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Reference point formation and new venture creation

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Abstract In this study, we introduce reference point formation as an important antecedent of new venture creation. Based on considerations from prospect theory, we hypothesize that individuals who generally and consistently set more aspiring reference points have a higher intention to form a new venture. Testing our hypothesis with entrepreneurs and managers, results show that entrepreneurs indeed set more aspiring reference points. Therefore, they might find themselves more often in a perceived loss situation which in turn increases their risk-taking behavior, following the predictions of prospect theory. In testing entrepreneurial intention of business graduate students, results are shown to be robust. We discuss theoretical and managerial implications of the findings and develop avenues for future research.

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1 Introduction

Although a high number of new ventures fail within a few years of their creation, thousands of individuals start their own business every year (Headd 2003). Hence, entrepreneurship research is interested in examining what drives some individuals to become entrepreneurs and which personal characteristics differentiate entrepreneurs from other groups, such as managers (Baron 1998; for an overview see Shane 2003; Shaver and Scott 1991). Despite decades of research, scholars still have an incomplete understanding of the factors and decision processes that lead an individual to become an entrepreneur (Grilo and Thurik 2008; Markman et al. 2002; Shane and Venkataraman 2000).

One important criterion for entrepreneurship is that entrepreneurs are willing to take risks (Knight 1921). Kihlstrom and Laffont (1979) were the first to formalize the idea that entrepreneurs tend to be less risk averse than society at large. Generally, models of occupational choice assume that entrepreneurs are characterized by a low degree of risk aversion (Blanchflower and Oswald 1998; Kanbur 1979).

Empirical evidence shows that returns from entrepreneurship are more variable than wages of employment (for an overview see de Wit 1993) and that average returns from poorly diversified private equity are unattractive compared to public equity (Moskowitz and Vissing-Jorgensen 2002), which suggest that entrepreneurs should be more risk tolerant. All in all, the proclivity to take risk is viewed as an important determinant of entrepreneurship (Stewart et al. 1999; Zhao et al. 2010).

Given that risk-taking behavior is accepted as a decisive element of entrepreneurship, prospect theory (Kahneman and Tversky 1979; Tversky and Kahneman 1992), which considers, in contrast to approaches that focus on personality traits of entrepreneurs, cognitive factors influencing risk attitudes, has received surprisingly little attention (Baron 2004; Palich and Bagby 1995). According to prospect theory, the perception of an outcome as either a gain or a loss relative to a reference point, which could be defined as a neutral point to compare actual states of wealth or welfare with (Kahneman and Tversky 1979), has a strong influence on risk-taking behavior. In general, people exhibit risk aversion when perceiving gains and risk-seeking behavior when perceiving losses, with significantly greater aversion to losses than appreciation of gains. Thus, the position of the reference point is a major determinant of risk-taking behavior in prospect theory, particularly because the same situation can be experienced as either a gain or as a loss, depending on the reference point. The reference point is formed during the so called editing phase, in which an individual organizes and reformulates prospects to simplify subsequent evaluation and choice (Kahneman and Tversky 1979). Furthermore, different individuals can have contrasting reference points in similar situations (Abeler et al. 2011; Baucells et al. 2011). Baron (2004), who suggests that prospect theory, and, in particular, the coding of reference points during the editing phase, may help establish why certain individuals choose to become entrepreneurs, assumes that entrepreneurs due to the fact that they set more aspiring reference points tend to frame situations more often as losses, which, in turn, increases their risk-taking behavior.

This is the first study that empirically examines differences in reference point formation between entrepreneurs and non-entrepreneurs. One reason for this lack of prior evidence might be that reference points are not directly observable, making them difficult to study. In particular, there is no standard practice for their examination. Arkes et al. (2008) assessed the magnitude of shifts in the reference point based on a questionnaire. We employ and adapt this method to examine differences in reference point formation between entrepreneurs and managers. Based on prospect theoretical considerations, we hypothesize that individuals who generally and consistently set more aspiring reference points have a higher intention to form a new venture. The rationale can be illustrated with someone who aspires to make a fortune in life. This person would consider himself in a loss situation when working in a decently paying job that is lacking further upside potential. He might therefore be more willing to take the risk of creating a new venture.

We test our hypothesis on a sample of entrepreneurs and managers, where we use new venture creation as the dependent variable and reference point formation behavior as the independent variable. To show the magnitude of the reference point effect on new venture creation, we examine risk propensity and opportunity evaluation as additional risk-related antecedents of new venture creation. Furthermore, we control for other antecedents, such as illusion of control, optimism, and need for achievement.

As a robustness test, we gathered information on two samples of business graduate students, which we use to assess entrepreneurial intention as the dependent and reference point formation behavior as the independent variable.

This study makes three contributions to the literature. First, we empirically examine differences in reference point formation between entrepreneurs and non-entrepreneurs, which is a strong indicator about differences in risk-taking behavior. Since differences in risk-taking behavior are among the main distinguishing factors between the groups, we empirically introduce aspects of prospect theory as an important cognitive theory of risk-taking behavior to the field of entrepreneurship and contribute to the discussion of factors that distinguish entrepreneurs from others. Second, we contribute to the debate on the importance of cognitive factors in comparison with personality traits of entrepreneurs. While previous research has mainly focused on personality traits, our study reveals a differentiated picture and highlights that while personality traits indeed are very important to predict

entrepreneurial behavior, cognitive processes add substantial explanatory power. Third, by applying and adapting the reference point measurement method of Arkes et al. (2008), we show that this method is not only applicable to analyze theoretical decision-making tendencies but also to predict real decision-making behavior in various contextual situations like for example entrepreneurship. Taken together, our results show that the reference point is an important antecedent of entrepreneurial intention and new venture creation.

The paper proceeds as follows. First, we describe prospect theory in the context of entrepreneurship by discussing how reference points are expected to impact the probability to set up a new venture. Next, we briefly discuss risk propensity and opportunity evaluation as risk-related antecedents of new venture creation. After presenting our research results, we conclude by discussing theoretical implications and offering suggestions for future studies.

