the sociodemographic variables and the firm characteristics are very similar across the three categories of investment failure and are largely in line with the results presented in Table 6 above. Investment projects in founder-run firms, in smaller firms, and in financially constrained firms are more likely to be abandoned, delayed, or downsized. The age of the manager and the dummy variable which indicates whether the manager holds a university degree are no longer significant.

The most remarkable results are those for the overconfidence measure. The results for the three categories of investment failure differ in a striking way. Managerial overconfidence significantly increases the probability that an investment project will be delayed, while it does not significantly affect the probabilities for abandoning or downsizing a project. The marginal effects shown in Panel B of Table 7 reveal that an overconfident manager increases the probability of delaying a project by 2.32% in model 1 and by 1.80% in model 2. Thus, our earlier finding that investment projects planned by overconfident managers are more likely to fail than projects planned by their non-overconfident peers is due to a higher inclination of overconfident managers to delay a project. The probabilities of downsizing or abandoning a project, on the other hand, do not differ significantly across the two groups of managers.

It thus appears that overconfident managers, when faced with difficulties, prefer to delay the investment rather than to downsize or abandon it. This is consistent with the view that overconfident managers consider the problems they are facing as transitory in nature. As we have outlined in Sect. 2, considering a problem as transitory is one way to reduce the cognitive dissonance caused by the information that the project is facing problems. It is further conceivable that overconfident managers are more prone to reduce cognitive dissonance in order to preserve their positive self-perception. Our finding that overconfident managers are more likely to delay projects supports this view.[10]

Our data set does not allow us to track what actually happened to the investment project. It is perfectly possible that the CEO indicated in the questionnaire that the project was delayed while in fact the project was entirely abandoned at a later date. However, such cases are entirely in line with our argument. Pretending to only delay a project, even if that is unlikely to be true, is a way to at least temporarily reduce cognitive dissonance.

[9] Such a case may arise when either one project is delayed and downsized, or when a firm had planned several projects and at least two of them failed, with failure for different projects falling into different categories.

[10] As already noted previously, we offer cognitive dissonance (only) as one potential explanation for our finding that overconfident managers prefer to declare projects to be delayed (rather than downsized or fully abandoned). We do not intend to claim that it is the only conceivable explanation.

Table 7 Multinomial logit models of investment project failure using *sales-based expectation errors*

Dependent variable = project failure				
	(1)		(2)	
Panel A: Multinomial logit estimates				
Abandoned				
Expectation error (sales)	0.0795	(0.88)	0.0304	(0.31)
University degree			0.197	(1.51)
Manager is male			−0.0932	(−0.45)
Experience within the firm (0–5 years)			−0.197	(−0.86)
Founder status			0.377***	(2.93)
Ln(age)			−0.424	(−1.17)
Financially constrained			2.753***	(19.50)
Ln(# employees)			−0.200***	(−3.82)
Constant	−3.325***	(−14.13)	−1.609	(−1.16)
Delayed				
Expectation error (sales)	0.199***	(2.94)	0.159**	(2.25)
University degree			0.141	(1.52)
Manager is male			−0.0791	(−0.48)
Experience within the firm (0–5 years)			0.245	(1.62)
Founder status			0.169*	(1.83)
Ln(age)			−0.396	(−1.59)
Financially constrained			1.810***	(16.99)
Ln(# employees)			−0.0762**	(−2.02)
Constant	−1.931***	(−13.15)	−0.344	(−0.35)
Downsized				
Expectation error (sales)	0.0581	(0.45)	0.0292	(0.23)
University degree			0.152	(0.90)
Manager is male			−0.111	(−0.40)
Experience within the firm (0–5 years)			0.113	(0.43)
Founder status			0.359**	(2.08)
Ln(age)			−0.483	(−1.04)
Financially constrained			1.660***	(8.70)
Ln(# employees)			−0.172***	(−2.69)
Constant	−3.758***	(−11.97)	−1.572	(−0.84)
Observations	5971		5971	
Pseudo R^2	0.027		0.112	
Dependent variable = project failure				
Panel B: Average marginal effects				
Abandoned				
Expectation error	0.00268	(0.49)	−0.000894	(−0.17)
University degree			0.00817	(1.18)
Manager is male			−0.00353	(−0.32)
Experience within the firm (0–5 years)			−0.0152	(−1.26)
Founder status			0.0170**	(2.47)

Table 7 (continued)

