TI 2015-124/VII
Tinbergen Institute Discussion Paper

Are Entrepreneurs more Optimistic and Overconfident than Managers and Employees?

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November 5, 2015

Abstract

Empirical evidence supports the conventional wisdom that entrepreneurs are more optimistic and overconfident than others. However, the same holds true for top managers. In this lab-in-the-field experiment we directly compare the scores of entrepreneurs, managers and employees on a comprehensive set of measures of optimism and overconfidence (n = 2,058). The results show that on average entrepreneurs are more optimistic than others in their dispositional optimism and attributional style when bad events occur. For incentivized measures of overconfidence we find no difference between entrepreneurs and managers, although both are more prone to it than employees. Finally, exploration of within-group heterogeneities shows that optimism and success are more strongly related for managers than for entrepreneurs and that an average entrepreneur is not more optimistic than successful managers. We conclude that optimism and overconfidence are indeed characteristics of entrepreneurs, but they are not unique when compared to (top) managers.

Key words: Entrepreneurs, managers, dispositional optimism, attributional style, overestimation, overconfidence, behavioral economics.
JEL codes: L26, C93, D03, M13.

"*I am an optimist. I think you have to be, to be an entrepreneur.*" – *Mark Zuckerberg*

1. Introduction

This study aims at testing whether, in what respect, and to what extent entrepreneurs are more optimistic and overconfident than managers and employees. Conventional wisdom has it that especially entrepreneurs are among the most optimistic and overconfident types, and that self-selection

into entrepreneurship would be promoted by such optimism and/or overconfidence.[1] Moreover, optimism and overconfidence have also been put forward as a main explanation for why people persist in entrepreneurship despite the fact that earnings are lower and riskier on average than in paid employment (Hamilton, 2000; Moskowitz and Vissing-Jorgensen, 2002).[2] Optimism and overconfidence might also impact the level of success of the firm and its way of financing (Bitler et al., 2005; Puri and Robinson, 2006; and Landier and Thesmar, 2009).

Interestingly, many of these results have also been documented in the literature on (top) managers. That is, managers have also been found to be more optimistic and overconfident than others, and a number of empirical studies have showed that these behavioural traits can account for some of the heterogeneity in corporate policies (Bertrand and Schoar, 2003; Malmendier and Tate, 2005, 2009; and Graham et al., 2013). Various theoretical explanations have been put forward to rationalize these findings, including selection into and out of management, slightly overconfident managers leading to less manager-shareholder conflicts, and overconfident employees having a higher probability of being promoted to CEO (Goel and Thakor, 2008; Hackbarth, 2008; and Campbell et al., 2011). Van den Steen (2004) provides an alternative reason why managers (and entrepreneurs) are more overconfident than regular employees. In his model, overconfidence increases in the number of actions an agent can choose from. Therefore, "An agent who can choose his own projects will be more optimistic than one who gets assigned his projects. This may be one reason why entrepreneurs often seem more overoptimistic than regular employees. It also implies that restricting a manager's degree of freedom may reduce her bias." (p. 1144).

Surprisingly, very little is known about the levels of optimism and overconfidence of entrepreneurs vis-à-vis managers. Hence, are optimism and overconfidence truly unique traits of entrepreneurs? Or do these traits rather pertain to strategic decision-makers in general? And finally, how do the arguably more successful managers and entrepreneurs compare to each other?

To answers these questions, we provide an encompassing assesment of the level and kind of optimism and overconfidence of entrepreneurs relative to managers and employees. Our large lab-in-the-field experiment includes two well-defined survey measures of optimism, i.e. dispositional optimism (Scheier and Carver, 1985, and Scheier et al., 1994) and attributional style (Seligman, 2000), and two well-defined incentivized measures of overconfidence, i.e. overestimation of one's own ability (e.g., Moore and Healy, 2008) and overestimation of a future stock market closing price (cf. Bengtsson and Ekeblom, 2014).

[1] For optimism, see e.g. Krueger et al. (2000); Hmieleski and Baron (2009); and Puri and Robinson (2013). For overconfidence, see e.g. Abdelsamad and Kindling (1978); Cooper et al. (1988); Kahneman and Lovallo (1993); Busenitz and Barney (1997); Camerer and Lovallo (1999); Arabsheibani et al. (2000); Simon et al. (2000); Astebro (2003); Lovallo and Kahneman (2003); Fraser and Greene (2006); Puri and Robinson (2006); Crane and Crane (2007); Puri and Robinson (2007); Koellinger et al. (2007); Koellinger (2008); Trevelyan (2008); Landier and Thesmar (2009); Cassar (2010); Ucbasaran et al. (2010); Rietveld et al. (2013); Bengtsson and Ekeblom (2014); Dawson et al. (2014); and Dawson et al. (2015).

[2] Alternative explanations for this puzzle include higher risk appetites (e.g., Hvide and Panos, 2014), non pecuniary benefits deriving from higher levels of autonomy and control (e.g., Blanchflower and Oswald, 1998; Hamilton, 2000; Hurst and Pugsley, 2011; and Puri and Robinson, 2013), different selection and treatment effects of personality traits (e.g. Hamilton et al., 2014), and status concerns (e.g., Parker and Van Praag, 2010). See also Astebro et al. (2014) for an overview of the (behavioral) roots of entrepreneurship.

Overall, our study has three distinguishing features relative to the literature. First and foremost, measuring and comparing an entrepreneur's (optimistic or pessimistic) attributional style is novel, and we find it to be a key differentiating factor between entrepreneurs and managers. The only entrepreneurship study we know of that also includes the attributional style measure is Krueger et al. (2000). They use a version of Seligman (2000)'s measure of learned optimism to explain entrepreneurial intentions among 97 students. In contrast, our sample consists of 1,391 established entrepreneurs and managers, hence those individuals who have realized their intentions. A second distinguishing feature of our study is that we compare entrepreneurs with two specific groups, i.e. managers and employees, rather than just the public at large (see also Koudstaal et al., 2015). Entrepreneurs and managers may be relatively similar to each other, both being responsible for strategic decisions and for hiring and directing their personnel (see Table 1 for an admittedly simplified and rough comparison).

Table 1 Simplified Differences Between Entrepreneurs, Managers, and Employees

	Entrepreneurs	Managers	Employees
Bearing responsiblility for taking strategic decisions	Yes	Yes	No
Bearing responsibility for taking risks	Yes	Yes	No
Bearing responsiblility for hiring and managing personnel	Yes	Yes	No
Bearing full financial consequences of undertaken risks	Yes	No	No

In addition to these more functional similarities, our sample also reveals that entrepreneurs and managers are remarkably similar in terms of their background characteristics. The differences between entrepreneurs and managers might therefore be more informative on what really makes an entrepreneur different in terms of their optimism and overconfidence. Employees are nevertheless an interesting category to compare entrepreneurs and managers to, and also allow relating our study to previous studies that compare entrepreneurs with 'others' (e.g. Puri and Robinson, 2013). Finally, the third distinctive aspect of our study is the large samples of entrepreneurs, managers and employees, which allows us to create meaningful subsamples of (more successful) entrepreneurs and managers and to test the robustness of our findings to alternative definitions of these occupational groups.[3]

Based on a sample of 875 entrepreneurs, 516 managers and 667 employees (so $n = 2{,}058$), we find that entrepreneurs differ from managers and employees in their dispositional optimism and in

[3]In the baseline sample we take as 'entrepreneur' someone who founded, inherited or has taken over a company that s/he is currently (co-)managing and of which s/he has at least 5% of the shares. The stricter definitions of entrepreneurship we employ focus on those who are arguably more successful and thus more similar to the 'Schumpeterian' entrepreneur. These are the ones with an incorporated firm, earning above median income or having an above median number of employees. Managers in the overall sample are defined as employees in firms not started up by the respondent, and having at least two direct reports under their responsibility. Here stricter definitions are based on being the CEO, or having above median income or above median number of direct reports. Employees are the people who work in organizations and do not belong to the groups of entrepreneurs and managers.

their attributional style. Regarding dispositional optimism, entrepreneurs are significantly more optimistic than managers, who in turn are more optimistic than employees. We further show that 58% of entrepreneurs and 54% of managers are very optimistic, while only 32% of the employees are so. In terms of attributional style, entrepreneurs appear to be especially unique in their attitude towards dealing with bad events. They take these as more specific and less pervasive - thus a more optimistic approach - than managers and employees do. These findings confirm the stereotype that occupations with a high failure rate require an optimistic explanatory style to persist (Kahneman, 2011). In the area of overconfidence, we find that entrepreneurs and managers are alike. They both overestimate their own abilities as well as a future stock market closing price more than employees do, but they do not differ from each other.