2 Theoretical framework and hypothesis

The empirical literature regarding the risk-taking behavior of entrepreneurs is inconclusive. For example, Cramer et al. (2002) find that risk aversion discourages entrepreneurial activity, while Xu and Ruef (2004) find that nascent entrepreneurs are more risk averse than non-entrepreneurs. In the psychological research stream, a meta-analysis by Stewart and Roth (2001) supports the view that the risk propensity of entrepreneurs is greater than that of managers. In contrast, Miner and Raju (2004)'s meta-analysis indicates an opposite effect, namely, that entrepreneurs are more risk averse than managers.

Some attempts have been made to reconcile the risk-bearing characterization of entrepreneurs with the inconsistent empirical findings. An important approach in this direction is the consideration of entrepreneurial cognition as driver of entrepreneurial action (Baron 1998; Busenitz and Barney 1997; Forbes 1999, 2005; Grégoire et al. 2011; Katz and Shepherd 2003; Mitchell et al. 2002, 2011; Wood et al. 2012). The cognitive perspective emphasizes the mental processes through which individuals acquire, transform, and use information (Barsalou 1992; Simon 1979). Building on cognitive research, Weber and Milliman (1997) argue that risk-taking behavior results from a combination of risk propensity and risk perception, which is defined as a decisions maker's assessment of the risk inherent in a situation (Sitkin and Pablo 1992). Empirical research indeed supports the hypothesis that individuals who perceive less risk are more likely to evaluate an opportunity more favorably and to start their own venture (Keh et al. 2002; Simon et al. 2000).

Applying prospect theoretical considerations and particularly reference point formation processes during the editing phase, we first analyze the effect of the reference point on new venture creation. To show the magnitude of this effect, we consider two important risk-related factors that have been found to affect new venture creation. While risk propensity describes a behavioral factor that has been found to influence new venture creation (e.g., Zhao et al. 2010), opportunity evaluation describes a cognitive antecedent of new venture creation that has been theoretically developed (e.g., Elfving et al. 2009) and recently empirically validated (Tumasjan et al. 2013; Welpe et al. 2012). Following prior research and suggestions by Baron (2004), we thus analyze the reference point, risk propensity, and opportunity evaluation as antecedents of new venture creation.

2.1 Applying reference point formation

Under what conditions are individuals more risk willing and, therefore, more likely to start a new venture? By applying reference point formation as part of prospect theory, a decision-making theory, Baron (2004) suggests that entrepreneurs are not necessarily more risk loving, but generally tend to perceive outcomes differently. Prospect theory claims that whether an outcome is perceived as a gain or as a loss relative to a reference point, which is individually determined in the editing phase through coding operations (Kahneman and Tversky 1979), has a strong influence on risk-taking behavior. While individuals focusing on gains tend to avoid risks, those focusing on losses are risk seeking (Kahneman and Tversky 1979; Tversky and Kahneman 1992). In this context, the position of the reference point is a major determinant of risk-taking behavior that may help to explain differences between entrepreneurs and non-entrepreneurs. If entrepreneurs tend to frame status quo situations in terms of losses (e.g., forfeited gains by not forming a venture), they will be more willing to

take risks and will choose to start a business more often (Baron 2004). In contrast, if non-entrepreneurs tend to perceive the status quo as a gain, they will be less willing to take on new risks and will be more reluctant to form a venture.

Most empirical studies applying prospect theory consider the reference point to be either the current status quo (Kahneman and Tversky 1979; Samuelson and Zeckhauser 1988) or the initial status quo (Genesove and Mayer 2001; Odean 1998). Recent research contributes to these more traditional considerations by showing that factors such as initial and recent information influence the reference point. For example, Baucells et al. (2011) confronted students with a sequence of information on the development of stock prices and estimated the individual reference point after each price change. The evidence shows that the most recent price receives a large weight which dramatically decreases upon the arrival of the next price information. Surprisingly, the first price permanently receives a large weight in the reference point formation.

Besides status quo information, social norms, which could be defined as patterns of behavior to which individuals accept to conform to, may also be potential reference points as shown in studies analyzing reactions to renegotiations of fixed contracts (Bartling and Schmidt 2015; Fehr et al. 2015). In the context of bonus payments, Ockenfels, Sliwka, and Werner (2015) show that falling behind a natural reference point (100 % bonus percentage) reduces satisfaction and subsequent performance.

In a theoretical contribution, Schmidt and Zank (2012) provide a foundation for prospect theory where the reference points arise endogenously. Furthermore, and specifically important in our research context, Kőszegi and Rabin (2006, 2007) consider endogenous reference point formation where the reference point is given by rational expectations. In this respect, experiments provide evidence that expectations (Abeler et al. 2011; Hack and von Bieberstein 2015), and goals (Heath et al. 1999) might play an important role in the formation of reference points. For example, Bartling and Schmidt (2015) show that professional soccer players and their coaches exhibit reference-dependent behavior during matches and that reference points are shaped by expectations. However, up to now it is not clear how individual reference points are formed and updated given these factors. In particular, different individuals can have contrasting reference points in similar situations.

Many theoretical models assume that entrepreneurs seek risk more often than other individuals (Iyigun and Owen 1999; Kihlstrom and Laffont 1979). Empirical findings, however, have been mixed (Miner and Raju 2004; Stewart and Roth 2001). One reason might be the different experimental designs, where the reference point does (or does not) play a role. We assume, in line with Baron (2004), that entrepreneurs will have the general tendency in life to set more aspiring reference points that will subsequently result more often in loss perceptions and consequently and consistently in more risk-seeking behavior. This leads to the following hypothesis:

Hypothesis There is a relationship between the reference point and new venture creation. Specifically, people who generally set more aspiring reference points are more likely to create a new venture.

2.2 Verifying the impact of reference points

Researchers have identified several important antecedents of entrepreneurial intention (Liñán and Chen 2009; Thompson 2009; Zhao et al. 2010) and new venture creation (Shook et al. 2003). While risk propensity, which we consider as a personality trait (Mount and Barrick 1995; Zhao et al. 2010), has received considerable attention (Zhao et al. 2010), opportunity evaluation has recently attracted researchers (Haynie et al. 2009; Mitchell and Shepherd 2010; Wood et al. 2014; Wood and Williams 2014) and has been identified as an antecedent of entrepreneurial exploitation (Tumasjan et al. 2013; Welpe et al. 2012).