Dependent variable = project failure				
	(1)		(2)	
Ln(age)			−0.0156	(−0.81)
Financially constrained			0.119***	(15.71)
Ln(# employees)			−0.00931***	(−3.36)
Delayed				
Expectation error	0.0232***	(2.86)	0.0180**	(2.25)
University degree			0.0126	(1.22)
Manager is male			−0.00718	(−0.39)
Experience within the firm (0–5 years)			0.0311*	(1.88)
Founder status			0.0119	(1.16)
Ln(age)			−0.0370	(−1.34)
Financially constrained			0.160***	(14.41)
Ln(# employees)			−0.00482	(−1.16)
Downsized				
Expectation error	0.000585	(0.15)	−0.000160	(−0.04)
University degree			0.00301	(0.60)
Manager is male			−0.00253	(−0.31)
Experience within the firm (0–5 years)			0.00272	(0.35)
Founder status			0.00838*	(1.66)
Ln(age)			−0.0106	(−0.79)
Financially constrained			0.0290***	(5.71)
Ln(# employees)			−0.00396**	(−2.12)
Observations	5971		5971	

Panel A of this table presents coefficient estimates of multinomial logit models of investment failure. The dependent variable is categorized into abandoned, delayed, downsized, and successfully completed investment projects. The base category comprises companies that successfully completed their investment projects. Panel B presents average marginal effects. The number of observations is lower than in Table 6 because observations have been excluded if more than one answer was selected. The definitions of the variables are provided in Table 1. All regressions include year and industry fixed effects. T-statistics are shown in parentheses and are based on standard errors clustered at the firm level. Standard errors are obtained using the delta method. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively

6 Robustness

In the analyses presented so far. we used a measure of managerial overconfidence that is based on managerial sales forecasts. To check the robustness of our results, we also construct an overconfidence measure based on the managers' forecasts of future employment:

$$\Delta_E = EXP_{EMPLOYMENT} - 1_{(\Delta\text{EMPLOYMENT}\geq 1)},$$

where $EXP_{EMPLOYMENT}$ denotes the manager's expectation and is coded as 1 if the manager expects an increase in employment and coded as 0 otherwise.

$1_{(\Delta EMPLOYMENT \geq 1)}$ measures actual employment growth and is set equal to 1 if the growth rate is positive and to 0 otherwise. Again, the expectations error is measured as the difference between the reported expectation and the realization, i.e. actual employment growth.[11] In our full sample the realization exceeds expectations in 17% of the cases, meets expectations in 75% and falls short of expectations in 8% of the cases.

We repeat the entire analysis using this alternative overconfidence proxy. We start with the relation between overconfidence and investment intensity. The results are shown in Table 8. We no longer find a significant relation between overconfidence and total investment intensity (Panel A of Table 8). However, Panels B and C reveal that there is a significantly positive relation between overconfidence and expansion investments, and a significantly negative relation between overconfidence and replacement investments. Thus, our previous result that overconfident managers are more likely to expand their business still holds.

The results on the relation between overconfidence and investment failure are shown in Tables 9 and 10. They are consistent with those presented in Sect. 3. Most importantly, investment projects initiated by overconfident managers are significantly (at the 10% level) more likely to fail, and overconfident managers are significantly (at the 5% level) more likely to delay a project than their non-overconfident peers.

7 Conclusion

Previous research has shown that the investment level of firms with overconfident managers is more sensitive to changes in cash flow as compared to other firms (Malmendier and Tate 2005). These authors interpret their result as evidence that overconfident CEOs overinvest. If this was the case one would expect that investment projects undertaken by overconfident managers are more likely to fail. So far, this hypothesis has not been tested, most likely because of a lack of suitable data. In this paper, we try to fill this gap.

We use a unique panel data set provided by Kreditanstalt für Wiederaufbau (KfW). The data set comprises small and medium-sized German firms and spans the 12-year period from 2002 to 2013. We first confirm the finding of Malmendier and Tate (2005) and others that overconfident managers invest more than their non-overconfident peers. We also show that the relation between overconfidence and investment intensity is driven by expansion investments. We do not find a similar relation for replacement investments.

We then directly test whether managerial overconfidence has a significant impact on the success or failure of planned investment projects, where "failure" means that a planned project is delayed, downsized, or abandoned. Overall, our

[11] We acknowledge that the employment-based expectations error is likely to be a noisier proxy for managerial overconfidence than the sales-based estimation error, for example because of labour market rigidities.

