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The good, the bad, and the talented: Entrepreneurial talent and selfish behavior

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ABSTRACT

Talent allocation models assume that entrepreneurially talented people are selfish and thus allocate into unproductive or even destructive activities if these offer the highest private returns. This paper experimentally analyzes selfish preferences of the entrepreneurially talented. We find that making a distinction between *creative* talent and *business* talent explains systematic differences in selfish behavior. Generally, both the less business-talented and the more creative are more willing to forego private payoffs to avoid losses to others. A moderator analysis reveals that less creative individuals with business talent are significantly more selfish than all others, including the creative with business talent. This finding applies to both certain and risky payoffs with and without negative externalities. The paper makes a contribution to entrepreneurship research by qualifying the implications of talent allocation models and highlighting the importance of distinguishing between the two types of entrepreneurial talent. We also add to the field of experimental economics by advancing research on altruism under risk and with negative externalities.

1. Introduction

Traditionally, entrepreneurship is thought to have positive effects on economic growth and welfare. However, since the early 1990s, several theoretical papers have challenged the longstanding notion of the 'productive entrepreneur' and stress the importance of building appropriate institutions and incentive schemes to channel entrepreneurial activity. For example, in his seminal paper, Baumol (1990) posits that entrepreneurship is not necessarily productive; it can be just the opposite

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and can also take unproductive and even destructive forms. He notes that entrepreneurs act in ingenious and creative ways to increase their wealth, power, and prestige and not always with consideration of the effects their activities have on others and/or the economy as a whole.[1]

Essentially, Baumol (1990), Murphy et al. (1991, 1993), Acemoglu (1995), Mehlum et al. (2003), and others argue that entrepreneurial talent allocates into activities "with the highest private returns, which need not have the highest social returns" (Murphy et al., 1991, p. 506). Most models of talent allocation assume a fixed pool of one-dimensional entrepreneurial talent that chooses between productive activities (e.g., starting firms that innovate and foster growth) and unproductive activities (e.g., by redistributing or destroying wealth and reducing growth).[2] This choice is modeled to depend entirely on private payoffs. If unproductive activities offer more rewards than productive activities, talent allocation models assume that entrepreneurial talent chooses the former, despite possible negative externalities for others or adverse effects on economic growth.[3] Hence, common to talent allocation models, and a central assumption in the corresponding literature, is that entrepreneurial talent is not altruistic but selfish. This is the key hypothesis that we test in this paper.

It has long been held in experimental economics that people do depart from pure self-interest and that they vary in their degree of selfishness across individuals. In the economic literature, these preferences are mostly discussed under the rubric of benevolence or altruism (see e.g., Trivers, 1971; Brennan, 1975; Becker, 1976; Bester and Güth, 1998; Andreoni and Miller, 2002). Sometimes they are thought to be better construed as fairness or inequity aversion (Bolton, 1991; Fehr and Schmidt, 1999; Bolton and Ockenfels, 2000). For an overview see Daruvala (2010). In this paper we use the term 'altruism', or 'selfishness' for the opposite. The overwhelming majority of these studies focus on sure payoffs. Entrepreneurial decisions, however, also involve risk, and recently there has been some attempt to investigate the propensity to take a risk when this affects others. Brennan et al. (2008) and Güth et al. (2008) provide first empirical results on this type of 'social risk taking'. Their major finding is that risk to others appears much less important than own risk, even for those with altruistic preferences. Güth et al. (2008) explain this result by suggesting a cognitive "crowding out" of altruistic preferences by own risk. If people are occupied with considerations about their own risky payoffs, they ignore others' well-being, even though they are more altruistic in other situations involving less risky payoffs for themselves. In a related study, Bolton and Ockenfels (2010) analyze the effect of social comparison and relative standing on risk taking. Their results suggest that decision makers tend to be more risk averse when their decisions affect others, but less risk averse when the safe option implies an unfair outcome. In fact, unfair outcomes seem to be more acceptable when they are due to chance. Bradler's (2009) results corroborate this, but she also finds that altruism is not necessarily "crowded out" by own risk, as people prefer fair outcomes even when they are more costly in the sense of more risk. In summary, experimental evidence shows that, in contrast to the assumptions of most talent allocation models, altruistic preferences constitute an important element in human decision-making, in particular when payoffs are certain, but also under risk.

Although studies in experimental economics have not yet explicitly linked altruism to entrepreneurial talent, the notion that entrepreneurial talent may be less selfish than assumed by Baumol (1990) is widely recognized in the entrepreneurship literature, particularly in the field of social entrepreneurship. For example, Zahra et al. (2009, p. 5) define social entrepreneurship as something that "encompasses the activities and processes undertaken to discover, define, and exploit opportunities in order to *enhance social wealth* by creating new ventures or managing existing organizations in an innovative manner" (emphasis added). Bornstein (2004) provided supporting evidence for the importance of social motivations in entrepreneurship. Hence, in the field of social entrepreneurship, altruistic preferences are considered to play a dominant role.

If we accept, based on the above-mentioned literature, that altruism plays a role in human behavior, this can have important implications for entrepreneurship policies. In most talent allocation models, incentive systems and institutions determine the private costs and benefits of the different types of activity. Consequently, institutions are considered to determine the allocation of entrepreneurial talent. Since externalities can create market failures in allocating entrepreneurial talent, institutions need to internalize these externalities to ensure welfare maximization (Baumol, 1990). If altruistic preferences internalize some of these externalities, then less policy intervention will be needed. If the entrepreneurially talented are more altruistic than the less talented, the allocative function of formal institutions risks being too restrictive and might even hinder the selection of appropriate individuals into productive ventures. In an extreme case such institutions might even crowd out intrinsically motivated altruism (e.g. Frey, 1997; Frey and Oberholzer-Gee, 1997). If, on the other hand, entrepreneurial talent is negatively correlated with altruism, strong formal institutions will be needed to internalize negative externalities.

It is not a given, however, that altruism always improves the allocation of talent. Evidence shows that community standards or altruism can also explain market anomalies with suboptimal resource allocations (Kahneman et al., 1986a,b). Within the pool of entrepreneurs, for example, it is possible that altruistic preferences allocate the less talented into social

[1] Here, Baumol (1990) refers to a range of activities that threaten productive entrepreneurship (for related work, see Nunn, 2007; Murphy et al., 1991, 1993; Grossman and Kim, 1995). One example is innovation in rent-seeking procedures, such as "a previously unused legal gambit that is effective in diverting rents to those who are first in exploiting it" (Baumol, 1990, p. 897).

[2] Murphy et al. (1993) separate rent-seeking from entrepreneurship by definition. In this paper, we use the broader Baumolian (1990) definition of entrepreneurship that includes rent-seeking activities.

[3] Similar models also offer a more general economic explanation for crime (e.g. Becker, 1968; Ehrlich, 1973) and for violent conflicts (so-called predator–prey models by Hirshleifer, 1987; Bates et al., 2002; Neary, 1997; Skaperdas, 1992).

entrepreneurship. If social entrepreneurship is considered desirable, it may be necessary to design policy so as to improve the quality of entrepreneurs allocated into this type of entrepreneurship.

Testing the specific role of entrepreneurial talent raises the question of what type of entrepreneurial talent we are looking at. To be successful as an entrepreneur, a person needs both the creativity to develop and recognize a commercial opportunity (Shane and Venkataraman, 2000; Sarasvathy et al., 2005) and the skills and talents to set up and operate new ventures. Empirical evidence suggests that, in particular, opportunity recognition and self-assessed creativity are positively correlated (e.g. Hills et al., 1999; Ward, 2004; Corbett, 2005). Likewise, the evidence on self-assessed business talent and entrepreneurial intentions and actions is well established (Chen et al., 1998; Krueger et al., 2000; Zhao et al., 2005; Cassar and Friedman, 2009). Accordingly, scales for both, business talent and creativity, are often merged in questionnaires that seek to measure entrepreneurial competences (see e.g., Wilson et al., 2007; Zhao et al., 2005). In contrast, Parker (2009) discusses the views of classics like Jean-Baptiste Say and Josef Schumpeter and argues that the entrepreneur might be "an exploiter rather than an inventor of new knowledge" (p. 34). Given the different views on entrepreneurship, this paper suggests, and shows empirically, that it may be useful to distinguish creativity from business talent.

The experimental evidence presented in this paper tests Baumol's (1990) key assumption that entrepreneurial talent is generally selfish. In addition, our results stress the importance of distinguishing between different types of entrepreneurial talent, as well as considering the possibility that people do care about inflicting damage on others, even when this damage is not certain. In our experiment, we find that entrepreneurial talent consists of two components: creative talent and business talent. More importantly, along these dimensions of entrepreneurial talent, we find that individuals differ systematically in their willingness to forego private payoffs to avoid loss to others. On average, individuals with a stronger business-oriented (creative) component of entrepreneurial talent are more (less) likely to accept collateral damage by engaging in privately profitable, but socially unproductive or even destructive activities. More specifically, we observe that individuals who are both more business-talented and less creative behave significantly more selfishly than the rest.