2.2.1 Risk propensity

Prior research supports the positive effect of risk propensity on entrepreneurial intention and new venture creation (Zhao et al. 2010). Risk propensity can be defined as a personality trait involving the willingness to pursue actions in the face of outcome uncertainty (Jackson 1994; Zhao et al. 2010). Because entrepreneurs make risky decisions in uncertain environments (Knight 1921), existing literature considers risk propensity as a key attribute associated with entrepreneurs (e.g., Baron 1998; Begley and Boyd 1987; Zhao et al. 2010). Recent meta-analytic studies

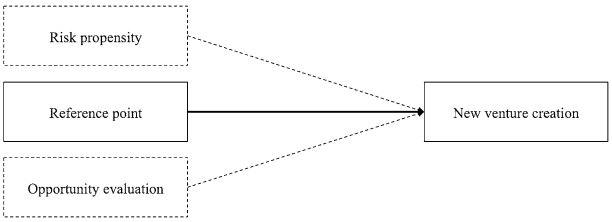

Fig. 1 Visualization of hypothesis

have demonstrated that risk propensity, measured as a separate personality dimension, indeed distinguishes entrepreneurs (higher risk propensity) from the general population (lower risk propensity) regarding entrepreneurial intention (Cramer et al. 2002; Stewart and Roth 2001; Zhao et al. 2010).

2.2.2 *Opportunity evaluation*

Opportunity evaluation consists of individuals testing opportunities with regard to market acceptability, financial returns, and resource availability (Corbett 2005). In this process, individuals consult their network and try to assess whether the opportunity favors starting a new venture.

Although early models of entrepreneurial intention have not included opportunity evaluation (Krueger 1993; Krueger and Brazeal 1994; Krueger and Carsrud 1993; Krueger et al. 2000), more recent research supports the importance and consideration of opportunities, opportunity recognition, and opportunity evaluation in the context of entrepreneurial intention and new venture creation (Ardichvili et al. 2003; Eckhardt and Shane 2003; Elfving et al. 2009; Shane and Venkataraman 2000). For example, Ardichvili et al. (2003) include opportunity evaluation as core process of new venture formation. Opportunity evaluation describes a cognitive antecedent of entrepreneurial intention and new venture creation that has been theoretically developed (e.g., Elfving et al. 2009) and recently empirically validated (Tumasjan et al. 2013; Welpe et al. 2012). Further empirical findings that suggest a potential positive effect of opportunity evaluation on entrepreneurial intention and new venture creation can be obtained from the literature on outcome expectations. When considering outcome expectations as an indicator of opportunity evaluation, research shows that higher outcome expectations have a positive effect on the decision to start a new venture (Townsend et al. 2010).

Some scholars suggest that individuals take risky actions because they perceive less risk inherent in a situation and, thus, in the action taken (Kahneman and Lovallo 1993; March and Shapira 1987; Simon et al. 2000). Even if individuals show the same risk propensity when evaluating the same situation, those who perceive less risk might unknowingly take more risky actions (Nutt 1993; Simon et al. 2000). Hence, risk perception may explain new venture creation (Palich and Bagby 1995; Simon et al. 2000). Empirical studies using cognitive approaches to examine opportunity evaluation and entrepreneurial intention substantiate this causality. Prior results show that individuals who perceive less risk are more likely to evaluate an opportunity more favorably (Keh et al. 2002) and to start a new venture (Forlani and Mullins 2000; Simon et al. 2000).

Hence, we consider risk propensity and opportunity evaluation as two important factors that have been associated with risk behavior. Including both factors in our analysis, in which we use the reference point as another cognitive aspect, we assume that the effect of the reference point persists.

Figure 1 presents the visualization of our hypothesis.

Taken together, our reasoning can be summarized as follows: According to considerations from prospect theory, the perception of an outcome as either a gain or a loss relative to a reference point has a strong influence on risk-taking behavior. Thus, reference point formation is an important cognitive factor in influencing risk attitudes. As with other cognitive factors (e.g., risk perception), entrepreneurs and non-entrepreneurs might differ with regard to reference point formation (Baron 2004). Thus, we examine the general tendency of entrepreneurs to set higher reference points. Given such a general tendency, entrepreneurs will more often find themselves in a loss situation relative to their elevated reference point, for example, when working in a decently paid job that lacks further upside potential. In this situation, they

will be more inclined to take the risk of forming a venture. We were not able to test this last aspect directly in the current paper, that is, we could not identify the reference point of our study participants at the time of their decision to start a new venture. However, if reference point formation is a general disposition, we expect current entrepreneurs to set more aspiring reference points compared to non-entrepreneurs in general. In addition, we consider student samples to examine the relationship between reference point formation and entrepreneurial intention. If reference points have predictive power, students with higher reference points should be more likely to envision forming a venture.

3 Methodology

3.1 Sample

We drew personal contact details from an alumni database of a German business school and chose a random sample of 150 entrepreneurs and 150 managers, to whom we sent a personalized email which included a link to our online survey. In total, we received complete responses from 53 entrepreneurs and 54 managers (total of 107 respondents). The response rate is 35.66 percent; mean respondent age is 31.3 years; 85 percent are male. As all respondents have similar backgrounds in terms of education (i.e., they all had to pass the same admission tests to attend the business school), this sample is well suited for our study.

In order to test for multicollinearity, we assessed the correlation matrix and the variance inflation factors (VIF). Only modest levels of correlation exist between the variables. VIFs (all <1.460) are below critical values (Hair et al. 2010). Thus, multicollinearity is not a significant concern.

Following Podsakoff et al. (2003), we compared measurement models with method factor models to test for common method bias as recently applied in other studies (e.g., Zellweger et al. 2012). The results showed that the fit for the method factor models (Chi-square (65) = 288.768; CFI, 0.385; IFI, 0.406; RMSEA, 0.180) were significantly worse than the confirmatory factor analysis model. These models showed acceptable fit levels considering the sample sizes and the inclusion of the single-item indicators (Chi-square (59) = 111.139; CFI, 0.857; IFI, 0.864; RMSEA, 0.091). Thus, common method bias does not appear to be a significant problem.