Table 8 Tobit models of investment intensity using *employment-based expectation errors*

	(1)		(2)	
Dependent variable = investment intensity				
Expectation error (employment)	−0.0117	(−0.63)		
Expectation error = -1 (underconfidence)			0.0294	(1.10)
Expectation error = 1 (overconfidence)			0.0115	(0.38)
Cash flow	0.222***	(14.49)	0.222***	(14.49)
Sales growth	0.144***	(3.14)	0.145***	(3.15)
Ln (# employees)	−0.0281***	(−2.94)	−0.0288***	(−3.03)
Financially constrained	−0.417***	(−8.45)	−0.416***	(−8.41)
Observations	3393		3393	
Dependent variable = capacity expansion intensity				
Expectation error (employment)	0.044**	(2.12)		
Expectation error = − 1 (underconfidence)			−0.017	(−0.57)
Expectation error = 1 (overconfidence)			0.077**	(2.21)
Cash flow	0.100***	(6.33)	0.100***	(6.30)
Sales growth	0.216***	(4.04)	0.218***	(4.07)
Ln (# employees)	−0.017	(−1.50)	−0.018	(−1.58)
Financially constrained	−0.184***	(−3.86)	−0.183***	(−3.83)
Observations	2247		2247	
Dependent variable = replacement intensity				
Expectation error (employment)	−0.054***	(−4.04)		
Expectation error = -1 (underconfidence)			0.057***	(2.75)
Expectation error = 1 (overconfidence)			−0.050**	(−2.48)
Cash flow	0.073***	(6.67)	0.073***	(6.66)
Sales growth	−0.062**	(−2.17)	−0.062**	(−2.16)
Ln (# employees)	−0.001	(−0.21)	−0.002	(−0.23)
Financially constrained	−0.025	(−0.84)	−0.025	(−0.83)
Observations	2232		2232	

Panel A of this table presents average marginal effects of tobit models of investment intensity. Panel B and C report separate results for capacity expansion and replacement intensity. The definitions of the variables are provided in Table 1. All regressions include year and industry fixed effects. T-statistics are shown in parentheses and are based on standard errors clustered at the firm level. Standard errors are obtained using the delta method. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively

univariate and multivariate results provide empirical evidence that managerial overconfidence is positively related to investment failure as described above. More specifically, in a multinomial context in which we distinguish between the three different categories of failure we find that our proxy for overconfidence, the

Table 9 Logit models of investment project failure using *employment-based expectation errors*

	(1)		(2)	
Dependent variable = project failure				
Panel A: Logit estimates				
Expectation error (employment)	0.0938*	(1.67)	0.114*	(1.88)
University degree			0.167**	(2.02)
Manager is male			−0.124	(−0.92)
Experience within the firm (0–5 years)			0.141	(1.00)
Founder status			0.233***	(2.80)
Ln(age)			−0.638***	(−2.85)
Financially constrained			2.250***	(22.87)
Ln(# employees)			−0.101***	(−2.98)
Constant	−1.472***	(−12.15)	1.043	(1.18)
Observations	5908		5908	
Pseudo R^2	0.0118		0.134	
Panel B: Average marginal effects				
Expectation error (employment)	0.0174*	(1.67)	0.0177*	(1.88)
University degree			0.0260**	(2.01)
Manager is male			−0.0193	(−0.92)
Experience within the firm (0–5 years)			0.0219	(1.00)
Founder status			0.0362***	(2.81)
Ln(age)			−0.0994***	(−2.86)
Financially constrained			0.350***	(27.66)
Ln(# employees)			−0.0157***	(−3.00)
Observations	5908		5908	

Panel A of this table presents coefficient estimates of logit models of investment success. The dependent variable is equal to one if the planned investment project failed and zero otherwise. Panel B presents average marginal effects. The definitions of the variables are provided in Table 1. All regressions include year and industry fixed effects. T-statistics are shown in parentheses and are based on standard errors clustered at the firm level. Standard errors are obtained using the delta method. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively

managerial expectation error, is associated with a significantly higher probability that investment projects are delayed. This is consistent with the view that overconfident managers consider problems they may be facing as transitory in nature, and it is consistent with the notion that overconfident managers are more likely to behave in a way that reduces cognitive dissonance.

Overall, our results contribute to a better understanding of the link between managerial overconfidence on the one hand and corporate financial decisions and their outcome on the other hand.