The heterogeneity and other checks yield two additional notable findings. First, we find that the differences between entrepreneurs and managers in dispositional optimism and attributional style disappear when limiting the sample of managers to the arguably more 'successful' ones (a.o. CEOs). Optimism and success turn out to be even more positively correlated for managers than for entrepreneurs, and this might therefore explain the disappearance of differences between entrepreneurs and managers when considering solely CEOs. Second, we find that the results on overconfidence are largely robust to the use of different sample definitions, with two exceptions. First, when using the definitions of entrepreneurs and managers of Busenitz and Barney (1997), i.e., business founders who recently started their businesses and managers in firms with more than 10,000 employees, we find that entrepreneurs do overestimate themselves more than managers. The second exception in the overestimation results arises when we compare entrepreneurs in young and small firms to managers in fairly identical firms with arguably similar information availability. Again we find that entrepreneurs are more prone to overestimate their own ability than managers. Therefore, the question arises to what extent information availability really explains the differences (cf. Busenitz and Barney, 1997) or whether it is self-selection in the sample of entrepreneurs (cf. Landier and Thesmar, 2009; Van den Steen, 2011).

Unfortunately our study is purely descriptive and thus unable to identify cause and effect. In other words, we are unable to detect the source of differences in dispositional optimism and attributional style between entrepreneurs and managers, i.e. whether it is an 'endowment' or 'investment'. Similarly, little can be learned from our study about the potential causal relationship between optimism and success. A number of existing studies are informative in this regard, though. Longitudinal studies suggest that dispositional optimism, attributional style and overestimation are relatively stable traits throughout adult life (see e.g. Burns and Seligman, 1989; Carver et al., 2010; and Dawson et al., 2014). Dawson et al. (2014) explicitly study whether overestimation is a trait of future entrepreneurs or whether it is developed during entrepreneurship. They find stronger evidence for overestimation being a cause than a consequence of entrepreneurship, but the latter is not zero either. Regarding the potential correlation between optimism and success, some studies find it to be positive while others find a non-monotonic relationship.[4] By and large the collective

[4]For a positive relationship between optimism and success, see e.g. Seligman and Schulman (1986), Segerström

evidence seems to suggest that moderate levels of optimism are good, but extreme levels lower performance and success.

In what follows, we discuss the data, design and measurement choices in Section 2. In Section 3 we present the descriptive statistics, while we describe the empirical findings in Section 4. Section 5 provides a discussion and conclusion.

2. Design, measurement and sampling

2.1 Measurement of optimism

A variety of definitions and measures of optimism exist in the social sciences literature. In our study, we rely on two of them: dispositional optimism (Scheier and Carver, 1985 and Scheier et al., 1994) and an optimistic attributional style (Seligman, 2000). We select these two because they are among the main optimism measures within psychology (see Peterson, 2000, for an overview), and also among the main psychological measures of optimism used within economics (see e.g., Krueger et al., 2000; Puri and Robinson, 2006; Hmieleski and Baron, 2009; and Graham et al., 2013, for applications).[5] Furthermore, both dispositional optimism and an optimistic attributional style are found to be relatively stable over time as well as across situations, contexts, and cultures (see e.g. Burns and Seligman, 1989; Schulman et al., 1993; Scheier et al., 1994; Giltay et al., 2006; and Fisher and Chalmers, 2008). Finally, the attributional style test also bears the advantage of being hard to 'beat', i.e. test-takers cannot fake optimal responses (Schulman et al., 1987). The latter is important given that some entrepreneurs seem to fill out survey questions in line with what they view as being expected from entrepreneurs (see e.g., Koudstaal et al., 2015). We will now discuss each of the two measures in detail.

2.1.1 Dispositional optimism

Dispositional optimism is the global expectation that good things will be plentiful in the future and bad things will be scarce (e.g., Scheier and Carver, 1985; Scheier et al., 1994; and Peterson, 2000). It is measured using the brief 10-item self-report questionnaire of Scheier et al. (1994), which is also referred to as the Revised Life Orientation Test (LOT-R), see Figure 1 in Appendix C. Among the 10 items in the LOT-R, three of them are associated with positive expectations (1,4 and 10) and three with negative expectations (3,7 and 9). The remaining four statements are filler items (2,5,6 and 8). Each statement can be answered with either "Strongly disagree" (0 points), "Disagree"

(2007), Solberg Nes et al. (2009), and Kaniel et al. (2010). For a negative relationship between being too optimistic or overconfident and success, see e.g. Lowe and Ziedonis (2006), Puri and Robinson (2007), Hmieleski and Baron (2009), Dawson et al. (2014), and Dawson et al. (2015). Apart from better socioeconomic status (like education and income) and broader social networks, optimism has also been found to be positively associated with psychological well-being, better coping with adverse events and physical health. See Carver et al. (2010) for an informative overview.

[5] An exception is the comparative optimism measure used by Ucbasaran et al. (2010).

(1 point), "Neutral" (2 points), "Agree" (3 points) or "Strongly agree" (4 points). To obtain a score for optimism, the scores of all six non-filler items are added, where the items with negative expectations are reversely coded. Overall, participants thus obtain a minimum score of 0 points and a maximum score of 24 points. A participant who answers "Neutral" on all items ends up with a score of 12.

2.1.2 An optimistic attributional style

In contrast to dispositional optimism, focusing more on evaluations of future events, an optimistic attributional style measures an individual's explanatory style of past life events (Buchanan and Seligman, 1995). Optimists are referred to as those who believe that good events will persist (i.e. are "permanent") and will extend to other areas (i.e. are "pervasive"). Bad events are, by contrast, regarded as impermanent and non-pervasive. Unsurprisingly, for pessimists the opposite is true: they believe good events to be non-persistent (temporary) and non-pervasive and bad events as permanent and pervasive. Seligman (2000) further clarifies the aforementioned by considering an example with two accountants who are redundant in their firm (p. 90). Both are looking for a new job, but feel depressed due to their sacking. One of them, however, keeps on going to the gym, stays healthy and remains a loving family member at home, while the other falls apart and catastrophizes. The latter is what Seligman typifies as pessimistic behavior, while the former is what he deems the optimistic side of the same coin.

To measure the level of an optimistic attributional style, we use the 32-item optimism test from Seligman (2000), see also Figure 2 in Appendix C. The test generates scores on four variables: PmG (permanence of good events), PvG (pervasiveness of good events), PmB (permanence of bad events) and PvB (pervasiveness of bad events). We use the same scoring rule as Seligman (2000). Furthermore, the sum of PmG and PvG minus the sum of PmB and PvB gives an indication of the level of optimism in one's attributional style (range: -16 until 16). A high score is associated with optimism, as good events are believed to be caused by factors that are permanent and universal, whereas bad events are explained by temporary and specific causes. Conversely, low scores on attributional style are associated with pessimism: pessimists believe bad events to be caused by factors that are permanent and universal, whereas good events are temporary and specific.

2.2 Measurement of overconfidence

The two measures of overconfidence that we use focus on overestimation, or the behavioral bias where one can be shown to be too optimistic due to the availability of an objective 'right' estimate. While the general term 'overconfidence' has often been used to describe this bias, Astebro et al. (2014) rightly point out that "multiple measures and definitions across empirical studies have made it hard to pin down the precise bias that may be behind entrepreneurship" (p. 58). In earlier

work, Moore and Healy (2008) have therefore made a subtle distinction between overestimation, overplacement and overprecision, even though these terms might seem observationally equivalent. In this paper we will focus on incentivized measures of overestimation of (a) one's own ability and (b) a non-ability related quantity (stock index development).[6]

2.2.1 Overestimation of one's own ability

The first measure of overconfidence is measured as the difference between a participant's assessments of their own performance on ten Raven test questions with a varying level of difficulty and the actual number of correct answers. Trivia questions or Raven test questions are generally used to obtain a measure of overestimation (see e.g. Lichtenstein et al., 1982; Moore and Healy, 2008; and Herz et al., 2014).[7] Before answering the 10 Raven test questions, we provided an example to get participants accustomed with the task. After all 10 questions had been answered, participants had to indicate the number of correct answers.[8] The incentive was as follows: a correct answer (i.e. forecasted = actual) was rewarded with €100 and an incorrect answer with €0.