We compared late and early respondents to assess potential non-response bias for the first sample. Because non-respondents tend to be more similar to late respondents (Kanuk and Berenson 1975; Oppenheim 1966), we used ANOVA (analysis of variance) to test for differences between early and late respondents (e.g., Eddleston et al. 2008). No statistically significant differences were found in any of the variables analyzed in this study, which at least partially mitigates nonresponse concerns.

3.2 Measures

Our questionnaire was administered in German. When possible, we used validated and reliable measurement scales based on measures of related constructs in the literature.

3.2.1 Independent variables

3.2.1.1 Reference point formation To measure the general tendency to set higher or lower reference points, we asked respondents to read and respond to the following scenario, taken from Arkes et al. (2008):

> Two months ago, you bought a stock for 30 € per share. One month ago, you were delighted to learn the stock was trading higher—at 36 € per share. This month, you decide to check the stock's price again. At what price would the stock need to trade today to make you just as happy with the stock's price this month as you were when you learned the stock had risen from 30 € to 36 € last month?

Determining the stock price that generates the same utility as the previous price increase allows us to calculate the reference point. As in Arkes et al. (2008), two assumptions are necessary to perform this calculation. First, we assume that the purchase price serves as the initial reference point ($P_0 = R_0$). Second, we assume that the shape of the value function remains unchanged during the updating. Figure 2 illustrates the reasoning.

The previous price change is assessed based on the initial reference point R_0 resulting in utility $U_{R_0}(P_1)$ in

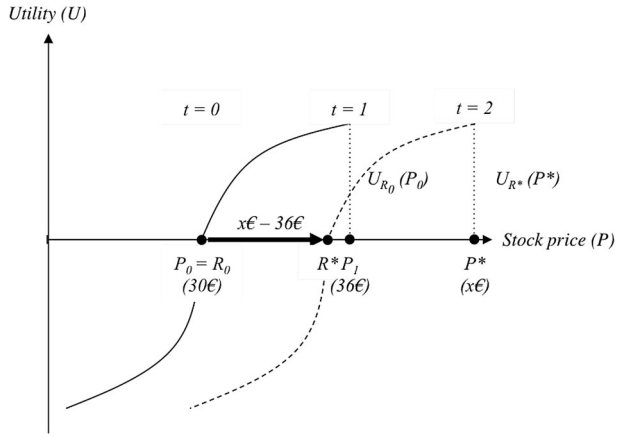

Fig. 2 Reference point calculation

$t = 1$. We ask subjects what stock price P^* in $t = 2$ will generate the same utility. For example, without a shift in the reference point, subjects will still state P_1. We are interested in the new reference point R^* with $U_{R^*}(P^*) = U_{R_0}(P_1)$. The following equation holds:

$$P^* - R^* = P_1 - R_0 => R^* = P^* - P_1 + R_0$$

Given this equality, we are thus able to derive the new reference point (R^*). Note that individuals who state a higher price (and thus have a higher reference point) will more often find themselves in a situation in which they perceive a given stock price as a loss compared to an individual who states a lower price. For example, an individual who states that 44 € will make him just as happy, has a reference point of 38 €. If the true stock price is 37 €, this individual will perceive himself/herself in a loss situation. In contrast, another individual with a lower reference price might consider 37 € as a gain.

One might argue that assessing the reference point formation via a stock trading scenario is unrelated to the reference point an entrepreneur might use in deciding whether to launch a new business. As we are interested in the general tendency of entrepreneurs to set more aspiring reference points—irrespective of the specific situation—and the hypothesis that they therefore more often perceive loss situations, framing is not a main concern for our study. Nevertheless, we wanted to make sure that our results were not driven by the specific scenario. Therefore, in the robustness test section, we adapted this scenario to that of a start-up, where participants evaluate their utility from an increase in the value of their company (see Sect. 5 and "Appendix").

3.2.1.2 Risk propensity Risk propensity is measured by using three items from the German Socio-Economic Panel Study (SOEP), which is a wide-ranging representative longitudinal study of private households, conducted by the German Institute for Economic Research, Berlin. The three items that measure risk propensity rely on three survey questions in the SOEP on willingness to take risks in general, in financial matters, and in occupational issues. Recent research has applied these items to measure risk propensity (Dohmen et al. 2011, 2012). Respondents indicate their risk propensity on an 11-point Likert-type scale, with 0 indicating "not at all willing to take risks" and 10 indicating "very willing to take risks". The construct demonstrates acceptable reliability, with a Cronbach's alpha of 0.70. All items appear in the "Appendix".

3.2.1.3 Opportunity evaluation We asked respondents to read and evaluate a short case study (see "Appendix"). In order to measure opportunity evaluation, we adapted two items from Keh et al. (2002) that capture whether the respondents viewed the proposed venture as an opportunity. Specifically, the two items capture the perceived feasibility of the venture. The construct demonstrates good reliability, with a Cronbach's alpha of 0.78. All items appear in the "Appendix".

3.2.2 Dependent variables

We applied new venture creation as dependent variable. We measured new venture creation by using a dichotomous variable that allowed us to differentiate

between entrepreneurs and managers. We asked respondents to indicate "yes" or "no" if they have ever started a new venture. Based on this, we coded managers as 0 and entrepreneurs as 1.