Table 10 Multinomial logit models of investment project failure using *employment-based expectation errors*

	(1)		(2)	
Dependent variable = project failure				
Panel A: Multinomial logit estimates				
Abandoned				
Expectation error (employment)	−0.0840	(−0.85)	−0.0636	(−0.58)
University degree			0.255*	(1.81)
Manager is male			−0.256	(−1.22)
Experience within the firm (0–5 years)			−0.151	(−0.61)
Founder status			0.341**	(2.48)
Ln(age)			−0.390	(−1.03)
Financially constrained			2.889***	(19.72)
Ln(# employees)			−0.204***	(−3.78)
Constant	−3.344***	(−13.83)	−1.751	(−1.20)
Delayed				
Expectation error (employment)	0.156**	(2.18)	0.168**	(2.23)
University degree			0.149	(1.57)
Manager is male			−0.184	(−1.14)
Experience within the firm (0–5 years)			0.207	(1.28)
Founder status			0.113	(1.19)
Ln(age)			−0.608**	(−2.37)
Financially constrained			1.948***	(17.56)
Ln(# employees)			−0.0704*	(−1.76)
Constant	−1.898***	(−12.93)	0.591	(0.58)
Downsized				
Expectation error (employment)	0.175	(1.28)	0.184	(1.32)
University degree			0.0861	(0.49)
Manager is male			0.0697	(0.22)
Experience within the firm (0–5 years)			0.202	(0.72)
Founder status			0.239	(1.33)
Ln(age)			−0.618	(−1.23)
Financially constrained			1.788***	(9.22)
Ln(# employees)			−0.126*	(−1.87)
Constant	−3.775***	(−11.73)	−1.314	(−0.65)
Observations	5764		5764	
Pseudo R^2	0.0133		0.105	
Dependent variable = project failure				
Panel B: Average marginal effects				
Abandoned				
Expectation error (employment)	−0.00650	(−1.16)	−0.00610	(−1.12)
University degree			0.0106	(1.54)
Manager is male			−0.0105	(−1.03)
Experience within the firm (0–5 years)			−0.0111	(−0.93)
Founder status			0.0150**	(2.24)

Table 10 (continued)

	(1)		(2)	
Ln(age)			−0.00943	(−0.52)
Financially constrained			0.114***	(15.84)
Ln(# employees)			−0.00900***	(−3.44)
Delayed				
Expectation error (employment)	0.0187**	(2.21)	0.0193**	(2.28)
University degree			0.0130	(1.26)
Manager is male			−0.0179	(−1.00)
Experience within the firm (0–5 years)			0.0248	(1.42)
Founder status			0.00696	(0.67)
Ln(age)			−0.0611**	(−2.16)
Financially constrained			0.174***	(15.69)
Ln(# employees)			−0.00455	(−1.05)
Downsized				
Expectation error (employment)	0.00452	(1.14)	0.00453	(1.14)
University degree			0.000949	(0.19)
Manager is male			0.00368	(0.41)
Experience within the firm (0–5 years)			0.00508	(0.64)
Founder status			0.00524	(1.05)
Ln(age)			−0.0133	(−0.96)
Financially constrained			0.0325***	(6.53)
Ln(# employees)			−0.00264	(−1.41)
Observations	5764		5764	

Panel A of this table presents coefficient estimates of multinomial logit models of investment success. The dependent variable is categorized into abandoned, delayed, downsized, and successfully completed investment projects. The base category comprises companies that successfully completed their investment projects. Panel B presents average marginal effects. The number of observations is lower than in Table 9 because observations have been excluded if more than one answer was selected. The definitions of the variables are provided in Table 1. All regressions include year and industry fixed effects. T-statistics are shown in parentheses and are based on standard errors clustered at the firm level. Standard errors are obtained using the delta method. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively

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References

Ahmed AS, Duellman S (2013) Managerial overconfidence and accounting conservatism. J Account Res 51:1–30

Alicke M (1985) Global self-evaluation as determined by the desirability and controllability of trait adjectives. J Pers Soc Psychol 49:1621–1630

Andriosopoulos D, Andriosopoulos K, Hoque H (2013) Information disclosure, CEO overconfidence, and share buyback completion rates. J Bank Finance 37:5486–5499

Asker J, Farre-Mensa J, Ljungqvist A (2015) Corporate investment and stock market listing: a puzzle? Rev Financial Stud 28:342–390

Banerjee S, Humphery-Jenner M, Nanda V (2015) Does CEO bias escalate repurchase activity? J Bank Finance 93:105–126

Ben-David I, Graham J, Harvey C (2013) Managerial miscalibration. Quart J Econ 128:1547–1584

Campbell TC, Gallmeyer M, Johnson SA, Rutherford J, Stanley BW (2011) CEO optimism and forced turnover. J Financ Econ 101:695–712

Chang T, Solomon D, Westerfield M (2016) Looking for someone to blame: delegation, cognitive dissonance, and the disposition effect. J Finance 71:267–302

Cordeiro L (2009) Managerial overconfidence and dividend policy. working paper, February.