In this paper, we contribute to the entrepreneurship literature by providing a first experimental analysis linking selfish preferences to entrepreneurial talent. Further, we show the importance of distinguishing between the creative and the business dimension of entrepreneurial talent. In testing the key assumption of selfish behavior in talent allocation models, we also provide an empirical investigation of the general validity of these models. Furthermore, this paper contributes to the experimental economics literature by studying altruism and social risk taking with respect to negative externalities. In doing this, and in contrast to most literature in the field, we explicitly analyze the willingness to risk collateral damage. This is an important contribution because previous findings from related studies cannot easily be generalized to situations with negative externalities. There are at least two reasons for this. First, attitudes to risks borne by others have not yet been introduced into economic theory.[4] Second, there is ample evidence from descriptive decision theory that risk propensity differs with respect to gains and losses (e.g., Tversky and Kahneman, 1992). As most theory models of talent allocation include risky payoffs with losses for others, there is thus a need for an experimental analysis of social risk taking with negative externalities, which, to the best of our knowledge, this paper is among the first to provide.

In Section 2, the different decision tasks (treatments) and the experimental procedures are described in detail. The results of the experiment are reported in Section 3. Section 4 concludes.

2. The experiment

2.1. Decision tasks

To elicit other-regarding preferences, we rely on six decision tasks (treatments), which are summarized in Appendix A. All treatments are based on the dictator game. In fact, Treatment 1 (the base case), is the classic dictator game, where a dictator d receives an amount of money M and then decides on the size of a donation $D \leq M$ to the receiver r. In our experiment, M is 10 Euro. The payoff of the dictator, P_d, and for the receiver, P_r, are defined as follows[5]:

$$\begin{aligned} P_d &= M - D, \\ P_r &= D, \end{aligned} \quad \text{with} \quad 0 \leq D \leq M$$

Treatment 1 elicits altruistic preferences in sure payoffs. Most models of unproductive entrepreneurship, however, involve decisions under risk and distributing sure positive payoffs might involve different behavior than distributing chances for receiving a positive payoff. We therefore modify the classic dictator game to include risky payoffs. Following Karni et al. (2008) and Krawczyk and Le Lec (2008), we let the dictator decide on how to divide 100 lottery tickets, each of which wins M if drawn. Intuitively, both the dictator and the receiver have a lottery wheel with 100 lottery tickets out of which one ticket will be drawn. The dictator's lottery wheel contains 100 winning tickets each worth a prize M if drawn; the receiver's lottery wheel contains 100 blanks, each worth zero. The dictator can decide how many of her winning tickets she wants to exchange for blanks of the receiver. This allows a dictator who cares about others to give the receiver a chance to win, too.

[4] In fact, none of the existing theoretical frameworks, neither models of decision making under risk nor models of social preferences, can explain how social preferences of individuals affect decision making under risk (Brennan et al., 2008; Bradler, 2009).

[5] For simplicity, we define the payoffs of all decision tasks as expected monetary payoffs.

As shown in the following payoff functions of Treatment 2, the expected payoff for the dictator is thus the probability p of winning the amount M, whereas the expected profit for the receiver is based on the complementary probability:

$$P_d = p \cdot M$$
$$P_r = (1 - p) \cdot M$$

Because risk propensity varies with respect to gains and losses (e.g., Tversky and Kahneman, 1992), we replicate Treatment 2 with a negative prize M. This generates the following expected payoffs for Treatment 3:

$$P_d = p \cdot M$$
$$P_r = ((1 - p) \cdot M)$$

To include negative externalities, we combine the dictator's payoffs in Treatments 2 and 3. In Treatment 4, the dictator does not split the pie of (risky) gains or losses; instead, any increase in the probability of winning M is accompanied by an equally strong increase in the risk of collateral damage (loss for the receiver). In this treatment, both the dictator's and the receiver's lottery wheels each contain 100 blanks. The dictator additionally receives 100 winning tickets each worth M, which can be used to convert (draw and replace) blanks in her own lottery. However, every time the dictator converts one of her blanks into a winning ticket, a blank in the receiver's lottery is converted into a ticket 'winning' a negative amount, $-M$.

$$P_d = p \cdot M$$
$$P_r = -(p \cdot M)$$

In a modification of Treatment 4, the dictator is able to recover some or all of the negative externalities inflicted on the receiver. In Treatment 5, the chances that the dictator forgoes winning M, i.e., $(1 - p)$, are used to reduce the risk of collateral damage, i.e., $-(p \cdot M)$. In this treatment, all unused conversions of blanks into winners in the dictator's lottery automatically convert 'negative tickets' in the receiver's lottery back into blanks. The dictator is thus able to 'neutralize' negative externalities to a sure payoff of zero for the receiver.

$$P_d = p \cdot M$$
$$P_r = \begin{cases} -((p - (1 - p)) \cdot M) & \text{if } \ p > 0.5 \\ 0 & \text{if } \ p \leq 0.5 \end{cases}$$

In Treatment 5, any decision on $p < 0.5$ is wasteful. In Treatment 6, we remove this restriction, so that the dictator can now share positive expected gains by choosing $p < 0.5$. That is, once all negative externalities have been neutralized in the receiver's lottery, all of the dictator's remaining unused conversions (up to 100) replace blanks in the receiver's lottery with 'positive tickets', each worth M if drawn. The payoffs in Treatment 6 are as follows:

$$P_d = p \cdot M$$
$$P_r = -((p - (1 - p)) \cdot M)$$

Thus, in Treatment 6, the dictator can either maximize private revenues by choosing $p = 1$, partially or fully neutralize negative externalities by choosing $0.5 \leq p > 1$, or share positive expected gains by choosing $p < 0.5$. Note that both the dictator and the receiver earn the same amount (in expected terms) if the dictator chooses $p = 1/3$.

While Treatments 4–6 look rather similar, there are important differences. In Treatment 4 the dictator cannot gain without hurting the other. In Treatment 5, up to a threshold, the dictator can increase her gain without hurting the other, but she cannot do something good for the other. In Treatment 6, the dictator can actually decide to benefit the other. Hence, in contrast to Treatments 1–3, which have no externalities, the dictators' decisions can change welfare in Treatments 4–6 and welfare is maximized at different levels.

All treatments share two fundamental characteristics. First, there is a dictator determining her own and the receiver's payoffs. Second, in each of the six treatments, purely self-interested maximization of the dictator's own payoff generates a sure gain of 10 Euro. Hence, according to talent allocation models, the entrepreneurially more talented choose the maximum payoff of 10 Euro with certainty. Also, for the talented, this choice does not change across treatments, because the maximum gain stays the same. Note that our measure of talent is relative, so we do not expect the more talented dictators to always go for the maximum. We do expect, however, that the entrepreneurially more talented choose a higher private gain than the less talented. In the following, we refer to this as the 'talent effect'. Analogously to above, we expect that this talent effect is robust with respect to differences across treatments. These differences include risk (Treatment 2–6), framing of gains and losses (Treatments 2 and 3), externalities (Treatments 4–6) and changes in welfare (Treatments 4–6).

The main reason for including different treatments with equal maximum gains is to increase the external validity of our findings. Isolated results from the classic dictator game could easily be challenged by referring to the fact that many entrepreneurial decisions include risk. The same applies to negative externalities, welfare effects, and the fact that often not gains, but losses are distributed. Reality is likely to be a mixture of these and many more cases. There are therefore ample reasons why one might expect differences in absolute gains across the whole sample and between treatments. However, if we find the same basic pattern with respect to the talent effect, we can not only be more confident of its robustness, but also hopeful that it might generalize to settings which we have not studied.

2.2. Participants

Talent allocation models assume that there exists a fixed pool of entrepreneurially talented people. To replicate this theoretical assumption in a laboratory setting, we need to identify entrepreneurial talent. At first thought it might seem prudent to use actual entrepreneurs as participants. However, despite the potential benefits of focusing on selected professionals for experiments (Alevy et al., 2007; Drehmann et al., 2005; Elston et al., 2006; Elston and Audretsch, in press), there are at least three reasons why established entrepreneurs (e.g., business owners) are not a suitable population for our experiment. First, established entrepreneurs have already revealed their occupational choice and would therefore bias our sample on one of the possible outcomes of entrepreneurial talent. Baumol (1990) explicitly argues that entrepreneurially talented people do not necessarily end up in a productive entrepreneurial occupation. Second, an experiment with established entrepreneurs would suffer from an attrition bias, as business survival depends on many things other than individual talent. Third, it is not the real talent, but the subjectively perceived talent that determines the a priori choice talent allocation models are interested in. We therefore conducted our experiments with a diverse group of students, who did not yet reveal the type of activity they will choose after graduation.

To identify the entrepreneurially more talented among these students, we measure their subjective perception of their talent to perform activities that are required to become an entrepreneur, i.e., their entrepreneurial self-efficacy (see Section 2.4). This provides us with a relative measure of entrepreneurial talent, i.e. a continuum of more or less talented individuals based on the experimental sample. Note that subjective entrepreneurial self-efficacy is shown to be related to entrepreneurs' actual success such as firm growth (Baum et al., 2001; Baum and Locke, 2004; Hmieleski and Corbett, 2006).

Three experimental sessions were conducted at the experimental laboratory ELSE at Utrecht University, the Netherlands, in February 2009. Participants were taken from a subject pool of approximately 1400 registered bachelor and master students of the Utrecht University. Another three sessions were conducted in March 2009 at the experimental laboratory of the Max Planck Institute of Economics, Jena, Germany. There, participants came from a pool of approximately 2000 registered bachelor and master students of universities located in Jena. In both locations, we recruited students from all faculties, ranging from the natural to the social sciences, with the exception of psychology.[6] Altogether 132 subjects participated, 60 in Utrecht and 72 in Jena. There were 79 male and 53 female participants, with an average age of 22.6 years (and a standard deviation of 2.95). Of the 60 dictators (who knew their role in advance), 40 were male and 20 female, with an average age of 22.9 years (and a standard deviation of 3.08).