3.2.3 Control variables

Consistent with prior research, we utilized a number of variables shown to influence new venture creation. First, we controlled for gender, as men are more likely to start a new venture than women (Gupta et al. 2009). Second, we controlled for optimism, which has been identified as a driver of entrepreneurial intention and new venture creation (Rauch and Frese 2007). To measure optimism, we adapted five items from the German version of the Life Orientation Test (Scheier and Carver 1985); this test uses eight items measured on a 5-point Likert-type scale ranging from "strongly disagree" to "strongly agree." Because the exploratory factor analysis loaded on two factors when we used all items, we excluded three of the eight original items and obtained an acceptable reliable Cronbach's alpha of 0.71. Items appear in the "Appendix". Another antecedent of new venture creation is illusion of control. Following Simon et al. (2000), we measured illusion of control using three questions concerning the same short case study used for capturing opportunity evaluation. Items were measured on a Likert-type scale with a 7-point response format anchored by "strongly disagree" to "strongly agree." The construct demonstrates acceptable reliability, with a Cronbach's alpha of 0.72. Items appear in the "Appendix". Last, we controlled for need for achievement as entrepreneurs are more achievement oriented than the general population (Stewart et al. 1999). To measure need for achievement, we used 16 items from the German version of the Personality Research Form (Stumpf et al. 1985). For each question, participants had a forced choice between "yes" or "no." A need for achievement score with a value of 16 for individuals is the highest score possible. All items appear in the "Appendix".

4 Results

Table 1 displays the correlations, means, and standard deviations. To test our hypothesis, we ran a binary logistic regression analysis (Cohen et al. 2002). Table 2 contains the results.

We set up three models. In Model 1, we entered the control variables. Gender, illusion of control, and need for achievement are significantly associated with new venture creation.

In Model 2, we included the reference point. Compared to Model 1, R^2 increased from 0.28 to 0.39 (Nagelkerke) and from 0.21 to 0.29 (Cox and Snell), respectively. We found a positive and significant relationship between the reference point and new venture creation, thus supporting our hypothesis.

In Model 3, we entered risk propensity and opportunity evaluation to test robustness of the impact of the reference point on new venture creation. By adding these variables, R^2 increased from 0.39 to 0.50 (Nagelkerke) and from 0.29 to 0.37 (Cox and Snell), respectively. Results show a positive relationship

Table 1 Descriptive statistics and correlations

Variables	Mean	SD	1	2	3	4	5	6	7
1. Gender	0.85	0.36							
2. Optimism	4.26	0.53	−0.03						
3. Illusion of control	5.05	1.00	−0.15	−0.13					
4. Need for achievement	0.81	0.12	0.00	0.22*	−0.05				
5. Reference point	41.24	3.82	0.02	0.09	0.11	0.09			
6. Risk propensity	7.19	1.64	0.41**	0.18	−0.24*	0.10	0.11		
7. Opportunity evaluation	3.64	1.24	−0.15	−0.13	0.17	−0.09	−0.38**	−0.09	
8. New venture creation	0.50	0.50	0.26**	0.18	0.14	0.30**	0.40**	−0.11	0.35**

N = 107

* $p < 0.05$; ** $p < 0.01$

Table 2 Binary logistic regression analysis predicting new venture creation

	N = 107 (53 entrepreneurs, 54 managers) Reference point measurement: stock price scenario		
	Model 1	Model 2	Model 3
Intercept	−10.83***	−20.02***	−24.95***
Controls			
Gender	2.12**	2.05**	1.12
Optimism	0.71	0.68	0.36
Illusion of control	0.55*	0.52*	0.78**
Need for achievement	5.33**	5.29**	5.93**
Main effect			
Reference point		0.23**	0.23**
Independent variables			
Risk propensity			0.73**
Opportunity evaluation			0.16
−2 log likelihood	122.90	111.54	98.67
R^2 (Nagelkerke)	0.28	0.39	0.50
R^2 (Cox & Snell)	0.21	0.29	0.37
Chi-square	25.43	36.79	49.65
df	4	5	7
Correct classification	73.83	78.50	74.77
Significance	0.000	0.000	0.000

Regression coefficients are reported as B values

* $p < 0.05$; ** $p < 0.01$

between risk propensity and new venture creation but no significant evidence for an effect of opportunity evaluation on new venture creation. However, the positive effect of the reference on new venture creation remains significant.

5 Robustness test

According to researchers, there could be key differences in the way current entrepreneurs and those willing to become entrepreneurs process information (e.g., Baron 1998); for example, mediating effects of illusion of control on risk propensity (Keh et al. 2002; Simon et al. 2000). To test for the robustness of our results on actual entrepreneurs and managers, we also use two student samples to examine the decision processes of individuals who envision forming a venture. The first student sample (student sample 1) consists of 185 business graduate students and the second student sample (student sample 2) of 168 business graduate students from a large German university. Each group of students answered a brief questionnaire in a classroom setting.

Testing for multicollinearity, both VIFs (all <1.393) and CIs (all <22.787) are below critical values (Hair et al. 2010). Further, testing for common method bias, results showed that the fit for the method factor models (Student sample 1, Chi-square (104) = 541.378; comparative fix index (CFI), 0.563; incremental fit index (IFI), 0.570; root-mean-square error of approximation (RMSEA), 0.151; student sample 2, Chi-square (119) = 593.113; CFI, 0.476; IFI, 0.486; RMSEA, 0.154) were significantly worse than the confirmatory factor analysis model. These models showed acceptable fit levels considering the sample sizes and the inclusion of the single-item indicators (Student sample 1, Chi-square (94) = 150.176; comparative fix index (CFI), 0.944; incremental fit index (IFI), 0.945; root-mean-square error of approximation (RMSEA), 0.057; student sample 2, Chi-square (109) = 229.353; CFI, 0.867; IFI, 0.871; RMSEA, 0.081). Finally, testing for nonresponse bias by using an ANOVA, no statistically

significant differences were found in any of the variables analyzed in this study, which again at least partially mitigates nonresponse concerns.

5.1 Robustness test measures

While student sample 1's questionnaire included a stock trading scenario to measure the reference point, student sample 2's questionnaire included a start-up scenario. While the first scenario is consistent with the scenario of the main study, the second scenario describes a start-up scenario, which is presented in the "Appendix". All students participated voluntarily. The mean ages of the respondents are 21.3 years (student sample 1) and 20.9 years (student sample 2).

Risk propensity and opportunity evaluation were measured using the same approaches like in the main study. Risk propensity demonstrates acceptable reliability, with Cronbach's alphas of 0.73 (student sample 1) and 0.71 (student sample 2). Opportunity evaluation demonstrates good reliability, with Cronbach's alphas of 0.82 (student sample 1) and 0.77 (student sample 2). All items appear in the "Appendix".