The number of correct answers itself was also measured and used as a proxy for intelligence in the set of control variables. This is possible because we selected as the first five Raven puzzles the one prescribed by Bilker et al. (2012), which are shown to have a correlation of 0.95 with the actual score on the full 60-item Raven Standard Progressive Matrices (RSPM) test. The last five Raven puzzles were selected from the shortened 12-item Raven test of Arthur and Day (1994), which are somewhat harder to answer correctly and therefore create - in combination with the first five - some extra dispersion across participant scores, especially at the high end.

2.2.2 Overestimation of a future stock market closing price

In line with Bengtsson and Ekeblom (2014), our second measure of overconfidence is based on forecasts of a future stock market closing price. We consider this measure to be complementary to the previous measure in the sense that this one is uncorrelated with the individual's own life or work situation (Bengtsson and Ekeblom, 2014). However, the flip side of this advantage is that it also introduces two drawbacks; first, the realization is similar for everybody and second, there might be a larger scope for unobserved differences in e.g. skills. We are therefore mainly interested if overestimation of own ability extends to situations that are less under an individual's control.

[6] Incentivized behavioral measures of overoptimism about the future have been used before by e.g. Weinstein (1980), Dunning et al. (2004), Ben-David et al. (2013) and Bengtsson and Ekeblom (2014).

[7] Since our survey was online, we opted for Raven puzzles instead of trivia questions to alleviate the possibility of participants looking up the answers on the internet.

[8] A potential critique of this setup might be that more (less) able participants are less (more) likely to overestimate themselves. However, this criticism may be less relevant in our particular case. Only 31 out of 2,058 participants answered either zero or all questions correctly, and only 2 of these participants correctly forecasted that.

To measure overestimation of a future stock market closing price, participants are requested to provide a 3-month forecast of the value of the AEX index (the Dutch stock market index composed of companies that trade on NYSE Euronext Amsterdam). The measure of overestimation subtracts from this forecast the actual value on the date for which the forecast was requested (September 1st 2014). To help participants, we disclosed the rounded AEX closing price of May 6th, which was 397. As an incentive, selected prize winners were rewarded with €100 if their estimate was within 10 points from the actual closing price, and €0 otherwise.

2.3 Sampling

The data collection uses the same approach as Koudstaal et al. (2015), which is a combination of a lab-in-the-field experiment and an online survey. The procedure to reach large samples of entrepreneurs, managers and employees was also similar. Again, for reaching volume in the entrepreneur sample, we teamed up with "Synpact", a company that has access to more than 15,000 entrepreneurs in the Netherlands. All of these entrepreneurs received an invitation to participate in the online research and a link to the questionnaire and experiments. The control group of managers was again drafted from the large and highly reputed training center De Baak, which is part of the largest and influential employers organization in the Netherlands ("VNO-NCW, MKB-Nederland"). We approached 4,131 managers in their files. Finally, the same invitation and survey were sent to a sample of 7,500 employees, recruited via a Dutch market research agency with access to over 70,000 Dutch employees.

All invitations were sent out to all groups on May 7th 2014, with the explicit mentioning of a response time of 14 days at maximum. A reminder was sent out after 7 days. 875 entrepreneurs, 516 managers and 667 employees completed the survey. Similar to Koudstaal et al. (2015), the response rates were thus in the range of 5-15% and in line with expectations of Synpact and De Baak who regularly send out qualitative surveys to their database on their own. A comparison of respondents' background characteristics in this research wave and the one gathered in November 2013 (see Koudstaal et al., 2015) yields that the distributions of background variables among entrepreneurs, managers and employees are generally similar across the two rounds.

2.3.1 Definition of subsamples

The qualifying characteristics for inclusion in the entrepreneur sample were similar as in Koudstaal et al. (2015). That is; 'entrepreneurs' are all people who have founded, inherited or taken over a company that they are currently (co-)managing. We also classified participants as 'entrepreneurs' when they currently (co-)manage a company which they joined within 5 years after start-up and of which they have obtained at least 5% of the company shares.[9] 'Managers' are all people who are employed by an organization that they did not start up themselves and have at least two

[9]The Dutch tax authority considers a five percent ownership to be a substantial interest.

subordinates for whom they are directly responsible. Project managers also classify in case of overall project responsibility and at least two direct reporting lines. People belong to the group of 'employees', finally, if they are employed by an organization and do not belong to the first two groups. Participants who were eligible for multiple subsamples were instructed to select the one generating most of their income.

2.4 Incentives

Respondents were requested to first complete the two unincentivized parts (on dispositional optimism and attributional style) and then fill out the two incentivized parts (ten Raven test questions and the AEX 3 month forecast). All participants were first informed about the general setup of the survey and the incentives structure. Instructions also included examples and practice rounds to get acquainted with the experimental setup, which differed from many of the surveys that entrepreneurs and managers normally fill out. Overall, an average respondent spent 23 minutes on the survey, including possible breaks. Ex ante, the estimated average earnings per winning respondent were around €300. Participants could earn a maximum of €450, which consisted of a fixed fee of €250 and two times €100 that could be earned in the two incetivized parts. Given budget limitations and the rather high income levels of the participants in our survey, we chose to pay out a substantial (instead of very small) amount to a few (instead of all) randomly selected participants. In doing so, we follow e.g. Gneezy and Rustichini (2000) and Laury (2006) who show that this should produce similar results as when paying smaller amounts to all participants. In total, we selected 25 prize winners. This was clearly communicated at the beginning of our survey. Hence, *ex post* the chance to be paid out was 1/83, but this was unknown to the participants (and ourselves) *ex ante*. To further foster trust and truthful reporting, we assigned the selection of prize winners, all random draws, and the payouts to a civil-law notary.

3. Descriptive statistics

Panel A of Table 2 outlines the descriptive statistics of the measures of optimism and overconfidence we employ: dispositional optimism, attributional style, overestimation of own ability and the forecast of the 3-month AEX closing price (which was 414). Panel B shows the correlations between these measures. We find that individual scores on all measures vary substantially (Panel A), and that their intercorrelations are positive but low (Panel B), see also Isaacowitz and Seligman (2001), thus suggesting that the four measures pick up complementary aspects of optimism.

Table 3 shows the statistics of the background characteristics that will define stricter subsamples of entrepreneurs and managers (see also Koudstaal et al., 2015). The first Panel (A) shows the income distribution of each of the three samples, using the answer categories from the survey.

Table 2 Descriptive Statistics of the Optimism and Overconfidence Measures

Panel A: Means	Observations	Mean	St. dev.	Min.	Max.
Optimism					
- Dispositional optimism	2,058	16.96	4.08	0	24
- Attributional style	2,058	2.02	3.35	-15	13
Overconfidence					
- Overestimation of own ability	2,058	0.74	1.65	-6	8
- Overestimation of AEX 3M closing price	2,058	1.92	32.79	-404	313

Panel B: Correlations	Dispositional optimism	Attributional Style	Overestimation *Own ability*
Attributional style	0.25 ***	-	
Overestimation of own ability	0.01	0.05 *	-
Overestimation of AEX 3M closing price	0.06 *	0.04	0.02

* Denotes statistical significance at the 10% level; ** at the 5% level; *** at the 1% level.

Entrepreneurs are over-represented in both tails of the income distribution relative to managers and employees, consistent with previously obtained evidence, e.g. Hamilton (2000). The average levels of entrepreneurial and managerial incomes are similar. For both groups, the median income category is €50,001-€75,000, while the median employee income falls in the category €25,001-€50,000 (note that the modal income was €33,000 in The Netherlands in 2014).

Panel B further describes the sample of entrepreneurs and managers that participated in our experiment. 80% of the entrepreneurs are firm founders, 17% of the firms were acquired by takeover, and the remaining 3% of the entrepreneurs have joined existing firms within 5 years after start-up and acquired a minimum of 5% of its shares. In later analyses, we will restrict the sample of entrepreneurs to align with part of the entrepreneurship literature (e.g. Begley, 1995; Busenitz andBarney, 1997; Sandri et al., 2010; and Holm et al., 2013). Likewise, for managers, we will analyze subsamples of CEOs (14%), project managers (15%), and general managers (71%).