Deshmukh S, Goel AM, Howe KM (2013) CEO Overconfidence and dividend policy. J Financial Intermed 22:440–463

Doukas JA, Petmezas D (2007) Acquisitions, overconfident managers and self-attribution bias. Eur Financ Manag 13:531–577

Ferris SP, Jayaraman N, Sabherwal S (2013) CEO Overconfidence and international merger and acquisition activity. J Financial Quant Anal 48:137–164

Festinger L (1957) A theory of cognitive dissonance. Row Peterson, Evanston, Illinois

Forbes D (2005) Are some entrepreneurs more overconfident than others? J Bus Ventur 20:623–640

Galasso A, Simcoe TS (2011) CEO Overconfidence and Innovation. Manag Sci 57:1469–1484

Gennaioli N, Ma Y, Shleifer A (2016) Expectations and investment. NBER macroeconomics annual 2015.

Gervais S, Heaton JB, Odean T (2011) Overconfidence, compensation contracts, and capital budgeting. J Financ 66:1735–1777

Gibbons FX, Eggleston TJ, Benthin AC (1997) Cognitive reactions to smoking relapse: the reciprocal relation between dissonance and self-esteem. J Pers Soc Psychol 72:184–195

Glaser M, Weber M (2007) Overconfidence and trading volume. Geneva Risk Insur Rev 32:1–36

Goel AM, Thakor AV (2008) Overconfidence, CEO selection and corporate governance. J Financ 63:2737–2784

Graham JR, Harvey CR, Huang H (2009) Investor competence, trading frequency and home bias. Manage Sci 55:1094–1106

Graham JR, Harvey CR, Puri M (2013) Managerial attitudes and corporate actions. J Financ Econ 109:103–121

Heaton JB (2002) Managerial optimism and corporate finance. Financ Manage 31:33–45

Hirshleifer D, Low A, Teoh SH (2012) Are overconfident CEOs better innovators? J Financ 67:1457–1498

Hribar P, Yang H (2015) CEO overconfidence and management forecasting. Contemp Account Res 33:204–227

Huang J, Kisgen D (2013) Gender and corporate finance: are male executives overconfident relative to female executives? J Financ Econ 108:822–839

Johnson D, Fowler J (2011) The evolution of overconfidence. Nature 477:317–320

Kahnemann D, Tversky A (1979) Prospect theory: an analysis of decision under risk. Econometrica 47(2):263–292
Kolasinski AC, Li X (2013) Can strong boards and trading their own firm´s stock help CEOs make better decisions? evidence from acquisitions by overconfident CEOs. J Financ Quant Anal 48:1173–1206
Landier A, Thesmar D (2009) Financial contracting with optimistic entrepreneurs. Rev Finan Stud 22:117–150
Lee JM, Hwang B-H, Chen H (2017) Are founder-CEOs more overconfident than professional CEOs? evidence from S&P 1500 companies. Strateg Manag J 38:751–769
Levi M, Li K, Zhang F (2014) Director gender and mergers and acquisitions. J Corp Finan 28:185–200
Mace C (2017) Revisiting overconfidence: evidence of profitability and covariate imbalance. Working Paper.
Malmendier U, Tate G (2005) CEO overconfidence and corporate investment. J Financ 60:2661–2700
Malmendier U, Tate G (2008) Who makes acquisitions? CEO overconfidence and the market´s reaction. J Financ Econ 89:20–43
Malmendier U, Taylor T (2015) On the verges of overconfidence. J Econ Perspect 29:3–8
Malmendier U, Tate G, Yan J (2011) Overconfidence and early-life experiences: the effect of managerial traits on corporate financial policies. J Financ 66:1687–1733
Moore DA, Healy PJ (2008) The trouble with overconfidence. Psychol Rev 115:502–517
Phua K, Tham M, Wei C (2018) Are overconfident CEOs better leaders? Evidence from stakeholder commitments. J Financ Econ 127:519–545
Roll R (1986) The hubris hypothesis of corporate takeovers. J Business 59:197–216
Shepherd DA, Williams TA, Patzelt H (2015) Thinking about entrepreneurial decision making: review and research agenda. J Manag 41:11–46