2.3. Procedures

Subjects were randomly assigned to pairs and informed of their role in this pair, i.e., receiver or dictator. At no point during the experiment were the students told who the other half of their pair was.[7] Participants remained in the same pair and played the same role throughout the entire session. The experiment consisted of two sets of treatments. Within each set, the presentation of treatments was randomized. In the first set, participants were confronted with the treatments explained in Section 2.1 and in Appendix A.[8] Subsequently, an additional set of 13 treatments, closely related to Brennan et al. (2008) and Güth et al. (2008), was played. These treatments are not analyzed in this paper and because they were always played last, we do not expect any confounding effects on the results reported here. In order to measure entrepreneurial talent and other psychometric variables, which are explained in Section 2.4, the participants also had to answer a questionnaire. To minimize spillover effects, we administered the incentivized part of the experiment last, i.e. after the (non-incentivized) psychometric measurements. Moreover, by applying the psychometric measurements prior to assigning the roles to participants, we are able to analyze a larger sample with respect to the reliability and validity of the psychometric properties. At the end of the session each subject answered a few additional questions on personal, demographic data.

Both sets of three sessions followed the same procedure. The sessions were computerized using a program written with z-tree (Fischbacher, 2007). Participants were seated in a random order at PCs, separated from each other by blinds. Instructions were distributed before each part of the experiment and questions were answered in private.[9] All treatments contained a "preview" function. Participants could only proceed once they have pushed the preview button, which resulted in a display of the consequences of their decision both for the dictator as well as for the receiver (see screen shots in Appendix B). Per decision, several previews were possible, enabling participants to better understand the effects of their decisions on the

[6] Psychology students may be particularly biased and/or distrustful, because of the higher likelihood that they have previously participated in psychological experiments, which do not follow the paradigms of economic experiments.

[7] In Utrecht, the receivers were asked to make the same decisions as the dictators, but from a hypothetical perspective. In the Jena sessions, 10 dictators were complemented with 14 passive players. The passive players were informed that they will be randomly drawn as a dictator with a chance of 1 out of 7. The actual role of the passive players was then revealed at the end of the experiment. In this paper, however, we only focus on the responses of dictators who knew in advance that they were dictators.

[8] In this set, a few additional treatments (two in Utrecht and three in Jena) of the dictator game with sure outcomes were included. These treatments closely followed Bardsley (2008), where dictators can take sure payoffs from the other. For the sake of brevity and relevance to entrepreneurship, our analysis focuses on the treatments with risky outcomes and on one treatment with sure payoffs as a benchmark (the classic dictator game). Including the other treatments in our analysis does not change the conclusions reported in this paper.

[9] Upon request, the complete set of instructions and the experimental data are available from the authors.

final outcomes. Before starting the experiment, subjects were informed that they receive a participation fee of 12.50 Euro (payable after the experiment); this ensured that no one went home with less money than they arrived with. Earnings in the experiment were determined by one treatment per pair, which was individually and randomly selected at the end of the session. This led to an average payoff of 15 Euro per subject, but with substantial variance between 2.5 and 27.5 Euro. The duration of the experiment was about 90 min.

2.4. Psychometric measurements

Entrepreneurial self-efficacy has been measured at different levels of relatedness to entrepreneurship: Wilson et al. (2007) at a more general level and Zhao et al. (2005) at a more specific level.[10] As shown in Appendix C, we utilize Wilson et al. (2007) (six items), extend it with items from Zhao et al. (2005), and add two items at the more specific level suggested by Erik Monsen in personal communication.[11] On a 7-point scale from "much worse" to "much better", participants were asked to indicate their confidence in their abilities to perform different activities relative to their fellow students. A relative measure of competence and talent is especially important for market entry decisions (e.g. Camerer and Lovallo, 1999; Moore et al., 2007). It closely mirrors beliefs about absolute performance (Larrick et al., 2007) and has become a characteristic frequently investigated with respect to entrepreneurs (see e.g., discussions in Koellinger et al., 2007 and in Parker, 2009). To validate the internal structure, we run a common factor analysis. The common factor analysis yields three factors with eigenvalues above 1; the third just marginally exceeds 1. The three factors relate to creativity, to general self-efficacy, mainly based on Wilson's items, and more specific self-efficacy based on the Zhao and Monsen items. Velicer's (1976) Minimum Average Partial (MAP) test, which is less susceptible to overestimating the number of factors, suggests only two factors, but does not provide guidance on which factors need to be separated.

Chen et al. (1998) and Long (1983) propose that, next to uncertainty, two components play an important role in entrepreneurship: managerial talent and creativity. Similarly, for Schein's (1975) Career Orientation Inventory it was found that business-related entrepreneurship (business talent) and creativity constitute two separate constructs. Danziger et al. (2008) test the construct validity of the two-factor model with 1847 Israeli working adults and provide strong support for the distinction between these two dimensions. In accordance with this literature, we factorize the entrepreneurial self-efficacy items without the creativity items (coded 'C' in Appendix C) and find that there is only one factor with an eigenvalue exceeding 1. Following Chen et al. (1998), Long (1983), and Danziger et al. (2008), we therefore separate the creativity items to form the *creativity* factor C (2 items, $\alpha = 0.76$), while the other items form the (entrepreneurial) *business talent* factor BT (10 items, $\alpha = 0.79$).[12]

Similar to Ben-Ner et al. (2004), who investigate the extent to which personality can affect behavior in dictator games, we also include the 'Big Five' personality traits, which describe five broad psychological factors or dimensions of personality: extraversion, agreeableness, conscientiousness, neuroticism, and openness. Although they have been found to be related to entrepreneurship (Zhao et al., 2010; Gruber, in press), we acknowledge that there exists an inconclusive discussion whether such general traits have potential in explaining entrepreneurial behavior (see Rauch and Frese, 2007). We therefore measured these variables primarily for exploratory purposes and only report them in this study, because post hoc they enabled a closer investigation of the two types of entrepreneurial self-efficacy.[13] Particularly, they allow us to analyze the independence of the two factors business talent and creativity by inspecting their correlation structure with the personality traits. In the questionnaire we included the 10-item short version of the 'Big Five' personality traits. The scale, developed by Rammstedt and John (2007), includes two items for each dimension. Participants were asked to indicate their level of agreement on a 7-point scale from "strongly disagree" to "strongly agree." A common factor analysis extracting five factors based on an oblique rotation leads to the expected loadings above 0.4 on their corresponding factors, but below 0.22 on other factors. Due to the extreme shortness (two items), reliability coefficients (Cronbach's α) vary substantially and are on average rather low, 0.73, 0.39, 0.46, 0.67, and 0.39. Only extraversion and neuroticism show acceptable levels of internal reliability. We nevertheless keep all variables in the analysis but treat the results with caution.

3. Experimental results

In the following analysis, we focus on a subset of responses, i.e., on the 60 dictators who knew in advance that they were dictators. The different versions of the dictator game that we employ are difficult to compare, because they require participants to respond in different ways, i.e. give away sure Euro amounts or convert lottery tickets for gains or losses. However, all versions of the game share the common characteristic that the dictator can unilaterally allocate positively

[10] Chen et al. (1998) measure entrepreneurial self-efficacy at a very specific level, including, for example, the perceived ability to set and meet market-share goals. However, this scale was specifically designed to distinguish entrepreneurial from managerial self-efficacy, but not from other backgrounds. Analogous to our argument for excluding real entrepreneurs, we therefore consider this scale inappropriate for our purposes.

[11] As a robustness check, we also tested the scales without the two items suggested by Erik Monsen. The results were qualitatively unchanged from those reported here.

[12] This factor includes one item with weak loadings, i.e., the ability to manage money.

[13] In a dictator game setting, Ben-Ner et al. (2004) show that the 'Big Five' can explain behavior. We therefore checked all regression analyses in this paper with the 'Big Five' as additional control variables (unreported). Their inclusion did not change the qualitative results of this paper.

Table 1
Summary statistics and Pearson correlation coefficients of psychometric variables and cumulative 'keeping'.

		Mean	S.D.	1	2	3	4	5	6	7
1	Creativity	4.242	1.254	1						
2	Business talent	4.277	0.737	−0.007	1					
3	Extraversion	4.758	1.448	0.275*	0.325*	1				
4	Agreeableness	4.175	1.285	−0.206	−0.072	0.039	1			
5	Conscientiousness	4.633	1.081	0.138	0.097	0.099	0.044	1		
6	Neuroticism	4.325	1.426	−0.012	−0.278*	−0.167	−0.147	0.112	1	
7	Openness	5.075	1.327	0.649***	−0.140	0.294*	−0.107	0.135	−0.083	1
8	Cumulated 'keeping'	0.000	0.687	−0.254*	0.220+	−0.040	−0.071	−0.033	−0.236+	−0.027

N = 60. Significance levels: prob. < 0.10 (+), prob. < 0.05 (*), prob. < 0.01 (**), prob. < 0.005 (***).