Panel C describes the types of firm that entrepreneurs, managers and employees work in, a basis for the analysis of further relevant subgroups (see Section 4.2). 15% (31%) of the entrepreneurs are currently managing firms in the start-up (survival) phase (the definition of entrepreneurs used by, for instance, Brockhaus, 1980; Busenitz and Barney, 1997), whereas the rest is beyond that phase (the definition of Holm et al., 2013), We will also restrict the sample of entrepreneurs to those (52%) who are incorporated (see Levine and Rubinstein, 2013). The right handside of Panel C depicts the age and size distributions of the firms that managers and employees work for. They are rather similar, but different from the age and size distributions of entrepreneurial firms that are younger and smaller. As an additional heterogeneity check in Section 4.2 we will therefore limit

Table 3 Descriptives of the Variables to Define Sample Splits

	Entrepreneurs (n = 875)		Managers (n = 516)	Employees (n = 667)
Panel A: Income		*Panel A: Income*		
< €25,000	24%	< €25,000	6%	24%
€25,001 - €50,000	21%	€25,001 - €50,000	22%	58%
€50,001 - €75,000	16%	€50,001 - €75,000	29%	13%
€75,001 - €125,000	23%	€75,001 - €125,000	32%	5%
€125,001 - €200,000	10%	€125,001 - €200,000	8%	0%
€200,001 - €300,000	3%	€200,001 - €300,000	1%	0%
€300,001 - €400,000	1%	€300,001 - €400,000	1%	0%
> €400,000	2%	> €400,000	1%	0%
Panel B: Entrepreneur characteristics		*Panel B: Manager characteristics*		
Founder	80%	CEO	14%	-
Business taken over	17%	General Manager	71%	-
Joined the firm within 5 yrs	3%	Project Manager	15%	-
Panel C: Firm characteristics		*Panel C: Firm characteristics*		
Start-up phase (0 - 3 yrs)	15%	Firm age $\leq$ 5 yrs	4%	3%
Survival phase (0 - 5 yrs)	31%	Firm age 6 - 50 yrs	54%	59%
		Firm age > 50 yrs	42%	38%
Incorporated	52%	Firm size $\leq$ 25 FTE	12%	14%
Sole propriotership	37%	Firm size 26 - 1000 FTE	54%	53%
Other	11%	Firm size > 1000 FTE	34%	33%
Panel D: Management level (FTE)		*Panel D: Management level (direct reports)*		
0	17%	2 - 5	41%	-
1	26%	6 - 10	28%	-
2 - 5	23%	11 - 25	17%	-
6 - 10	9%	26 - 50	5%	-
11 - 25	13%	More than 50	2%	-
26 - 50	4%			
51 - 100	4%			
101 - 500	3%			
More than 500	1%			

the sample of managers to the ones of small and young firms, respectively, to form an arguably more 'entrepreneurial' benchmark group.

Panel D of Table 3 shows the distribution of the span of control of entrepreneurs and managers in our sample. 17% of the entrepreneurs in our sample have zero employees and 43% have at most one. As a final heterogeneity check we shall therefore also limit the sample of entrepreneurs and managers to those with an above median span of control (cf. e.g. Tag et al., 2013).

Table 4 compares the background characteristics of the three subsamples. As announed in the Introduction, entrepreneurs and managers are similar in terms of the most commonly used background characteristics. The only exception this time is that managers have a significantly higher average degree of education than entrepreneurs. Employees are again different in terms of all background characteristics.

Table 4 Background Characteristics of Entrepreneurs, Managers, and Employees

	Entrepreneurs ($n = 875$)	Managers ($n = 516$)	Employees ($n = 667$)
Age	48.71 [a]	47.66 [c]	43.13 [a,c]
Female (dummy)	0.27 [a]	0.27 [c]	0.47 [a,c]
Education (highest degree):	[d,e]	[e,f]	[d,f]
- High School	6%	4%	7%
- Lower intermediate vocational degree	12%	12%	34%
- College education	45%	38%	39%
- University education	37%	46%	20%
IQ (scale 0-10)	5.93 [a]	5.93 [c]	5.24 [a,c]

a) Significant difference between entrepreneurs and employees at the 5% level (two-sample t-test)
b) Significant difference between entrepreneurs and managers at the 5% level (two-sample t-test)
c) Significant difference between managers and employees at the 5% level (two-sample t-test)
d) Significant difference between entrepreneurs and employees at the 5% level (Kolmogorov-Smirnov test)
e) Significant difference between entrepreneurs and managers at the 5% level (Kolmogorov-Smirnov test)
f) Significant difference between managers and employees at the 5% level (Kolmogorov-Smirnov test)

4. Results

4.1 Main results

Table 5 first shows the means of the each of the two measures of optimism and overconfidence for each of the three groups of interest. Starting with dispositional optimism in the first column, we find that entrepreneurs have the highest average score of all groups. Employees follow at some distance, while managers end up in between (but closer to entrepreneurs). Note that the average score for employees is close to the 14.33 - 15.15 interval reported by Scheier et al. (1994). Further (unreported) descriptives reveal that 58% of entrepreneurs, 54% of the managers, and 32% of the employees can be classified as 'very optimistic' (i.e. have a score of 18 or more), which in the case

of managers is comparable to the 54% observed for European CEOs in Graham et al. (2013).[10] All percentages are significantly different from each other at the 5% level in two-sample t-tests.

Table 5 Raw Differences in Optimism and Overconfidence

	Optimism		Overconfidence	
	Dispositional optimism	Attributional Style	Overestimation *Own ability*	Overestimation *AEX 3M closing price*
	(n = 2,058)	(n = 2,058)	(n = 2,058)	(n = 2,017)
Entrepreneurs	17.87 [a,b]	2.68 [a,b]	0.84 [a]	2.99 [a]
Managers	17.52 [b,c]	1.86 [b,c]	0.82 [c]	4.27 [c]
Employees	15.32 [a,c]	1.28 [a,c]	0.55 [a,c]	-0.39 [a,c]

a) Significant difference between entrepreneurs and employees at the 5% level (two-sample t-test)
b) Significant difference between entrepreneurs and managers at the 5% level (two-sample t-test)
c) Significant difference between managers and employees at the 5% level (two-sample t-test)

The second column of Table 5 shows the means of the attributional style measure, with a similar pattern, although managers now end up closer to employees than to entrepreneurs. Again, all measured differences between the three groups are significant. Hence, entrepreneurs deal with past events in a significantly more optimistic way than managers, who in turn are more optimistic than employees. The last two columns of Table 5 pertain to overconfidence and show the mean values of the incentivized overestimation measures. Entrepreneurs overestimate themselves most of all three groups followed by managers and employees (3^{rd} column). The difference between entrepreneurs and employees is significant (5% level), while the difference between entrepreneurs and managers is not. Note that on average all groups overestimate themselves. When examining the overestimation measure related to the stock market forecast, this picture is reinforced (4^{th} column). Entrepreneurs and managers exhibit more overestimation than employees, but not than each other. The latter result is based on the winsorized part of the distribution (i.e. the 99% of the distribution which excludes the ends of the tails), to avoid a large role of outliers.[11]

In Table 6 we analyze the differences in dispositional optimism and attributional style using standard regression analyses. We start discussing the results for dispositional optimism, the most widely used measure of optimism in academic economics research (see e.g. Krueger et al., 2000; Puri and Robinson, 2006; Hmieleski and Baron, 2009; and Graham et al., 2013). The results reinforce what we learned from Table 5: Entrepreneurs are most inclined to be optimistic about the future

[10] Note that these percentages still seem much lower than what is found for US CEOs (Graham et al., 2013) and what seems to be the case for US entrepreneurs (Hmieleski and Baron, 2009). Although Hmieleski and Baron (2009) do not report actual percentages, their average LOT-R score suggests that US entrepreneurs are more optimistic than the entrepreneurs who have participated in this study.

[11] This effectively implied dropping all answers corresponding to a very unrealistic expected return of approximately (minus) 25% in 3 months.