For the student samples, we used entrepreneurial intention as dependent variable. Indeed, intentions have been identified as a good predictor of actual behavior (Fishbein and Ajzen1975; Fishbein and Ajzen 2010). We developed this construct by adapting four items from Souitaris et al. (2007), Peterman and Kennedy (2003), and Lüthje and Franke (2003). We asked respondents about their general willingness to start a new venture, the likelihood of starting a new venture in general and within the next 5 years, and their preference regarding self-employment and employment. Each item was measured on a 7-point Likert-type. The construct demonstrates good reliability with Cronbach's alphas of 0.86 (student sample 1) and 0.84 (student sample 2). All items appear in the "Appendix".

Consistent with the control variables used in the main study, we controlled for gender, optimism, illusion of control, and need for achievement. All constructs obtained acceptable Cronbach' alphas (see "Appendix"). All items appear in the "Appendix".

5.2 Robustness test results

Tables 3 and 4 display the correlations, means, and standard deviations of student sample 1 and student sample 2. To test the robustness of our hypothesis, we ran two separate multiple regression analyses for each of three models (Cohen et al. 2002). All independent variables were mean-centered prior to running the analyses. Table 5 contains the results.

In the first three models, we used the first student sample (N = 185). In Model 4, where the control variables are entered, optimism ($\beta = 0.16, p < 0.05$), illusion of control ($\beta = 0.27, p < 0.001$), and need for achievement ($\beta = 0.16, p < 0.05$) are significant. These three control variables have a positive impact on entrepreneurial intention.

Model 5 tests for robustness of our hypothesis, which suggests a positive effect of the reference point on entrepreneurial intention. Results support a

Table 3 Descriptive statistics and correlations [Student Sample 1, stock price scenario (SPC)]

Variables	Mean	SD	1	2	3	4	5	6	7
1. Gender	0.69	0.47							
2. Optimism	3.85	0.62	−0.10						
3. Illusion of control	3.74	1.13	0.12	0.15*					
4. Need for achievement	0.39	0.16	0.10	−0.17*	0.03				
5. Reference point (SPC)	42.40	4.76	−0.06	0.15*	0.19**	0.16*			
6. Risk propensity	4.66	1.79	0.17*	0.31**	0.29**	−0.02	0.24**		
7. Opportunity evaluation	3.89	1.43	0.17*	0.16*	0.36**	0.08	0.32*	0.22**	
8. Entrepreneurial intention	3.68	1.35	0.12	0.16*	0.31**	0.15*	0.43**	0.40**	0.44**

N = 185

* $p < 0.05$; ** $p < 0.01$

Table 4 Descriptive statistics and correlations [student sample 2, start−up scenario (SUC)]

Variables	Mean	SD	1	2	3	4	5	6	7
1. Gender	0.65	0.48							
2. Optimism	3.91	0.61	−0.02						
3. Illusion of control	3.82	1.17	0.16*	0.06					
4. Need for achievement	0.68	0.23	−0.03	0.07	0.04				
5. Reference point (SUC)	44,373.21	4299.35	0.05	0.03	−0.04	0.13			
6. Risk propensity	4.75	1.81	0.18*	0.27**	0.28**	−0.02	0.12		
7. Opportunity evaluation	3.70	1.43	0.11	0.09	0.48**	−0.14	0.29**	−0.02	
8. Entrepreneurial intention	3.63	1.33	0.14	0.07	0.31**	0.24**	0.37**	0.30**	0.31**

N = 168

* $p < 0.05$; ** $p < 0.01$

Table 5 Results of multiple OLS regression analyses predicting entrepreneurial intention (robustness test)

	Student sample 1, N = 185 Reference point measurement: stock price scenario			Student sample 2, N = 168 Reference point measurement: start-up scenario		
	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Intercept	0.45	0.84	2.60***	0.94	1.10	2.36**
Controls						
Gender	0.09	0.11	0.03	0.11	0.09	0.05
Optimism	0.16*	0.14	0.03	0.04	0.03	−0.05
Illusion of control	0.27***	0.25***	0.11	0.28***	0.30***	0.14
Need for achievement	0.16*	0.11	0.10	0.23**	0.20**	0.25***
Main effect						
Reference point		0.21**	0.17**		0.29***	0.27***
Independent variables						
Risk propensity			0.29***			0.24**
Opportunity evaluation			0.23**			0.20**
R^2	0.15	0.18	0.32	0.16	0.25	0.33
Adjusted R^2	0.13	0.16	0.29	0.14	0.22	0.30
ΔR^2	0.15***	0.04**	0.13***	0.16***	0.08***	0.09***
F	7.61***	8.07***	11.77***	7.86***	10.49***	11.39***

Regression coefficients are reported as B values

* $p < 0.05$; ** $p < 0.01$;*** $p < 0.001$

significant positive effect ($\beta = 0.21$, $p < 0.01$). The observed R^2 change is significant ($\Delta R^2 = 0.04$, $p < 0.01$) supporting our hypothesis.

Model 6, including risk propensity and opportunity evaluation, tested for the robustness of the impact of the reference point on entrepreneurial intention. The effect of the reference point on entrepreneurial intention remains significantly positive ($\beta = 0.17$, $p < 0.01$). Furthermore, results show a positive and significant effect of risk propensity ($\beta = 0.29$, $p < 0.001$) and opportunity evaluation ($\beta = 0.23$, $p < 0.01$) on entrepreneurial intention.

In Model 7, Model 8, and Model 9, we used the second student sample (N = 168). In Model 7, where the control variables are entered, illusion of control ($\beta = 0.28$, $p < 0.001$) and need for achievement ($\beta = 0.23$, $p < 0.01$) are significant, suggesting a positive impact on entrepreneurial intention.

Model 8 also supports our hypothesis. The effect of the reference point on entrepreneurial intention is significant positive ($\beta = 0.29$, $p < 0.001$). The change in R^2 is significant ($\Delta R^2 = 0.08$, $p < 0.001$).