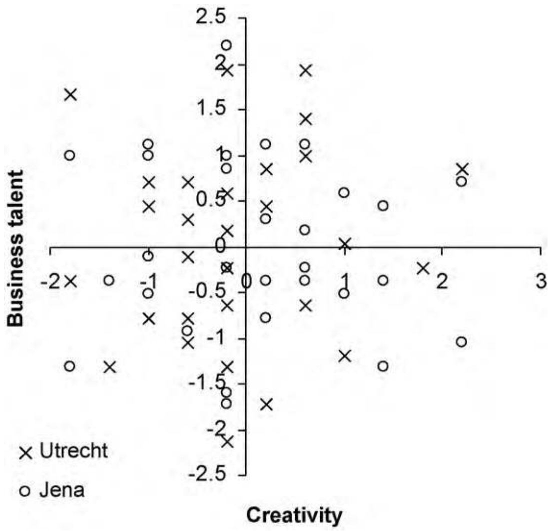

Fig. 1. Scatter plot of business talent and creativity (both standardized) for the two locations of experiments (Jena and Utrecht).

or negatively valued objects between herself and the receiver. Importantly, the two extreme responses are equal in all treatments; either the dictator receives nothing or gives away everything with certainty, or the dictator receives 10 Euro or does not lose 10 Euro with certainty. The treatments only differ with respect to interior results. Regardless of the game's structure, the dictator can continuously vary her own expected payoff between 0 and 10 Euro or between −10 and 0 Euro. To simplify the analysis and the reporting of the results, we transform all responses such that they are normalized between 0 and 10. All positive payoffs that the dictator generate for herself, irrespective whether she keeps gains or gives away losses (depending on the treatment), we jointly refer to as '*keeping*'.[14] We further calculate a combined response by standardizing (calculating the z-scores for) each treatment and calculating the sum over all treatments. This cumulated response does not describe the average 'keeping', but it describes the overall relative deviation from the population mean and therefore describes how much a participant deviates on average from the mean. The treatment-wise standardization controls for the fact that the variance of 'keeping' can differ across treatments, which is relevant for the regression analysis employed below.

Table 1 reports the summary statistics and Pearson correlations of the psychometric variables and the cumulated response (of 'keeping') across all treatments. Within the set of dictators, the Pearson correlation coefficient for creativity and business talent is −0.01 (with prob. = 0.96); thus, they are virtually independent. Fig. 1 also graphically shows the independence of the two components of talent, both for the sample in Utrecht and in Jena. The pairwise correlation structure of business talent and creativity with the 'Big Five' personality traits also suggests that the two components of talent represent different factors (Table 1). Both are significantly and positively associated with extraversion, which is consistent with Zhao et al. (2010), who show that entrepreneurial intent and performance are positively associated with this trait. For openness and neuroticism, however, we find substantial differences between creativity and business talent. While creativity is significantly and positively associated with openness, business talent is not. In contrast, business talent is significantly and negatively associated with neuroticism, while creativity is not. Overall, both factors show a substantially different correlation pattern with personality traits, which further supports the notion that these two components of entrepreneurial talent need to be distinguished and analyzed separately.

[14] For example, if the dictator gives away 80 out of 100 lottery tickets, one of which generates a loss of 10 Euro (Treatment 3), she 'keeps', in expected terms, 8 Euro.

Table 2
Treatment-specific summary statistics and treatment comparisons.

Treatment	Mean	S.D.	Median	Binary treatment comparisons				
				T2	T3	T4	T5	T6
T1	8.225	2.072	10	-3.064^{***}	-2.185^{*}	2.856^{***}	1.148	1.621
T2	8.878	2.006	10		1.380	4.577^{***}	3.746^{***}	4.242^{***}
T3	8.578	2.099	10			4.093^{***}	2.856^{***}	3.401^{***}
T4	7.245	3.377	9.5				-2.475^{*}	-1.963^{*}
T5	8.017	2.366	9.25					1.852^{+}
T6	7.723	2.843	9					

$N = 60$. Binary treatment comparisons based on Wilcoxon matched pairs signed-rank test (z values reported cells). Significance levels: prob. < 0.10 (+), prob. < 0.05 (*), prob. < 0.01 (**), prob. < 0.005 (***)

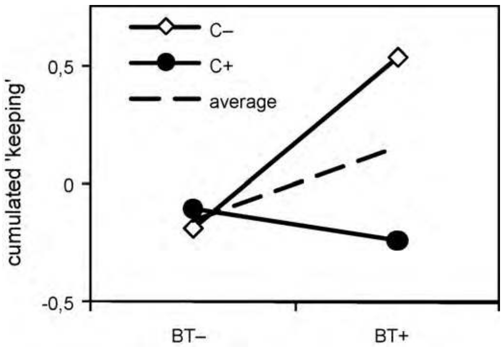

Fig. 2. Interaction of business talent (BT) and creativity (C) for cumulated 'keeping' based on a median sample split of raw data. *Note*. BT = business talent; C = creativity; (+) above median; (−) below median.

Table 2 reports the means, standard deviation, and the median of the absolute amount of 'keeping' for each treatment independently. It also reports the z-values of Wilcoxon matched pairs signed-rank tests for the equality of 'keeping' for each pair of treatments. For most treatments we find that their 'keeping' differs significantly at the five percent confidence level. Only two groups of treatments have statistically indistinguishable means: Treatments 1, 5, and 6, and Treatments 2 and 3. As explained at the end of Section 2.1, the differences between the absolute responses per treatment do not contradict the predictions of talent allocation models. Only the more talented are expected to maximize 'keeping' across all treatments, but the means in Table 2 refer to the total sample, including the less talented.

As we can see from the means in Table 2, dictators 'keep' relatively large amounts for themselves: on average, 'keeping' is lowest in Treatment 4 (negative externalities without recovery: 7.245 Euro) and highest in Treatment 2 (lottery with gains: 8.878 Euro). Note that Treatment 2 mimics the classic dictator game (Treatment 1) with the only exception that lottery tickets (for an equal, positive gain) instead of sure payoffs are distributed. Despite the high similarity, dictators 'keep' significantly more lottery tickets in Treatment 2 than sure payoffs in Treatment 1. This is consistent with earlier research of, e.g., Brennan et al. (2008) and Güth et al. (2008), who suggest that risk considerations crowd out altruism. For other (more complex) game structures that also involve lottery tickets, however, the average differences to the classic dictator game are smaller and statistically insignificant (see Treatments 1, 5, and 6 in Table 2).

We start our analysis of the two different components of entrepreneurial talent by inspecting the cumulative 'keeping' non-parametrically. First, we split the sample into four roughly equal-sized subgroups (via median splits along the two dimensions, creativity and business talent): BT_+/C_+, BT_+/C_-, BT_-/C_+, and BT_-/C_-. Then we plot the average cumulative 'keeping' for each of the four groups. As Fig. 2 shows, one group stands out: those who consider themselves as talented in business but less creative, i.e. BT_+/C_-. As shown in Appendix D, the special role of the business-talented, but uncreative can also be identified in the individual treatments. (Appendix D reports treatment-specific plots analogous to Fig. 2).

To investigate whether this visual result is statistically valid across and within treatments, we run non-parametric tests on the following hypotheses[15]: (1) average 'keeping' in BT_+/C_- is higher than in the remaining three groups together; (2) average 'keeping' in BT_+/C_- is higher than in each of the remaining three groups; (3) the population median of 'keeping' among the remaining three groups is equal; and (4) the population median of 'keeping' among all four groups is not equal. Table 3 reports the results of corresponding Mann–Whitney and Kruskal–Wallis tests. All signs of the pairwise comparisons are as predicted. Further, as expected from Fig. 2 and Appendix D, almost all tests confirm that dictators with more business talent, but less creativity (BT_+/C_-) 'keep' significantly more than the other groups (individually and jointly). There are only

[15] At a later point we also analyze the data parametrically. Non-parametric tests, however, rely on a smaller set of assumptions. We therefore consider them important to shed more light on the robustness of our results.

Table 3
Non-parametric tests whether business-talented uncreative participants (BT_+C_-) stand out from the rest of the population with respect to 'keeping', and whether the remaining groups (BT_+C_+, BT_-C_-, BT_-C_+) are indistinguishable.

	CK	Treatments					
		T1	T2	T3	T4	T5	T6
Mann–Whitney tests (z value)							
$BT_+C_- = \{BT_+C_+, BT_-C_-, BT_-C_+\}$[a]	3.031***	2.472*	2.588**	2.790**	3.408***	2.648**	2.480*
$BT_+C_- = BT_+C_+$	2.836***	2.108*	2.394*	2.759**	3.204***	2.570*	2.493*
$BT_+C_- = BT_-C_-$	2.696**	2.163*	2.478*	2.470*	3.158***	2.577**	2.097*
$BT_+C_- = BT_-C_+$	1.977*	2.046*	1.820+	2.246*	2.629***	1.398	1.648+
Kruskal–Wallis test (χ^2)							
$BT_+C_+ = BT_-C_- = BT_-C_+$	0.373	0.109	0.478	0.603	0.233	0.776	0.445
$BT_-C_+ = BT_+C_+ = BT_-C_- = BT_-C_+$	9.647*	6.172	7.204+	8.365*	11.773**	8.021*	6.682+
Additional Mann–Whitney tests (z value)							
$BT_-C_+ = BT_-C_-$	0.305	0.273	0.617	0.022	0.227	0.689	0.167
$BT_-C_+ = BT_+C_-$	0.565	0.305	0.592	0.679	0.100	0.832	0.698

Note. $N = 360$ in full sample. CK = cumulated 'keeping'; BT = business talent; C = creativity; (+) above median; (−) below median. Table reports test statistics, significant test statistics imply that the condition displayed in the left column does not hold. Significance levels: prob. < 0.10 (+), prob. < 0.05 (*), prob. < 0.01 (**), prob. < 0.005 (***).