Table 6 Ordered Probit Regressions on Dispositional Optimism and Attributional Style

Dep. variable:	(1) Dispositional optimism	(2) Dispositional optimism	(3) Dispositional optimism	(4) Attrib. Style	(5) Attrib. Style	(6) Attrib. Style
	Total Score	*Optimism*	*Pessimism*	*Total score*	*Score on Good events*	*Score on Bad events*
Entrepreneur	0.442***	0.401***	0.326***	0.179**	0.046	-0.212***
	[5.88]	[5.31]	[4.35]	[2.49]	[0.65]	[-2.93]
Manager	0.279***	0.239***	0.188**	0.001	-0.036	-0.048
	[3.79]	[3.22]	[2.53]	[0.02]	[-0.48]	[-0.64]
Age	0.060***	0.032*	0.070***	0.016	0.003	-0.019
	[3.36]	[1.72]	[3.94]	[0.95]	[0.15]	[-1.09]
Age^2/ 100	-0.058***	-0.028	-0.067***	-0.012	0.004	0.019
	[-2.97]	[-1.42]	[-3.46]	[-0.63]	[0.20]	[1.04]
Female	0.203***	0.121**	0.219***	0.087	0.154***	0.024
	[3.59]	[2.14]	[3.88]	[1.53]	[2.71]	[0.43]
Education	0.143***	0.051	0.164***	0.035	-0.124***	-0.160***
	[4.34]	[1.53]	[4.96]	[1.07]	[-3.76]	[-5.01]
Experience	-0.002	-0.001	-0.004	-0.009***	-0.006*	0.007**
	[-0.59]	[-0.19]	[-1.26]	[-2.76]	[-1.78]	[2.02]
IQ	0.046***	0.017	0.059***	-0.007	-0.042***	-0.033**
	[3.24]	[1.17]	[4.12]	[-0.47]	[-2.87]	[-2.33]
Ln(income)	0.198***	0.177***	0.170***	0.134***	0.108***	-0.083**
	[5.90]	[5.26]	[4.97]	[4.09]	[3.26]	[-2.56]
constant	-1.089**	-0.159	-1.495***	1.369***	2.151***	4.659***
	[-2.03]	[-0.32]	[-3.12]	[2.62]	[4.47]	[10.09]
Obs.	1,691	1,691	1,691	1,691	1,691	1,691
Log lik.	-4,529.2	-3,573.0	-3,698.6	-4,346.0	-3,696.4	-3,758.9
ENT=MAN [1)]	<0.01 ***	<0.01 ***	0.03 **	<0.01 ***	0.18	<0.01 ***

[1)] This row reports the p-values of Wald tests on β(Entrepreneur) = β(Manager).

Notes: The variables 'Entrepreneur' and 'Manager' are dummy variables that are 1 if the specific (main) occupational category applies. The categorical variables 'education' and 'income' have been summarized into one variable instead of using a set of dummies. The categorical education variable takes on the value 0 if the highest attained level is high school or lower, 1 if secondary education is obtained at a higher level, 2 if a participant has college education and 3 if the participant has a university degree. The originally categorical income variable has been collapsed into a continuous variable of which the natural log has been taken, using the midpoints of the categories (and 0.5 million euro for the upper category). Experience measures the years of experience as entrepreneur, manager, and employee, respectively. IQ is the number of correct answers to the ten Raven puzzles. Significance at the 10% level is denoted by *, 5% by **, and 1% by ***, with t-statistics reported in parentheses. Standard errors are robust.

and about the fact that bad events will be scarce. Managers on the other hand possess this attitude slightly less than entrepreneurs, but still more than employees. Some of the control variables show significant coefficients, too. For age, we find that people tend to become more optimistic until

Table 7 Probit / OLS Regressions on Overestimation and Correctness

Dep. variable:	(1) Over-estimation	(2) Over-estimation	(3) Correct estimation (YES=1; NO=0)	(4) Correct estimation (YES=1; NO=0)
	Own ability	*AEX 3M closing price*	*Own ability*	*AEX 3M closing price*
Regression type:	ordered probit	OLS	probit	probit
Entrepreneur	0.398***	3.983**	0.211**	0.162*
	[5.53]	[2.53]	[2.08]	[1.79]
Manager	0.367***	4.409***	0.220**	0.072
	[4.77]	[2.78]	[2.14]	[0.76]
IQ	-0.337***	-0.301		
	[-20.39]	[-1.00]		
Forecast			-0.041**	-0.005***
			[-2.11]	[-3.51]
Age	-0.010	0.074	0.106***	0.003
	[-0.58]	[0.18]	[3.93]	[0.14]
Age^2 / 100	0.024	-0.173	-0.123***	0.008
	[1.21]	[-0.39]	[-4.18]	[0.35]
Female	-0.099*	-0.759	-0.084	-0.136*
	[-1.76]	[-0.59]	[-1.07]	[-1.90]
Education	0.095***	0.549	-0.005	-0.004
	[2.81]	[0.78]	[-0.03]	[-0.09]
Experience	0.003	0.089	0.001	-0.010**
	[0.90]	[1.23]	[0.23]	[-2.46]
Ln(income)	-0.059*	0.889	0.032	0.106**
	[-1.70]	[1.20]	[0.70]	[2.53]
constant	5.587***	-10.41	3.114***	0.449
	[10.06]	[-1.00]	[4.66]	[0.65]
Obs.	1,691	1,663	1,691	1,663
Log lik.	-2,903.0	-7,485.4	-1,123.0	-1,121.6
ENT=MAN [1)]	0.62	0.74	0.89	0.26

[1)] This row reports the p-values of Wald tests on β(Entrepreneur) = β(Manager).

Notes: The variable 'Forecast' indicates one's estimate of one's own ability (0-10) in column 3 and one's estimate of the 3M AEX in column 4 (range: 316 - 511). All other variables have been specified before in Table 6. Significance at the 10% level is denoted by *, 5% by **, and 1% by ***, with t-statistics reported in parentheses. Standard errors are robust.

they reach the age of 52, after which it decreases again. Furthermore, women are more optimistic than men[12], people with higher levels of IQ and education tend to be more optimistic and experience

[12]So far, evidence for a relationship between gender and optimism has been mixed. Many studies find no difference

is insignificantly associated with dispositional optimism. When we decompose the dispositional optimism measure into an "optimistic" part (i.e. add the scores on items 1,4, and 10) and a "pessimistic" part (i.e. add the scores on items 3,7, and 9), it shows that the main results remain standing, see columns 2-3. In columns 4-6, the attributional style measure is further explored. We discuss the total measure in column 4, the sum of the factors the 'permanence of good event's (PmG) and 'pervasiveness of good events' (PvG) in column 5 ("Score on good events"), and finally the sum of the factors 'permanence of bad events' (PmB) and 'pervasiveness of bad events' (PvB) in column 6 ("Score on bad events"). Column 4 shows that controlling for a large set of background characteristics in a probit regression does not change the picture painted in Table 5 (raw means). Entrepreneurs have the most optimistic attributional style, all else equal. Managers are similar upon including controls. When distinguishing between good and bad events in columns 5 and 6 we see that entrepreneurs are different from the rest only because of their differential attributional style related to bad events. Unreported regressions show that the the significant difference that we find in column 6 largely pertains to the difference in the score on PvB, or the pervasiveness of bad events. Hence, entrepreneurs are distinct in what Seligman (2000) describes as: "Some people can put their troubles neatly into a box and go about their lives even when one important aspect of it - their job, for example, or their love life, is crumbling" (p. 90).

We now turn to discussing the regression results on overconfidence. The probit results in the first column of Table 7 show that both entrepreneurs and managers overestimate themselves more than employees do when estimating how many out of ten Raven puzzles they have solved correctly. However, we do not find that the difference between an 'average' entrepreneur and an 'average' manager reaches significance (the p-value of the Wald test $\beta_{ENT} = \beta_{MAN}$ is 0.62).[13]

Column 2 shows the regression output on stock market predictions, the other measure of overconfidence. Again, both entrepreneurs and managers are more likely to overestimate the future stock market than employees, but to a similar extent. Columns 3 and 4 repeat the analyses performed in (1) and (2) using as outcome measures dummies that are one for correct forecasts and zero otherwise.[14] While one might have expected based on columns 1 and 2 that entrepreneur and managers are less realistic in their forecasts, the opposite holds true. We find entrepreneurs and managers to be the two best performing groups, while employees follow at some distance. A closer examination of this result is referred to Section 4.3. We will now further explore the impact of

(e.g., Fischer and Leitenberg, 1986; Scheier et al., 1994; and Puskar et al., 1999), some more optimistic females like we do (e.g. Collard and Reynolds, 2004; Yazdipour, 2010), while the opposite is found by e.g. Stipek et al. (1981). Given that women are also more likely to experience a depression (see e.g. Piccinelli and Wilkinson, 2000, for a review), The Economist (2010) concluded that this either suggested that "women are more likely to experience more extreme emotions", or "that a few women are more miserable than men, while most are more cheerful".

[13] We obtain similar results (unreported) when we use a different methodology cf. Dawson et al. (2014). Overall, our results thus appears inconsistent with the findings of Busenitz and Barney (1997), who use different samples of entrepreneurs and managers. We will explore this issue further in the next section.