In Model 9, we included risk propensity and opportunity evaluation to test the robustness of the reference point effect on entrepreneurial intention. Again, the effect of the reference point on entrepreneurial intention remains significantly positive ($\beta = 0.27$, $p < 0.001$). Furthermore, the effects of risk propensity ($\beta = 0.24$, $p < 0.01$) and opportunity evaluation ($\beta = 0.20$, $p < 0.01$) are positively significant.

6 Discussion

Despite decades of research, the determinants of entrepreneurship are not yet well understood. One important aspect of entrepreneurial behavior is the willingness to take risks. Many theoretical models, therefore, have assumed that entrepreneurs are less risk averse than others. Empirical evidence regarding risk propensity, however, has produced inconclusive results, possibly because most studies consider risk propensity as an individual trait that should be stable over time, an approach that covers only one of the research streams on risk-taking behavior.

We found that the reference point has a significant impact on new venture creation and entrepreneurial intention. A test for differences between entrepreneurs and managers supports our hypothesis, which predicts a positive relationship between the reference point and new venture creation. Our results reinforce Baron (2004), who suggests that entrepreneurs will generally set higher reference points that will subsequently result in more risk-seeking behavior. It appears that because entrepreneurs tend to frame situations as losses rather than gains, they are more likely to engage in risk-seeking behavior, which may help to explain why they are more likely to start a new venture. This result is supported by the positive effect of the reference point on entrepreneurial intention. Testing two scenarios with two business graduate student samples, results support our hypothesis, which predicts that the reference point is positively related to entrepreneurial intention. These findings indicate that the reference point has an important effect on the decision of entrepreneurs and potential entrepreneurs to start a new venture.

To our knowledge, we are the first to consider the situational factors as described by prospect theory to explain different risk attitudes of entrepreneurs and non-entrepreneurs, specifically, differences in the formation of the reference point. With a higher reference point and a given distribution of outcomes, more potential outcomes are perceived as losses compared to the reference point. Prospect theory predicts that those who perceive a loss situation will engage more in risk-seeking behavior than others. Indeed, our results, which show that entrepreneurs set a significantly higher reference point compared to managers, allow us to contribute to the discussion of factors that distinguish entrepreneurs from others. In particular, we consider prospect theory as an important cognitive theory of risk-taking behavior in the field of entrepreneurship and test parts of its predictions empirically. Further, we contribute to the debate on cognitive factors and personality traits of entrepreneurs. While previous research has focused on personality traits, our study reveals a more differentiated picture by highlighting the importance of cognitive processes in addition to personality traits. By applying the reference point measurement method of Arkes et al. (2008), we also introduce an instrument to entrepreneurship that allows to observe reference points.

Additionally, results of the robustness tests are in line with prior studies that have identified risk propensity as an important driver of entrepreneurial intention (Zhao et al. 2010). Furthermore, results indicate that risk propensity differs significantly between entrepreneurs and managers. When analyzing risk behavior differences between entrepreneurs and managers (Miner and Raju 2004; Stewart and Roth 2001; 2004), this result supports Stewart and Roth (2001) who find that the risk propensity of entrepreneurs, measured as a stable personality trait, is greater than that of managers. Higher levels of opportunity evaluation have also a positive impact on entrepreneurial intention. Thus, individuals who are able to predict how well a business will perform in the future and to differentiate an idea from an opportunity are more likely to start a new venture. This finding supports recent theoretical models that point to the importance of opportunity evaluation as an antecedent of entrepreneurial intention (Elfving et al. 2009). Interestingly, our results show no significant differences of opportunity evaluation between entrepreneurs and managers. Compared to the student samples,

which show a significant effect of opportunity evaluation on entrepreneurial intentions, it appears as experience increases, opportunity evaluations of entrepreneurs and managers become aligned. Hence, student samples may reveal valuable results that help to identify differences due to experience. This is in line with previous studies that characterize student samples as suitable for examining entrepreneurial intentions, because students are confronted with an immediate career choice (Krueger et al. 2000) and anticipate lower barriers to business ownership due to their academic study of entrepreneurship (Hmieleski and Corbett 2006).

7 Limitations and future research

In the following, we discuss limitations of our study and implications of our findings for future research. The advantage of the current method is that it allows measuring the adaptation of the reference point directly. This advantage, however, comes at a cost. An important limitation is our assumption of risk attitudes based on prospect theory preferences. We assume that those who set a higher reference point will more often perceive a loss situation and, therefore, will engage in more risk-seeking behavior. A future study should test for risk-taking behavior directly in a setting where prior information has resulted in participants' adaptation of the reference point (e.g., choices between lotteries). The research design could also address a further limitation of this kind of questionnaire study, namely that subjects' decisions have no monetary consequences.

Another research avenue would be to consider differences in reference point formation between those with the intention to start a venture and those who have already done so. Prior research has shown that there could be important differences between the groups (e.g., regarding the mediating effect of illusion of control on risk propensity) (Simon et al. 2000).

A further limitation may be seen in our assumption that individuals show a stable tendency in the way they set reference points. As research on antecedents and the nature of reference point formation behavior is limited, the question whether the selection of reference points can be viewed as a stable tendency or rather a situation-based behavior remains to be answered. First studies indicate that reference point formation behavior is stable over time and situations, and is influenced by personality traits. For example, Heath et al. (1999) argue that goals can serve as reference points. Their results show that individual goal level setting is influenced by control orientation and amotivated orientation, which describe two distinct personality traits (Lee et al. 2003). Further evidence for a stable nature of reference point formation can be found in our study. Results show that entrepreneurs and students, who show high entrepreneurial intentions, tend to set higher reference points. This effect is stable across two different scenarios (i.e., stock trading scenario and start-up scenario) and is not affected by the situation.

However, there is still much room for studies concerning the role of other personality traits in the formation of reference points. In particular, test for overconfidence (Koellinger et al. 2007), which is a personality trait that is often associated with the decision to start a business, is a promising factor for future research. All in all, this kind of study could add not only to the research on entrepreneurship but also to the broader field of research on factors that influence the formation of reference points over time (Baucells et al. 2011; Köszegi and Rabin 2007).