[a] Groups in curly brackets were pooled before the test.

two exceptions. First, in Treatment 1, median 'keeping' among all four groups does not differ significantly, but a difference in 'keeping' in all pairwise comparisons is supported as expected. Second, in Treatment 5, average 'keeping' of BT_+/C_- is not significantly higher than the average response of BT_-/C_+. We therefore tested whether the more creative but less business-talented (BT_-/C_+), instead of BT_+/C_-, 'keep' more than the remaining two subgroups (BT_-/C_-; BT_+/C_+). As shown in Table 3, we find no significant differences for BT_-/C_+. The overall evidence therefore corroborates the general pattern reported in Fig. 1 and in Appendix D, across and within treatments.

To complement the non-parametric tests, we also employ a parametric, pooled ordinary least square regression analysis. To account for the potential correlation of error terms within subjects, we estimate robust Huber/White standard errors that are adjusted for heteroscedasticity and within-subject correlations (Wooldridge, 2002). As control variables we include age, as well as several contrast codes for gender, the city of data collection, and whether the participants' major was related to business or economics. To simplify the interpretation of results, especially be enabling interpreting main effects as average effect of variables, averaged over all values of moderating variables, we mean-centered all contrast codes and standardized all continuous variables (Cohen et al., 2003).[16] Table 4 reports the regression results.

Table 4 reports the estimation results for the control variables (Model 1), plus the two factors business talent and creativity (Model 2), plus the interaction between the two factors in entrepreneurial talent (Model 3). We further report models where we allow for treatment-specific intercepts (Model 4), for the variation of talent effects between treatments (Model 5), and for the variation of talent interaction effects between treatments (Model 6). Stone and Hollenbeck (1989) argue that differences in variance between different groups can lead to spurious interaction effects. Looking back at Table 2 we see substantial differences in variance between treatments. Levene's robust test of equality of variance rejects equal variance among treatments ($F = 9.342$, $p < 0.001$) as does the alternative suggested by Brown and Forsythe (1974) ($F = 4.070$, $p = 0.001$). To improve the identification of differences in talent effects between treatments we therefore follow Stone and Hollenbeck (1989) and standardize the responses for each treatment separately (Model 7).

The results show that the more creative participants 'keep' less and the more business-talented 'keep' more. This holds across all relevant Models 2–7. Further, Models 3–7 show a negative interaction between business talent and creativity. Fig. 3 plots this interaction effect for low (−1 S.D.) and high (+1 S.D.) values of both types of talent and also reports the 95-percent confidence intervals for the corresponding predictions. The interaction plot (based on Model 7 in Table 4) clearly shows that, dictators who are more business-talented and creative do not 'keep' as much for themselves as those who are more business-talented, but less creative. With regard to the control variables, only the contrast code for the location of the experiment is significant: on average, participants in Jena 'keep' more for themselves.

Corresponding to the non-parametric tests in Table 2 we find significant treatment effects on the absolute level of 'keeping' in Models 4–6.[17] Compared with Treatment 1 (classic dictator game), Table 4 shows that 'keeping' is higher in Treatment 2 and lower in Treatments 4 and 6. The treatment-specific main effects are not surprising, as they refer to all dictators in the sample, irrespective of their talent. With regard to business talent and creativity, however, we expect the talent effect to be robust across the different treatments. Indeed, Model 7, which is robust against spurious interaction effects, shows that hardly any treatment-specific interaction effects exist. The interaction effect with Treatment 4 in Model 6 is not robust

[16] This allows for the comparison of coefficients between nested models that include interaction effects. Without mean-centering the interpretation of coefficients of main effects would be different for models with and without interaction effect.

[17] As the responses in Model 7 are standardized at the treatment level, we do not expect and also do not detect treatment-specific main effects.

Table 4
Pooled OLS regression analysis testing talent effects and their variation across treatments.

DV: 'keeping'		Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7 (see Note)	
Constant		8.111	(0.268)***	8.111	(0.250)***	8.107	(0.239)***	8.107	(0.240)***	8.107	(0.244)***	8.107	(0.246)***	−0.002	(0.099)
Age		−0.181	(0.289)	−0.141	(0.285)	−0.060	(0.257)	−0.060	(0.259)	−0.060	(0.262)	−0.060	(0.264)	−0.035	(0.106)
Female vs. Male	F/M	−0.038	(0.193)	−0.015	(0.186)	−0.009	(0.179)	−0.009	(0.181)	−0.009	(0.183)	−0.009	(0.185)	−0.004	(0.075)
Jena vs. Utrecht	J/U	0.594	(0.260)*	0.645	(0.241)**	0.598	(0.238)*	0.598	(0.240)*	0.598	(0.243)*	0.598	(0.245)*	0.246	(0.099)*
Business & Econ	B/E	0.331	(0.413)	−0.009	(0.372)	0.169	(0.375)	0.169	(0.377)	0.169	(0.383)	0.169	(0.386)	0.066	(0.156)
Business talent	BT			0.510	(0.229)*	0.429	(0.196)*	0.429	(0.197)*	0.429	(0.200)*	0.429	(0.202)*	0.165	(0.083)+
Creativity	C			−0.620	(0.312)+	−0.581	(0.284)*	−0.581	(0.286)*	−0.581	(0.291)+	−0.581	(0.293)+	−0.232	(0.118)+
Business talent × Creativity						−0.658	(0.250)*	−0.658	(0.252)*	−0.658	(0.256)*	−0.658	(0.258)*	−0.263	(0.104)*
Treatment 2	T2							0.544	(0.187)**	0.544	(0.181)**	0.544	(0.183)**	−0.000	(0.090)
Treatment 3	T3							0.294	(0.165)+	0.294	(0.166)+	0.294	(0.168)+	−0.000	(0.080)
Treatment 4	T4							−0.817	(0.259)**	−0.817	(0.249)**	−0.819	(0.246)**	−0.000	(0.081)
Treatment 5	T5							−0.174	(0.185)	−0.174	(0.186)	−0.174	(0.188)	0.000	(0.084)
Treatment 6	T6							−0.418	(0.204)*	−0.418	(0.203)*	−0.420	(0.200)*	−0.000	(0.077)
Business talent × T2										−0.058	(0.221)	−0.067	(0.217)	−0.029	(0.106)
Business talent × T3										−0.141	(0.225)	−0.147	(0.225)	−0.072	(0.108)
Business talent × T4										0.624	(0.301)*	0.582	(0.303)+	0.122	(0.114)
Business talent × T5										0.187	(0.239)	0.186	(0.247)	0.062	(0.114)
Business talent × T6										−0.032	(0.240)	−0.069	(0.246)	−0.059	(0.105)
Creativity × T2										0.423	(0.185)*	0.423	(0.188)*	0.204	(0.093)*
Creativity × T3										−0.055	(0.167)	−0.054	(0.171)	−0.023	(0.082)
Creativity × T4										−0.063	(0.259)	−0.060	(0.235)	0.067	(0.069)
Creativity × T5										−0.013	(0.226)	−0.013	(0.228)	0.022	(0.099)
Creativity × T6										−0.275	(0.264)	−0.273	(0.240)	−0.036	(0.080)
Business talent × Creativity × T2												−0.085	(0.216)	−0.049	(0.108)
Business talent × Creativity × T3												−0.052	(0.233)	−0.022	(0.112)
Business talent × Creativity × T4												−0.403	(0.256)	−0.039	(0.078)
Business talent × Creativity × T5												−0.012	(0.255)	0.021	(0.112)
Business talent × Creativity × T6												−0.356	(0.283)	−0.069	(0.099)
Observations (groups)		360	(60)	360	(60)	360	(60)	360	(60)	360	(60)	360	(60)	360	(60)
R-squared (F)		0.057	(1.60)	0.145	(4.61)***	0.195	(4.35)***	0.240	(3.82)***	0.264	(4.45)***	0.269	(4.52)***	0.225	(4.14)***
Delta *R*-squared (F)		0.057	(1.60)	0.088	(6.12)***	0.051	(6.90)*	0.044	(5.29)***	0.024	(2.59)*	0.005	(0.93)		

Note. Significance levels prob. < 0.10 (+), prob. < 0.05 (*), prob. < 0.01 (**), prob. < 0.005 (***). Standard errors (in parentheses) are adjusted for heteroscedasticity and correlations within subject. Contrast codes (F/M, J/U, B/E, T2–T6) are mean-centered and continuous variables (age, BT, C) are standardized. Therefore, the coefficients of main effects are comparable between models including and models not including interaction terms. In Model 7 the dependent variable is standardized per treatment. Therefore no delta *R*-squared (F) is reported.

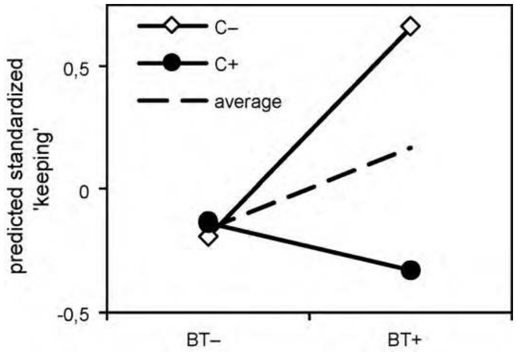

Fig. 3. Interaction of business talent (BT) and creativity (C) for 'keeping' (treatment-wise standardized) based on pooled OLS rsegression analysis (Table 4, Model 7). *Note*. BT = business talent; C = creativity; (+) above median; (−) below median. The 95-percent confidence intervals for the four predictions are: B_+C_- (0.329, 0.992), B_+C_+ (−0.649, −0.012), B_-C_- (−0.607, 0.216), B_-C_+ (−0.491, 0.222). The interval of B_+C_- does not overlap with any of the other intervals.