[14] A correct forecast in column (4) is a stock market forecast between 404 and 424 (i.e. less than 10 points off the realization of 414).

using alternative definitions of entrepreneurs and managers.

4.2 Heterogeneity checks

We first rerun the main regressions of Tables 6 and 7 on a subsample of entrepreneurs and managers

Table 8 Optimism of Entrepreneurs and Managers in Young and/or Small Firms

Dependent variable:	(1) Dispositional optimism	(2) Attrib. Style	(3) Over-estimation *Own ability*	(4) Over-estimation *AEX 3M closing price*
Panel A: Entrepreneurs and Managers in Firms ≤ 15 yrs, all Employees				
Entrepreneur ($n = 571$)	0.487^{***}	0.320^{***}	0.437^{***}	4.901^{***}
	[5.08]	[3.78]	[4.97]	[2.70]
Manager ($n = 90$)	0.264^{*}	0.172	0.240^{*}	6.048^{**}
	[1.87]	[1.25]	[1.96]	[2.01]
ENT = MAN [1)]	0.09 *	0.26	0.09 *	0.70
Panel B: Entrepreneurs and Managers in Firms ≤ 25 FTEs, all Employees				
Entrepreneur ($n = 779$)	0.495^{***}	0.276^{***}	0.368^{***}	3.541^{**}
	[5.96]	[3.59]	[4.74]	[2.10]
Manager ($n = 40$)	0.153	0.209	0.066	-4.030
	[1.22]	[1.19]	[0.43]	[-1.31]
ENT = MAN [1)]	< 0.01 ***	0.69	0.03 **	0.01 **
Panel C: Entrepreneurs in firms ≤ 2 yrs, Managers in firms ≥ 10,000 FTE, all Employees				
Entrepreneur ($n = 126$)	0.480^{***}	0.602^{***}	0.575^{***}	4.044^{*}
	[3.80]	[4.53]	[4.25]	[1.67]
Manager ($n = 56$)	0.156	0.231	0.185	2.064
	[0.98]	[1.44]	[1.23]	[0.62]
ENT = MAN [1)]	0.06 *	0.04 **	0.02 **	0.58

[1)] This row reports the p-values of Wald tests on β(Entrepreneur) = β(Manager).

Notes: Regressions and variables are similar to the ones reported in Tables 6 and 7. Significance at the 10% level is denoted by *, 5% by **, and 1% by ***, with t-statistics reported in parentheses. Standard errors are robust.

in young and small firms, see Table 8, thereby accounting for the very different distributions within the two groups of firm size and age, see Table 3. Panel A (young firms), Panel B (small firms) and Panel C (start-ups) show that most of the main outcomes of Section 3.1 extend to entrepreneurs and managers in young and/or small firms, although for managers some of the p-values turn higher than 0.10, likely due to smaller samples. The only notable additional finding is that arguably 'entrepreneurial' managers generally do not differ from entrepreneurs in their attributional style, but they do in their lower overestimation of their own ability. We find this result in both Panels A and B. Apparently entrepreneurs in younger and/or smaller firms seem to be more prone to overestimation than a control group of managers who work for comparable firms. In Panel C, we also compare founders of start-up firms ($<$ 3 years old) with managers in firms with more than 10,000 employees, cf. Busenitz and Barney (1997). Contrary to our result in Table 7, the difference between entrepreneurs and managers in overestimation of own ability now becomes significant at the 5% level. Taken together with Table 8, the data seem to be consistent with the view that different types are attracted to entrepreneurship (cf. Landier and Thesmar, 2009) rather than information availability or feedback being the main driver of the difference (cf. Busenitz and Barney, 1997). Interestingly, we do not obtain different conclusions when we look at the probabilities of being correct (analogous to the second part of Table 7).

We further examine the impact of using (stricter) definitions of entrepreneurs and managers in Table 9. Using the variation illustrated in Table 3, Panel A first analyzes with the following definitionsof entrepreneurs: (i) entrepreneurs with an incorporated firm, thereby mainly excluding the own-account self-employed, (ii) entrepreneurs with an above median number of fulltime equivalent employees in their company, (iii) entrepreneurs with above median incomes, (iv) entrepreneurs that have founded their business, instead of obtaining it through takeover or buy-in, and (v) entrepreneurs in the survival phase (firm age $\leq$ 5 years). For managers and employees we employ the original samples in Panel A. Its last line shows the result of Tables 6 and 7 again. Note that each coefficient is obtained in a separate regression. The panel shows a clear pattern consistent with the findings in Tables 6 and 7. Whatever definition of the entrepreneur is used, entrepreneurs assess themselves as more optimistic than both managers and entrepreneurs. Also the overestimation measures reveal largely the same outcomes, except that most of the findings on overestimation of the AEX closing price only turn significant at the 10% level, largely due to higher standard errors.

Panel B of Table 9 shows the results when the definition of a manager is varied (while using the complete samples of entrepreneurs and employees). We restrict the sample of managers to (vii) CEOs or general managers (so without project managers), (viii) CEOs exclusively, (ix) managers with more than the median number of direct reports, (x) managers with above median managerial income, and (xi) managers in firms that are older than 15 years old. The stricter definitions create samples of more successful managers and managers that can reasonably be expected to be more different from entrepreneurs than average, such as the ones employed in older firms. Again, the last line of the panel shows the benchmark result for managers taken from Tables 6 and 7. In contrast to Panel A, the main results change when considering the samples of (v) CEOs only, (vi) managers

Table 9 Differences in Optimism using Stricter Definitions of Entrepreneurs and Managers

Dependent variable:	(1) Dispositional optimism	(2) Attrib. Style	(3) Over-estimation *Own ability*	(4) Over-estimation *AEX 3M closing price*
Panel A: Subsets of Entrepreneurs				
i) Incorporated ($n = 461$)	0.472 [a,b]	0.196 [a,b]	0.412 [a]	3.647
	[4.90]	[2.27]	[4.66]	[1.85]
ii) Above median no. of employees ($n = 413$)	0.452 [a,b]	0.194 [a,b]	0.390 [a]	2.297
	[4.87]	[2.32]	[4.57]	[1.24]
iii) Above median ent. income ($n = 367$)	0.386 [a]	0.153 [a,b]	0.449 [a]	4.033
	[3.80]	[2.02]	[2.82]	[1.81]
iv) Founder ($n = 700$)	0.453 [a,b]	0.202 [a,b]	0.421 [a]	5.025 [a]
	[5.69]	[2.97]	[5.62]	[2.94]
v) In survival phase (firm age $\leq$ 5 yrs, $n = 277$)	0.609 [a,b]	0.227 [a,b]	0.542 [a]	2.320
	[5.44]	[3.16]	[5.15]	[0.67]
β(Entrepreneur) in Tables 6 & 7:	0.442 [a,b]	0.179 [a,b]	0.398 [a]	3.983 [a]
Panel B: Subsets of Managers				
vii) CEO or general manager ($n = 437$)	0.289 [b,c]	-0.003 [b]	0.384 [c]	3.925 [c]
	[5.74]	[-0.04]	[4.81]	[2.38]
viii) CEO ($n = 71$)	0.442 [c]	0.339 [c]	0.522 [c]	5.223
	[4.04]	[2.54]	[3.37]	[1.80]
ix) Above median no. of dir. reports ($n = 270$)	0.376 [c]	0.199 [c]	0.359 [c]	4.394 [c]
	[4.15]	[2.16]	[3.72]	[2.30]
x) Above median man. income ($n = 198$)	0.448 [c]	0.280 [c]	0.408 [c]	2.110
	[4.54]	[2.66]	[3.74]	[1.01]
xi) Manager in a firm that is $>$ 15 yrs old ($n = 427$)	0.299 [b,c]	0.053 [b]	0.392 [c]	3.901 [c]
	[3.96]	[0.07]	[4.85]	[2.36]
β(Manager) in Tables 6 & 7:	0.279 [b,c]	0.001 [b]	0.367 [c]	4.409 [c]
Panel C: Combinations of A&B				
i) vs. viii); p-values Wald tests	0.56	0.87	0.18	0.51
ii) vs. ix); p-values Wald tests	0.10	0.21	0.52	0.50
iii) vs. x); p-values Wald tests	0.66	0.75	0.41	0.46
Control variables	YES	YES	YES	YES

a) Significant difference between (subset of) entrepreneurs and employees at the 5% level (Wald test)

b) Significant difference between (subset of) entrepreneurs and (subset of) managers at the 5% level (Wald test)

c) Significant difference between (subset of) managers and employees at the 5% level (Wald test)

with above median direct reports, and (vii) managers with above average income (whereas the results don't change for subsamples (vii) and (xi). The difference between entrepreneurs and managers has vanished. Hence, successful managers and entrepreneurs both stand out from employees in their higher level of optimism.