Furthermore, as reference point formation is only one of many possible operations during the editing phase of prospect theory, future research might contemplate differences between entrepreneurs and non-entrepreneurs regarding other operations. For example, it would be interesting to find out if entrepreneurs, in comparison with non-entrepreneurs, segregate prospects differently and overrate the riskless components in a risky gamble. Furthermore, it might be enlightening to analyze whether hedonic editing and especially "breakeven"-aspects play a role in the risk seeking orientation of entrepreneurs. As Thaler and Johnson (1990) show, a prior loss does not always induce risk seeking. Only if a gamble offers the opportunity to break even, risk-seeking behavior will be triggered. If entrepreneurs perceive a higher breakeven potential in a business opportunity compared to non-entrepreneurs, this might be an explanation for higher risk seeking after perceived losses.

Finally, our argumentation rests upon considerations about the value function in prospect theory. Additional insight might be gathered if the

weighting function of prospect theory is taken into account. For instance, if entrepreneurs overweigh small probabilities more strongly, this could be an additional reason for their willingness to form a venture. For instance, prior research has shown that men and women differ in their probability weighting schemes (Fehr-Duda et al. 2006). Women are less sensitive to probability changes and they tend to underestimate large probabilities of gains more strongly than men do. Thus, in some situations they appear to be more risk averse. It would be interesting to run a similar experiment as in the study by Fehr-Duda et al. (2006) with entrepreneurs and non-entrepreneurs. Results could contribute to the observation that entrepreneurs perceive less risk compared to non-entrepreneurs and evaluate business opportunities more favorably, which has been shown by Keh et al. (2002) and Simon et al. (2000).

8 Conclusion

This study analyzes the effect of reference points on new venture creation and entrepreneurial intention. Specifically, we show that higher reference points have a positive impact on new venture creation and entrepreneurial intention. This highlights the importance of considering cognitive factors when examining new venture creation and entrepreneurial intention. We hope that our efforts will stimulate further research investigating reference point formation in the context of entrepreneurship, since entrepreneurs appear to set reference points in a different way.

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Appendix

See Table 6.

Table 6 Scale items and reliabilities

Construct	Items	Cronbach's α		
		Main study	Student sample 1	Student sample 2
Optimism	In uncertain times, I usually expect the best	0.71	0.71	0.68
	I'm always optimistic about my future			
	I always look on the bright side of things			
	I'm a believer in the idea that "every cloud has a silver lining"			
	Overall, I expect more good things to happen to me than bad			
Illusion of control	I can accurately forecast the total demand for my business	0.72	0.75	0.72
	I can accurately forecast when larger competitors will enter the market			
	I can make my business a success, even though others may fail			
Risk propensity	Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?	0.70	0.73	0.71
	How would you rate your willingness to take risks in financial matters?			
	How would you rate your willingness to take risks in your occupation?			
Opportunity evaluation	I will consider this business an opportunity	0.78	0.82	0.77
	This business is worth considering			
Entrepreneurial intention	How much would you like to start your own business?		0.86	0.84
	How likely is it that you will pursue a career as self-employed in the next 5 years?			
	How likely is it that you will pursue a career as self-employed some day?			
	If you were to choose between running your own business and being employed by someone, what would you prefer?			

Table 6 continued

Construct	Items	Cronbach's α		
		Main study	Student sample 1	Student sample 2
Need for achievement	People should be more involved with their work	Items are not aggregated to construct measure (see Sect. 3.2). No Cronbach's alphas to report		
	I seldom set standards, which are difficult for me to reach. (reverse coded)			
	I enjoy difficult work			
	I have rarely done extra studying in connection with my work			
	I will not be satisfied until I am the best in my field of work			
	I try to work just hard enough to get by (reverse coded)			
	I would work just as hard whether or not I had to earn a living			
	I do not let my work get in the way of what I really want to do			
	My goal is to do at least a little bit more than anyone else has done before			
	In my work I seldom do more than is necessary (reverse coded)			
	I often set goals that are very difficult to reach			
	People seldom think of me as a hard worker (reverse coded)			
	As a child I worked a long time for some of the things I earned			
	It doesn't really matter to me whether or not I become one of the best in my field (reverse coded)			
	I don't mind working while other people are having fun			
	I am not really very certain what I want to do or how to go about doing it. (reverse coded)			

Start-up scenario

> Two years ago you founded a company and invested 30.000 €. After one year, you were delighted to learn the value of the company was higher—at 36.000 €. Today, another year later, you decide to check the value of the company again. At what value would the company need to be today to make you just as happy with the value of the company today as you were when you learned the value of the company had risen from 30.000 € to 36.000 € one year ago?

After reading the scenario, we asked participants to indicate the value of the company generating the same utility as the previous increase of the company value.

Short case adapted from Keh et al. (2002) to measure opportunity evaluation

Mr. Mueller is a successful manager with 4 years of experience at a large German company. Before that he worked in a medium-sized local company for 5 years. The idea of being his own boss, taking calculated risks, and making a fortune all appeal to him. Hence he is thinking of starting his own business.

He has an idea for a new business and decides to ask around to see if it is a good idea. He has some very positive feedback from some potential customers and some associates who know the industry well. Mr. Mueller does not have the resources to do an in-depth market research to find out whether the business is going to work and published data are too general to be useful.

However, he feels that there is money to be made based on the positive feedback from potential customers and his associates. He is enthusiastic about starting the business even though he has no experience in this industry or starting his own business.

There are a few large companies in the same industry, but they have not targeted the market segment that Mr. Mueller is aiming for. He feels that the large companies are likely to move into the market as long as the new business is successful, and he will

not be able to fend off this major threat. He is unsure whether the market is still growing or matured. If the market has reached maturity, it is likely for a new business to be squeezed out of the market. If the market is still growing, the new business will be able to survive the entry of large companies into this market segment. He finds out that there are only a few small businesses that are still surviving in the industry. Mr. Mueller estimates he will need at least 100,000 € to finance the new business. As he has only 30,000 € in savings, he has to borrow from the bank or find partners to get the rest of the investment funds needed.

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