Table 5
Differences in levels of talent and 'keeping' specific to gender and major.

Sample split	*N*	Business talent		Creativity		Cumulative "keeping"	
Male	40	4.190		4.213		−0.010	
Female	20	4.450		4.300		0.021	
Difference (S.E.)		0.260	(0.200)	0.087	(0.346)	0.031	(0.240)
Management or economics	19	4.374		3.632		0.090	
No management nor economics	41	4.232		4.524		−0.042	
Difference (S.E.)		0.142	(0.205)	−0.893	(0.331)**	0.132	(0.243)

Note. Table reports means and standard errors of differences in parentheses. Significance of difference tested with *t*-test with unequal variances. Non-parametric Mann–Whitney test leads to equivalent results. Significance levels prob. < 0.10 (+), prob. < 0.05 (*), prob. < 0.01 (**), prob. < 0.005 (***)

and disappears in Model 7 where we correct for differences in variance. The only surviving effect is the interaction between Treatment 2 and creativity (C × T2). The raw data-based plot in Appendix D illustrates what happens: while the less creative, but more business-talented 'keep' approximately as much as in other treatments, the other three groups 'keep' more.[18] Differences between treatments with respect to the interaction of business talent and creativity (BT × C × T2–6) cannot be detected at all.

Overall, the findings from the non-parametric analyses can be confirmed with the parametric OLS regression analyses: while the more business-talented (creative) behave more (less) selfishly, dictators with both more business talent and less creativity 'keep' the most, irrespective of treatment-specific differences in risk, gain-loss framing or externalities. While there are differences between treatments at the overall level of 'keeping', the effects of business talent and creativity, and in particular their interaction effects, are robust and do not differ between treatments.

Our results might be challenged by arguing that the reported effects are not associated with talent but with participants' gender or study major. There is evidence from laboratory experiments that economics and business students behave more selfishly than other people (Frank et al., 1993; Frank and Schulze, 2000), but also that the major does not matter with respect to selfish behavior (Frey and Meier, 2002). Moreover, men have been shown to hold slightly more optimistic self-efficacy beliefs than women (Wilson et al., 2007). Despite the insignificant coefficients of the corresponding control variables in Table 4, gender and business/economics majors may drive our results, making our findings for talent spurious.

To address this issue we first test non-parametrically whether average talent differs between men and women or between students in business/economics and with other majors. Table 5 shows that gender does not make any difference with respect to the variables of interest. Business and economics students are also not significantly different with respect to business talent or 'keeping', which is consistent with findings reported by Frey and Meier (2002), but they do consider themselves less creative.

As an additional robustness check we estimate a parametric model to check whether the major or gender interacts with talent. Table 6 reports the results of a pooled OLS regression with gender-specific or major-specific talent effects. None of the interaction effects with gender or a major in business/economics is significant.[19] Further, we still find significantly positive (negative) associations between 'keeping' and business talent (creativity), and a significantly negative interaction between

[18] More specifically, the line for creative participants shifts upwards, but not as much as to overturn the 'keeping' of uncreative business-talent.
[19] This also holds when we test for subgroups, e.g., only business students or only economics students.

Table 6
Pooled OLS regression analysis testing the variation of talent effects for differences in gender and major.

DV: 'keeping'		Model 3		Model 7		Model 8	
Constant		8.107	(0.239)***	8.118	(0.254)***	8.131	(0.252)***
Age		−0.060	(0.257)	−0.031	(0.277)	−0.083	(0.254)
Female vs. Male	F/M	−0.009	(0.179)	−0.013	(0.191)	−0.012	(0.168)
Jena vs. Utrecht	J/U	0.598	(0.238)*	0.580	(0.256)*	0.713	(0.260)**
Business & Econ	B/E	0.169	(0.375)	0.178	(0.371)	0.152	(0.396)
Business talent	BT	0.429	(0.196)*	0.424	(0.201)*	0.403	(0.199)*
Creativity	C	−0.581	(0.284)*	−0.577	(0.326)+	−0.686	(0.294)*
Business talent × Creativity		−0.658	(0.250)*	−0.666	(0.311)*	−0.574	(0.253)*
Business talent × F/M				0.043	(0.162)		
Business talent × F/M				0.040	(0.246)		
Business talent × Creativity × F/M				0.054	(0.281)		
Business talent × B/E						0.459	(0.350)
Creativity × B/E						0.071	(0.406)
Business talent × Creativity × B/E						−0.365	(0.433)
Observations (groups)		360	(60)	360	(60)	360	(60)
R-squared (F)		0.195	(4.35)***	0.197	(3.31)***	0.220	(4.07)***
Delta R-squared (F)		0.051	(6.90)*	0.001	(0.09)	0.025	(1.21)

Note. Significance levels prob. < 0.10 (+), prob. < 0.05 (*), prob. < 0.01 (**), prob. < 0.005 (***). Standard errors (in parentheses) are adjusted for heteroscedasticity and correlations within subject. Contrast codes (F/M, J/U, B/E) are mean-centered and continuous variables (age, BT, C) are standardized. Therefore, the coefficients of main effects are comparable between models including and not including interaction terms. Model 3 is the same as in Table 4, but replicated here for ease of comparison with Models 7 and 8.

the two components of talent. We can therefore conclude that gender and business/economics majors do not drive our findings.

4. Conclusions

4.1. Summary

This study sought an answer to the question whether the entrepreneurially talented are self-interested profit-maximizers. Based on the predictions of talent allocation models (e.g., Baumol, 1990), selfish preferences would imply that entrepreneurially talented individuals are more likely to select into actions that hurt others if they provide higher private returns. We find that selfish preferences and the willingness to accept negative externalities are systematically related to entrepreneurial talent. This finding, however, is not uniform across the two types of talent that are considered essential for entrepreneurship, i.e. creativity and the ability to start and run a business. While the more business-talented are less willing to forego own payoffs in order to avoid losses to others, the more creative behave more altruistically. Furthermore, the two dimensions of talent reveal an interesting interplay. Those who consider themselves to have business talent but not to be particularly creative care less about others than people with any other combination of talent. This provides partial support for Baumol's (1990) assumption of self-interested profit-maximization of entrepreneurial talent: while the more business-talented and less creative people corroborate his assumption, it does *not* hold for the more creative, even if they are also more talented in business.

4.2. Limitations and future research

Our study is not without limitations. We measured talent as a subjective perception. From a decision-making perspective, we believe that subjective perceptions have more explanatory potential, compared with more objective information that is possibly unknown to the subject at the time of the decision. Moreover, entrepreneurial self-efficacy has been shown to be related to actual firm performance (Baum et al., 2001; Baum and Locke, 2004; Hmieleski and Corbett, 2006). From a welfare perspective that cares about the actual success of entrepreneurial talent in productive and unproductive activities, a more objective measure is needed. Therefore, in an attempt to improve and extend this study, a measure of actual entrepreneurial talent would be important. This, however, is quite a challenge, because such a measure needs to be independent of the occupation of people, in particular of productive and destructive activities. This requirement follows from the fact that talent allocation models (e.g., Baumol, 1990) define occupational choice as the dependent variable.

In validating our measure of entrepreneurial self-efficacy we identified two distinct factors, creativity and business talent, which we investigated in the subsequent analysis. There are many studies on entrepreneurial self-efficacy, but to the best of our knowledge there is only one study that distinguishes psychometrically between entrepreneurial creativity and entrepreneurial business talent. Based on a survey of 1847 Israeli working adults, Danziger et al. (2008) report that the 'entrepreneurial creativity' dimension within Schein's (1975) career orientation inventory needs to be split into two factors: entrepreneurship and creativity. These results, along with our own findings, clearly demonstrate that more research is needed to improve the rather rudimentary measurement of creativity vis-à-vis other business-related talents.

Our study of losses is limited by the fact that the participants could not actually lose money in the experiment due to the high participation fee. Our design therefore potentially suffers from the aggregation effect, where participants net the participation fee with the payoffs, rather than considering the participation fee as a lump-sum windfall gain. Feedback from participants after the experiment, however, indicated that low payoffs were felt as losses from the initial endowment. We therefore believe that the endowment effect is more dominant than the aggregation effect. The aggregation effect is probably also mitigated by the fact that participants generally expect to earn about 10 Euros per hour and so earning a positive but lower amount is viewed as an opportunity loss.

The lower external validity of laboratory research is often seen as the price paid for higher internal validity. To mitigate the former, we took great care to include a set of diverse treatments that all are related to the dictator game, but incorporate different characteristics. These include different combinations of risk, losses instead of gains, and negative externalities. The fact that the entrepreneurially talented behave qualitatively similarly across all treatments (with equal maximum gains for purely selfish behavior) provides some confidence in the robustness of the results and that they may be generalized to other contexts as well (also see the next subsection). Nevertheless, more research is needed to increase the external validity of our laboratory findings.

This paper tests selfish behavior of the entrepreneurially talented as a central assumption of talent allocation models, but not the mechanisms with which institutions could allocate talent. One of Baumol's (1990) propositions is that institutions provide incentives that channel entrepreneurial talent into certain activities. Our finding that the entrepreneurially more talented are less altruistic calls for, but does not test the design of institutions that internalize externalities by decreasing (increasing) the rewards from socially destructive (productive) activities. Translated into our experiment such an extension would require (additional) treatments where negative (positive) externalities have lower (higher) maximum earnings for selfish behavior. This would be a very interesting and natural extension of our paper.