Finally, in Panel C we test alternative definitions against each other. We compare (i) en-

trepreneurs of incorporated firms with CEOs, (ii) entrepreneurs and managers with larger spans of control, and (iii) entrepreneurs and managers with higher than median incomes. Overall, we find no differences in optimism between successful entrepreneurs and managers.

In Appendices A-B, we perform two additional tests. Appendix A deals with the potential concern that the three identified categories are not entirely mutually exclusive. For instance, entrepreneurs might also be employees or vice versa, and managers and employees might have taken their entrepreneurial experiences from the past into their current jobs. Appendix A1 shows some descriptives of the information on past work experiences across the different occupational categories that we gathered through the survey. 72% of the entrepreneurs in the sample have been a manager before, while 9% of the entrepreneurs is currently also a salaried employee in another firm. Moreover, 8% of the managers and of the employees owns a business on the side, whereas 11% of the managers and 9% of the employees have had one in the past. To cope with these 'grey' areas, we re-run the main regressions of Tables 6 and 7 including dummy variables for all the potential cross-occupational areas. Appendix A2 shows the results: almost none of these controls reach significance, and our main conclusions keep standing.

As a final heterogeneity check we explore variation in optimism within the samples of entrepreneurs and managers (Appendix B). More specifically, we explore the correlation between optimism and specific (crude) measures of performance. The results indicate that entrepreneurs with higher scores on dispositional optimism are more likely to be incorporated or to have an above median number of employees or income (see Panel A, columns (1a), (2a), and (3a)). In Panel B we find that the effect of attributional style is positive as well, although the coefficient only reaches significance in the case of incorporated entrepreneurs. Moving down to Panels C and D, we find largely insignificant differences between more and less successful entrepreneurs in their likelihood of overestimating their own ability or being correct about it.

For managers, we find similar patterns as for entrepreneurs, see columns (1b), (2b), and (3b). Those with higher scores on dispositional optimism and attributional style are significantly more likely to be a successful manager (e.g. a CEO or a manager with an above median number of direct reports or income). Again, success does not differentiate between managers who are more and less likely to provide correct or too high estimates of their own ability or the stock market index. Overall, we conclude that dispositional optimism, attributional style and success appear especially positively correlated for managers, and to a slightly lesser extent for entrepreneurs.

As a final check, we have analyzed an alternative measure of optimism using the data of Koudstaal et al. (2015) and the theoretical framework of Andersen et al. (2014). The latter show that entrepreneurs and non-entrepreneurs differ in their "probability optimism", which is the tendency to perceive an objective probability of winning a positive amount to be larger than an equal probability of losing the same amount. Examining the data, and in line with much of the previous, we find that both entrepreneurs and managers are more "probability optimistic" than employees, but do not differ from each other. Hence, compared to employees, they both view the probability of winning a positive amount more optimistically than the probability of losing the same amount.

5. Conclusion

Many of us have a brighter view on life than is warranted by reality. However, entrepreneurs are believed to be even more optimistic and overconfident than others. Why would one opt for entrepreneurship, with uncertain outcomes that are varying over time, and low on average? This choice may be explained by entrepreneurs holding (over-)optimistic beliefs. They would overestimate their probability of survival, neglect the quality of the competition, and overestimate the market for their product or service. In more direct tests between entrepreneurs and the population at large, the empirical evidence indeed suggests that entrepreneurs are not only more optimistic than others but also more prone to overconfidence. Yet, at the same time a different strand of literature shows that optimism and overconfidence are also behavioral traits prevalent among corporate managers such as CEOs and CFOs. Our analysis of the differences between entrepreneurs and managers in optimism and overconfidence can point out whether or not these are unique traits of entrepreneurs, or whether these characteristics pertain to strategic decision-makers in general. In other words, might a certain degree of optimism not only be required for entrepreneurship but also to climb the corporate ladder?

We have explored this question by means of a lab-in-the-field experiment among substantial groups of entrepreneurs, managers and employees (n = 2,058). We used two well-known measures of optimism, i.e. dispositional optimism and attributional style, and two well-known measures of overconfidence, i.e. overestimation of one's own ability and overestimation of a future stock market closing price. All measures test for slightly different sides of optimism and overconfidence. In that sense, we aim to provide an encompassing assessment of differences in optimism and overconfidence between the three groups of interest. Besides that, we believe we contribute to the literature by being the first to test the attributional style of entrepreneurs and managers, and more in general by testing optimism among such large samples of entrepreneurs and managers. The benefit of large samples proves to be particularly high when we explore the impact of alternative (and stricter) definitions of an entrepreneur and/or a manager. In the entrepreneurship literature, for instance, there is a debate going on about the definition of an entrepreneur.

The results indicate that entrepreneurs are more optimistic than managers and employees in their dispositional optimism and their attributional style. Concerning the latter, we do not find that entrepreneurs are significantly more optimistic about the permanence and pervasiveness of good events, but we do find significant differences when we examine attitudes towards dealing with bad events. Here it shows that entrepreneurs are more optimistic than both managers and employees, thus suggesting that they are more resilient in the face of setbacks than the other two groups. Furthermore, the two measures of overconfidence indicate that both entrepreneurs and managers are more prone than employees to overestimate their own ability or a future stock market closing price.

Our heterogeneity and robustness checks demonstrate that the main findings are hardly sensitive to the definitions used. There are two exceptions. Entrepreneurs in young and/or small firms seem

to overestimate themselves more than managers who work for comparable firms. Furthermore, when we restrict the sample of managers to the arguably more 'successful' ones (a.o. CEOs), we find that the gaps between entrepreneurs and managers on the two optimism measures vanish. Our analyses indicate that optimism and success are even more positively correlated within the sample of managers than within the sample of entrepreneurs. These same analyses also show that the more successful entrepreneurs and managers are not more overconfident than their less successful peers.

So do you have to be an optimist to be an entrepreneur, as Mark Zuckerberg suggested in one of the opening quotes? The answer appears to be yes. Moreover, our evidence also points out that entrepreneurs are not the only ones who are so optimistic and overconfident. Especially the more successful managers are so, too. Our findings thus show that; "The people who have the greatest influence on the lives of others are likely to be optimistic and overconfident..." (Kahneman, 2011, p. 256). More specifically, we find that entrepreneurs and managers are more overconfident than employees in general, whereas entrepreneurs and the most successful managers are more optimistic than others.

The fact that entrepreneurship and general management require an optimistic attitude is interesting from a managerial perspective as well. However, one needs to note that high level general managers will often work in management teams, probably consisting of CFOs and other functions. The same may be true, but to a lesser extent, for entrepreneurs. Future research might address the role of optimism and overconfidence of individuals working in teams and how a more pessimistic and less overconfident team member (for instance the CFO) might offset or strengthen the role of the CEO's optimism on team performance.

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ONLINE APPENDICES

Appendix A – Cross-occupational experience and the impact on optimism.

Appendix B – Correlations of optimism with success.

Appendix C – Survey screenshots.

Appendix A.1 Cross-Occupational Experience of Entrepreneurs, Managers and Employees

	Entrepreneur ($n = 875$)	Manager ($n = 516$)	Employee ($n = 667$)
% with Managerial Experience in the past	71.7	-	-
Level of past Managerial Experience (scale: 1-5)	1.72	-	-
% that is also Employee now	9.0	-	-
% that is also Entrepreneur now	-	7.9	8.0
Level of current entrepreneurial experience (scale: 1-8)	-	1.46	1.40
% with entrepreneurial experience in the past	-	11.0	9.3
Level of past entrepreneurial experience (scale: 1-8)	-	2.41	1.53

The 'level of managerial experience' is measured based on a question about the number of directly reporting subordinates when and if entrepreneurs were managers beforehand. The answering categories that we coded 1 to 5, respectively, are 2-5 // 6-10 // 11-25 // 26-50 // More than 50. The 'level of entrepreneurial experience' measure is based on the categorized answers to managers and employees how many fulltime equivalent people they employed when they were entrepreneurs. This question was posed only to those who had been entrepreneurs in the past. Answer categories were: 0 // 1-4 // 5-10 // 11-25 // 26-100 // 101-250 // 251-1,000 // More than 1,000 employees. The first answer (0) corresponds with a value of 1, the second answer (1-4) with a value of 2, and so on.

Appendix A.2 Cross-Occupational Experience and Optimism

Dep. variable:	(1) Dispositional optimism	(2) Attrib. Style	(3) Over-estimation	(4) Over-estimation	(5) Correct	(6) Correct
			Own ability	*AEX 3M closing price*	*Own ability*	*AEX 3M closing price*
Entrepreneur	0.489***	0.203**	0.396***	3.332*	0.327***	0.234**
	[5.60]	[2.41]	[4.79]	[1.89]	[2.72]	[2.20]
- Also employee	0.018	-0.150	-0.200	2.367	-0.084	-0.182
(YES=1; NO=0)	[0.13]	[-1.39]	[-1.49]	[0.73]	[-0.48]	[-1.18]
- Past mgmt experience	0.037	-0.003	-0.044*	-0.497	0.071*	0.034
(=0 if none)	[1.23]	[-0.01]	[-1.72]	[-0.81]	[1.88]	[1.02]
Manager	0.254***	0.001	0.397***	5.413***	0.191	0.033
	[3.22]	[0.01]	[4.80]	[3.07]	[1.63]	[0.33]
- Also entrepreneur	0.001	-0.075	0.168	-4.797*	0.079	0.269
(YES=1; NO=0)	[0.01]	[-0.58]	[1.10]	[-1.66]	[0.37]	[1.36]
- Past ent. experience	0.046	0.069	0.028	-0.179	0.037	0.031
(=0 if none)	[1.04]	[1.45]	[0.53]	[-0.16]	[0.51]	[0.42]
Employee						
- Also entrepreneur	0.038	0.025	-0.010	2.545	-0.456	0.296
(YES=1; NO=0)	[0.25]	[0.17]	[-0.06]	[1.04]	[-1.63]	[1.52]
- Past ent. experience	-0.014	0.013	0.078***	0.282	0.002	-0.056
(=0 if none)	[-0.46]	[0.41]	[2.59]	[0.30]	[0.04]	[-1.24]
Control variables	YES	YES	YES	YES	YES	YES
Obs.	1,691	1,691	1,691	1,663	1,691	1,663
Log lik.	-4,527.8	-4,344.3	-2,933.5	-74,83.2	-831.5	-1,113.0
ENT = MAN [1)]	<0.01 **	0.01 **	0.99	0.23	0.22	0.05 *

[1)] This row reports the p-values of Wald tests on β(Entrepreneur) = β(Manager).

This table reports the measures of optimism of enterpreneurs, managers and employees, but now including controls for cross-occupational experiences and interactions. All variables have been defined in Appendix Table B or before. Control variables are the same as in Table 6. Significance at the 10% level is denoted by *, 5% by **, and 1% by ***, with t-statistics reported in parentheses. Standard errors are robust.

Appendix B Correlations of Optimism with Success within Entrepreneurship and Management

Dep. variable:	Success measures					
	Incorporated	CEO	Above med. employees	Above med. direct reports	Above med. income	Above med. income
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Panel A						
Dispositional optimism	0.044***	0.048***	0.023*	0.028*	0.046***	0.052***
	[3.57]	[2.82]	[1.92]	[1.75]	[3.73]	[2.96]
$\beta_{ENT} = \beta_{MAN}$ [1)]	0.48		0.34		0.24	
Panel B						
Attrib. style	0.029**	0.053**	0.010	0.048***	0.007	0.052**
	[2.02]	[2.54]	[0.72]	[2.60]	[0.49]	[2.57]
$\beta_{ENT} = \beta_{MAN}$ [1)]	0.26		0.05 **		0.02 **	
Panel C						
Overestimation (own ability)	0.013	0.066	0.015	0.012	-0.004	0.052
	[0.39]	[1.27]	[0.47]	[0.28]	[-0.11]	[1.14]
$\beta_{ENT} = \beta_{MAN}$ [1)]	0.49		0.73		0.47	
Panel D						
Overestimation (AEX forecast)	0.002	0.004	0.002	0.001	0.004**	0.001
	[1.15]	[1.61]	[1.45]	[0.58]	[2.41]	[0.25]
$\beta_{ENT} = \beta_{MAN}$ [1)]	0.56		0.47		0.11	
Controls for age, gender, education and IQ	YES	YES	YES	YES	YES	YES

[1)] This row reports the p-values of Wald tests on β(Entrepreneur) = β(Manager).

Appendix C Survey screenshots

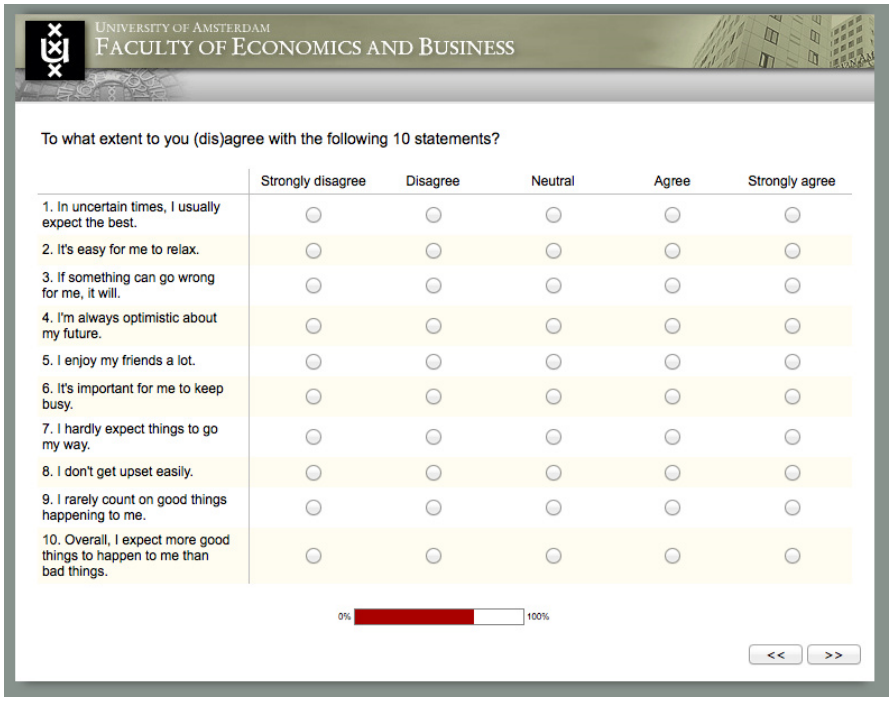

Figure 1: Dispositional Optimism

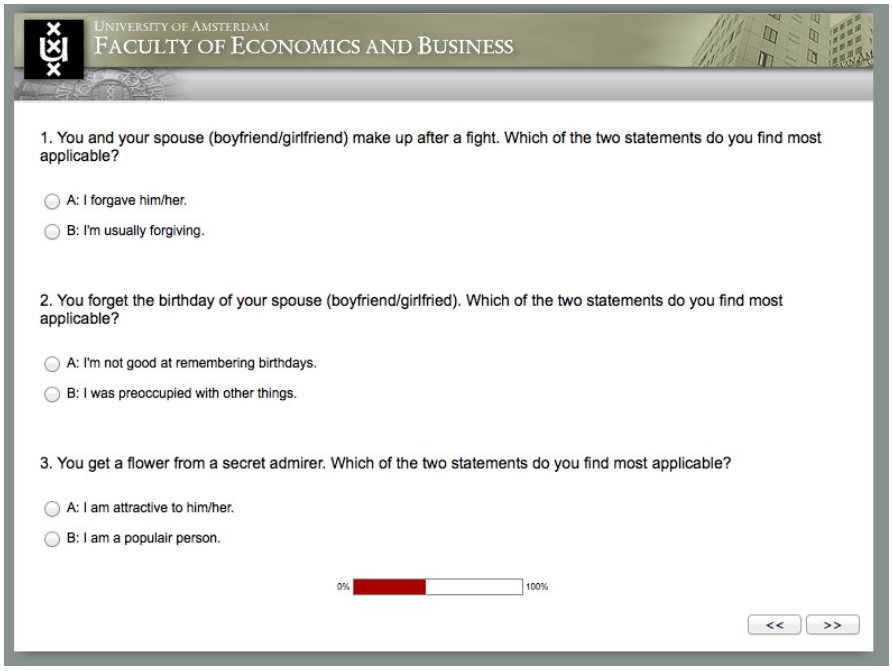

Figure 2: Attributional Style