4.3. Implications

Entrepreneurial behavior is complex. Experimental investigation of this behavior tends to focus on very specific aspects, e.g. on risk taking in investment decisions, or on market entry decisions (Camerer and Lovallo, 1999; Elston et al., 2006; Elston and Audretsch, in press). This study contributes to this body of research by investigating selfish preferences of entrepreneurial talent. By incorporating both risk and negative externalities, the treatments used in this paper capture central elements of entrepreneurial decision-making. In doing this they may provide a promising design for entrepreneurial experiments that go beyond market entry and risk taking. Note that our findings are especially significant for treatments with both risk and negative externalities, i.e. Treatment 4. We believe that this version of the dictator game shows particular potential for further investigation in a wider context.

Two main implications from our findings on altruistic preferences of entrepreneurially talented individuals may inform future research. First, entrepreneurial talent is at least two-dimensional with respect to its effects. Our results clearly show that business talent needs to be distinguished from creativity. Wilson et al. (2007) and Zhao et al. (2005), along with others in the empirical entrepreneurship literature, combine both dimensions. For some research questions, however, not disentangling these two dimensions of talent may produce misleading results.

Second, and more importantly, our findings challenge existing theories on the allocation of entrepreneurial talent. We demonstrate that selfish behavior is correlated with entrepreneurial talent, more specifically, with certain structural components of talent. Hence, the allocation of entrepreneurial talent is also associated with these components of talent and corresponding preferences. Allocation models need to take this into account, in particular when proposing incentive systems and formal institutions that are meant to channel entrepreneurial talent.

Our findings that creativity needs to be distinguished from business talent and that less creative business talent is more selfish than more creative business talent suggest an interesting path for theory development. We suggest that creativity is linked with value or rent creation, whereas business talent is linked with rent appropriation. While it is widely accepted that entrepreneurs need both (which is why measures of entrepreneurial self-efficacy include both), people whose talent is differently focused might allocate into different types of opportunities. This may explain our finding that creative business talent is less maximizing with regard to own profits. Creative business talent may focus more on appropriating the rents they create themselves instead of considering rent seeking as an alternative. The less creative, however, may anticipate that they themselves will create less value and are thus inclined to rely more on appropriating rents from others. As a consequence, uncreative business talent could select relatively more into opportunities that maximize their profits while creative business talent balances rent seeking with rent creation.

This perspective also provides an interesting avenue for the generalization of our results into the broader entrepreneurship literature. We identify four talent combinations in our samples. 'All-round entrepreneurs' (BT_+/C_+) are able to recognize and exploit an opportunity; 'rent creators' (BT_-/C_+) can recognize an opportunity but have trouble exploiting it; 'rent seekers' (BT_+/C_-) have trouble spotting an opportunity but are very successful in exploiting it; and 'employees' (BT_-/C_-) have no talent for either opportunity recognition or exploitation. To the extent that our results generalize outside our subject pool, one would also expect people to engage in corresponding activities. Of course, in reality, people will not map one-to-one into these 'occupations'. Employed managers in large multinationals, for instance, may display the same business talents that opportunity exploitation in high-growth ventures requires. Scientists in academia may show the same creative skills that opportunity recognition requires. As our results seem to indicate, however, it is the business-talented who are particularly sensitive to private incentives, whereas social norms appear to direct the choices and actions of the more creative to a much larger extent. This is useful information when policy makers aim to optimize the talent allocation in their economy, and it requires further research.

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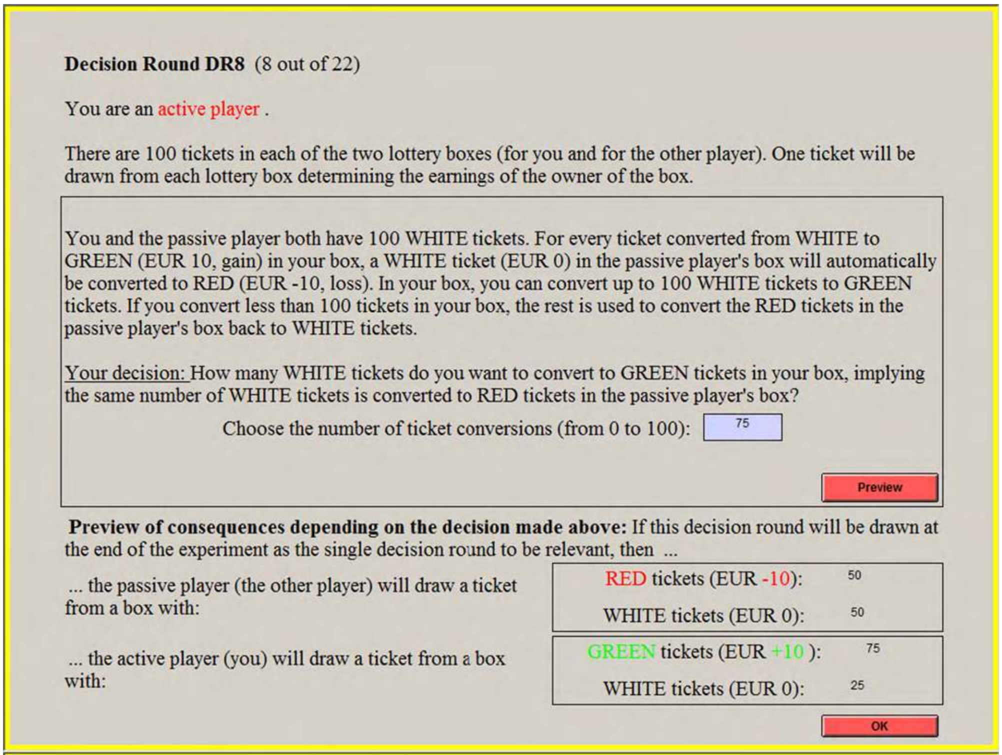
Appendix A. Overview over dictator treatments

Name	Description
T1 Euro Gain	You gain EUR 10 and the passive player gains EUR 0 (on top of your respective initial budgets). You can either leave earnings unchanged, or decrease your own, increasing the passive player's earnings. If you decrease your own earnings, this increases the passive player's earnings by the same amount. What amount do you want to deduct from your earnings and add to the earnings of the passive player?
INTRO: T2–T6	In this part there will be two lottery boxes. Each of the two boxes contains 100 lottery tickets. One box is yours (active player) and determines your earnings by drawing one ticket at random. The other box belongs to the passive player and determines his/her earnings in the same way. At the end of each decision round, exactly one lottery ticket will be randomly drawn out of each of the two boxes. There are three different kinds of lottery tickets that play a role in these five decision rounds: • GREEN tickets, if drawn, increase the earnings of the owner of the box by EUR 10. • RED tickets, if drawn, decrease the earnings of the owner of the box by EUR 10. • WHITE tickets, if drawn, leave the earnings of the owner of the box unchanged.
T2 Gain Lottery	You have 100 GREEN tickets (worth EUR 10) and the passive player has 100 WHITE tickets (worth EUR 0). You can exchange some or all of your GREEN tickets in your box with some or all of the WHITE tickets of the passive player's box, or you can leave the distribution of tickets unchanged. For every GREEN ticket you exchange, you receive one WHITE ticket of the passive player. How many GREEN tickets do you want to exchange for WHITE tickets of the passive player?
T3 Loss Lottery	You have 100 RED tickets (worth EUR −10) and the passive player has 100 WHITE tickets (worth EUR 0). You can exchange some or all of your RED tickets in your box with some or all of the WHITE tickets of the passive player's box, or you can leave the distribution of tickets unchanged. For every RED ticket you exchange, you receive one WHITE ticket of the passive player. How many RED tickets do you want to exchange for WHITE tickets of the passive player?
INTRO: T4–T6	In this part the 100 tickets in each of the two lottery boxes are WHITE (EUR 0). In each of the three treatments, you, the active player, will be asked to convert some of the tickets into another color. Which tickets you can convert in which of the boxes, how many tickets, and into which color, depends on the specific decision round. Each conversion from a WHITE into a GREEN ticket in your own box (active player) automatically converts one WHITE ticket into a RED ticket in the passive player's box. Such a conversion therefore increases your chances to get a GREEN ticket, but also increases the passive player's chances to get a RED ticket.
T4 Externality	For every ticket converted from WHITE into GREEN (EUR 10 gain) in your box, a WHITE ticket (EUR 0) in the passive player's box will automatically be converted into RED (EUR 10 loss). You can convert up to 100 WHITE tickets to GREEN tickets, but only in your box. How many WHITE tickets do you want to convert into GREEN tickets in your box, implying the same number of WHITE tickets is converted into RED tickets in the passive player's box?
T5Externality Recovery	For every ticket converted from WHITE into GREEN (EUR 10 gain) in your box, a WHITE ticket (EUR 0) in the passive player's box will automatically be converted into RED (EUR 10 loss). You can convert up to 100 WHITE tickets to GREEN tickets. Unused ticket conversions that you do not use to convert WHITE into GREEN in your box, are used to convert the RED tickets in the passive player's box back into WHITE tickets. How many WHITE tickets do you want to convert into GREEN tickets in your box, implying the same number of WHITE tickets is converted into RED tickets in the passive player's box?
T6 Externality Positive	For every ticket converted from WHITE into GREEN (EUR 10 gain) in your box, a WHITE ticket (EUR 0) in the passive player's box will automatically be converted into RED (EUR 10 loss). You can convert up to 100 WHITE tickets to GREEN tickets. Those unused tickets that you do not use to convert WHITE into GREEN in your box, are used to convert the RED tickets in the passive player's box back into WHITE tickets. If there are conversions left after converting passive player's RED tickets into WHITE, these will be used to convert passive player's WHITE tickets into GREEN. How many WHITE tickets do you want to convert into GREEN tickets in your box, implying the same number of WHITE tickets is converted into RED tickets in the passive player's box?

Appendix B. Examples of decision screens (Treatments T5 and T6)



Decision Round DR8 (8 out of 22)

You are an active player .

There are 100 tickets in each of the two lottery boxes (for you and for the other player). One ticket will be drawn from each lottery box determining the earnings of the owner of the box.

You and the passive player both have 100 WHITE tickets. For every ticket converted from WHITE to GREEN (EUR 10, gain) in your box, a WHITE ticket (EUR 0) in the passive player's box will automatically be converted to RED (EUR -10, loss). In your box, you can convert up to 100 WHITE tickets to GREEN tickets. If you convert less than 100 tickets in your box, the rest is used to convert the RED tickets in the passive player's box back to WHITE tickets.

Your decision: How many WHITE tickets do you want to convert to GREEN tickets in your box, implying the same number of WHITE tickets is converted to RED tickets in the passive player's box?

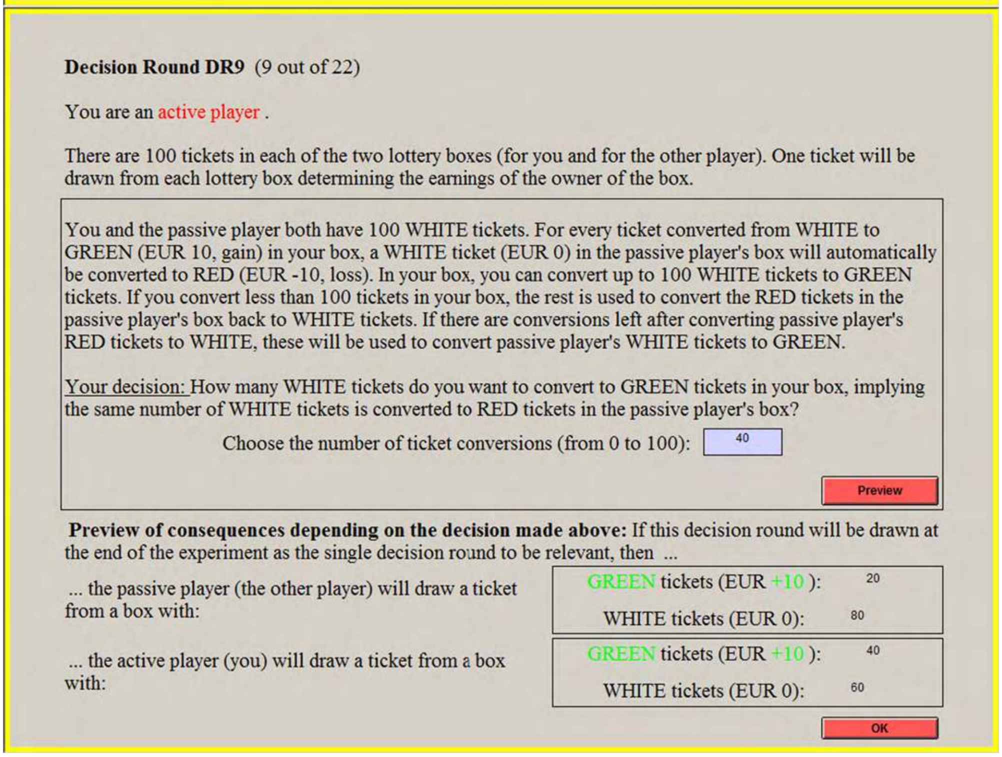
Choose the number of ticket conversions (from 0 to 100): 75

Preview

Preview of consequences depending on the decision made above: If this decision round will be drawn at the end of the experiment as the single decision round to be relevant, then ...

... the passive player (the other player) will draw a ticket from a box with:	RED tickets (EUR -10):	50
	WHITE tickets (EUR 0):	50
... the active player (you) will draw a ticket from a box with:	GREEN tickets (EUR +10):	75
	WHITE tickets (EUR 0):	25

OK



Decision Round DR9 (9 out of 22)

You are an active player .

There are 100 tickets in each of the two lottery boxes (for you and for the other player). One ticket will be drawn from each lottery box determining the earnings of the owner of the box.

You and the passive player both have 100 WHITE tickets. For every ticket converted from WHITE to GREEN (EUR 10, gain) in your box, a WHITE ticket (EUR 0) in the passive player's box will automatically be converted to RED (EUR -10, loss). In your box, you can convert up to 100 WHITE tickets to GREEN tickets. If you convert less than 100 tickets in your box, the rest is used to convert the RED tickets in the passive player's box back to WHITE tickets. If there are conversions left after converting passive player's RED tickets to WHITE, these will be used to convert passive player's WHITE tickets to GREEN.

Your decision: How many WHITE tickets do you want to convert to GREEN tickets in your box, implying the same number of WHITE tickets is converted to RED tickets in the passive player's box?

Choose the number of ticket conversions (from 0 to 100): 40

Preview

Preview of consequences depending on the decision made above: If this decision round will be drawn at the end of the experiment as the single decision round to be relevant, then ...

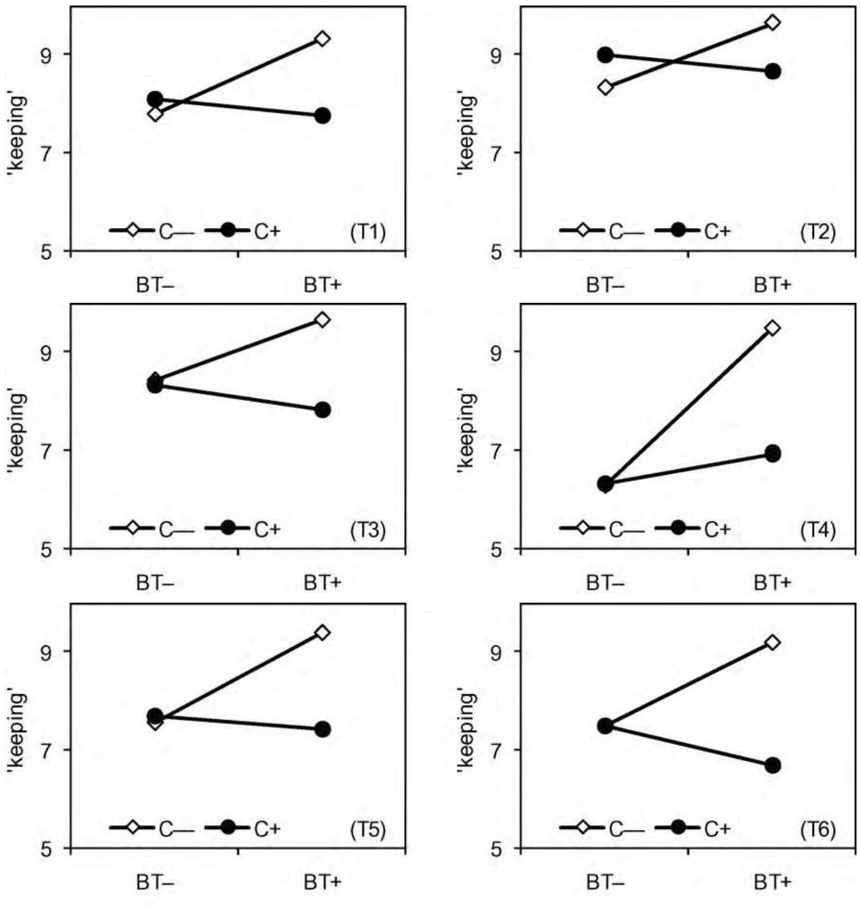
... the passive player (the other player) will draw a ticket from a box with:	GREEN tickets (EUR +10):	20
	WHITE tickets (EUR 0):	80
... the active player (you) will draw a ticket from a box with:	GREEN tickets (EUR +10):	40
	WHITE tickets (EUR 0):	60

OK

Appendix C. Items for measuring entrepreneurial self-efficacy and their association with business talent (BT) and creativity (C)

Items	Source	Factor
How do you compare yourself to fellow students in your ability to . . .		
a) . . . solve problems?	Wilson et al. (2007)	BT
b) . . . manage money?	Wilson et al. (2007)	BT
c) . . . be creative?	Wilson et al. (2007)	C
d) . . . get people to agree with you?	Wilson et al. (2007)	BT
e) . . . be a leader?	Wilson et al. (2007)	BT
f) . . . make decisions?	Wilson et al. (2007)	BT
g) . . . successfully identify new business opportunities?	Zhao et al. (2005)	BT
h) . . . create new products?	Zhao et al. (2005)	BT
i) . . . think creatively?	Zhao et al. (2005)	C
j) . . . commercialize an idea or new development?	Zhao et al. (2005)	BT
k) . . . raise funds for a new business?	Monsen (pers. comm.)	BT
l) . . . sell a new product or service?	Monsen (pers. comm.)	BT

Appendix D. Interaction of business talent (BT) and creativity (C) for 'keeping' per treatment based on a median sample split of raw data



Note. T1-6=Treatment 1-6; BT=business talent; C=creativity; + (above median); - (below median).

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