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# **Entrepreneurs: intuitive or contemplative decision-makers?**

Martin Koudstaal • Randolph Sloof • Mirjam van Praag

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Abstract In a large survey (n = 1928), we examine whether entrepreneurs differ in their decision-making style from managers and employees. Besides two selfreported measures taken from psychology, we build on Rubinstein (Quarterly Journal of Economics 131: 859-890, 2016) by including two behavioral measures derived from response times and the nature of the strategic choices made. Supporting conventional wisdom, entrepreneurs report a stronger Faith in Intuition than others. Their actual choices are partly in line with this: entrepreneurs make indeed more intuitive choices than managers, but are equally intuitive as employees. At the same time, entrepreneurs have response times and a self-reported Need for Cognition that exceeds those of employees. Together, these findings tentatively suggest that entrepreneurs start from a stronger predisposition to choose the intuitive action, but share with managers that they take more time to think things

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**Keywords** Entrepreneurs · Contemplativeness · Response times · Faith in Intuition · Need for Cognition · Lab-in-the-field experiment

JEL Classification L26 · D91 · C93

# **1** Introduction

People differ in the way they make strategic decisions. Some primarily follow their "gut" feeling and decide based on their intuition what seems best. Others, in contrast, prefer to think things over and rely on strategic reasoning before they take a decision. Entrepreneurs are typically thought of belonging to the more intuitive type. Given the uncertainty of their business environment and the limited availability of useful information, entrepreneurs may lean more on decision-making heuristics than other strategic decision-makers, like managers, do (cf. Busenitz and Barney 1997). Grasping windows of opportunities may also preclude them from more contemplative decision-making, under which first more information is gathered before a decision is taken. Focusing on the willingness to generalize from a limited number of observations, Busenitz and Barney (1997) indeed find that entrepreneurs are more likely to use this representativeness heuristic than managers

in large organizations do. Yet in other instances, entrepreneurs appear less biased than other strategic decision-makers; Burmeister and Schade (2007) for instance find that entrepreneurs are less susceptible to a status quo bias (i.e., selecting previously chosen alternatives too often) than start-up bankers are (but equally affected as students).<sup>1</sup>

In a recent paper, Rubinstein (2016) proposes a typology of strategic decision-makers based on their observed action choices. People are confronted with various strategic situations (games), which all have actions that are considered instinctive and actions that are seen as more contemplative. The classification of actions is based on (average) response times, with the fast actions being the instinctive ones and the slow actions the more contemplative ones. Rubinstein's typology thus allows for an objective assessment of decision-making styles based on actual choice behavior and response times. The binary distinction between fast and slow thinking has been part of various dual-process theories developed within psychology as well (see, e.g., Evans (2008) for a review). While these theories come in different forms, they all have in common that one processing mechanism (System 1) is fast, non-conscious, and intuitive, while the other (System 2) is slow, controlled, and conscious. (The bestseller Thinking, fast and slow by Kahneman (2011) provides a popular discussion of the two-systems approach.) One example is given by the cognitive-experiential self-theory of Epstein (2003), which portrays two independently operating systems: the "intuitive-experiential system" and the "analyticalrational system." These two decision-making styles have been extensively studied empirically, mainly using the Faith in Intuition (FI) and Need for Cognition (NFC) scales of Epstein et al. (1996) which are based on subjective self-assesments.

The aim of this paper is to thoroughly verify conventional wisdom that entrepreneurs have a decisionmaking style that differs from those of others, notably managers. In doing so, we believe that our paper offers two contributions. First, we expand on Rubinstein (2007, 2013, 2016) by investigating his typology among large samples of established entrepreneurs, managers and employees (n = 1,928), hence those people who actively participate in the labor market. Second, we test the consistency of the results on the two sets of measures. In other words, do the behavioral measures based on choice behavior and response times lead to similar results as the self-reported measures Faith in Intuition and Need for Cognition do?

We view managers as a particularly relevant comparison group for entrepreneurs, as they share a number of important functional tasks and responsibilities: both are responsible for making complex strategic choices, both are (or better, might be) responsible for hiring and managing personnel, and both are responsible for taking calculated risks when making professional decisions. Such tasks and responsibilities are generally to a much lesser extent imposed on employees. Based on functional similarities, one might therefore expect entrepreneurs and managers to have similar strategic decision-making styles, different from (and perhaps "better" than) those of employees. Yet there are also theoretical reasons to believe that entrepreneurs and managers differ from each other. First, as already noted above, the highly uncertain and complex environment in which especially entrepreneurs operate may necessitate a more intuitive decision-making style. As Busenitz and Barney (1997, p. 13) put it: "Entrepreneurs [...] often have to make decisions where there are no historical trends, no previous levels of performance, and little if any specific market information." In their view, managers-at least those in larger organizationstypically do have access to these information sources to reduce the uncertainty and complexity surrounding the strategic choices they face. Second, differences in decision-making styles could be the result of occupational sorting, with a different type of decisionmakers being drawn into entrepreneurship. The two reasons (decision environment and sorting) may in fact be closely interrelated, as the very decision to start up a venture is arguably itself a prime example of a strategic decision for which little hard information is available and information gathering efforts are unlikely to be very cost-effective (cf. Busenits and Barney 1997, p. 14). Especially those with a more intuitive decision-making style may thus be the ones to become entrepreneurs in the first place. Including both managers and employees as control groups allows us to study whether the potentially different decision-making style of entrepreneurs is a unique

<sup>&</sup>lt;sup>1</sup>See Hsu et al. (2017) and Kraus et al. (2016) for recent reviews of experimental studies in entrepreneurship. Shepherd et al. (2015) provide a broad review of the literature on entrepreneurial decision-making.

trait of entrepreneurs, or rather pertains to professional strategic decision-makers in general.

The above theoretical considerations illustrate why empirically documenting the potentially different decision-making style of entrepreneurs seems worthwhile; it might in the end turn out helpful in understanding the entrepreneurial earnings puzzle, i.e., the empirical observation that people enter and persist in entrepreneurship despite low average returns with high risk (variance). In their careful review of the behavioral drivers into entrepreneurship, Åstebro et al. (2014) discuss the evidence for three behavioral forces: risk preferences, overconfidence, and nonpecuniary benefits like a preference for autonomy. They conclude that these explanations can account for part of the earnings puzzle, but also that a large part still remains unexplained. They therefore conclude that: "In this regard, it is important that research continues to pursue an understanding of the role the above mechanisms, as well as others, play in entrepreneurship" (p. 65). A person's decision-making style might potentially be such an alternative behavioral mechanism. In the concluding discussion, we return to this issue. Studying the consistency between behavioral and self-reported measures of intuitive decisionmaking is worthwhile because in other domains-i.c. risk preferences-these different types of measures have yielded partially opposing results, thereby partly explaining the mixed findings on entrepreneurs' risk attitude reported in the extant literature (cf. Koudstaal et al. 2016). People's perceptions of their own actual behavior might not be fully accurate or partially driven by confirming common wisdom. Alternatively, the typically more general self-reporting measures might tap a wider range of aspects of the underlying concept than picked up by the narrower behavioral measures. By considering both types of measures, it can be verified to what extent this also plays a role here.

Our findings show that entrepreneurs make significantly more intuitive choices than managers do, but not than employees. At the same time, entrepreneurs share with managers a higher response time than employees. For the self-reported measures, we find that entrepreneurs have a significantly higher score on Faith in Intuition than all others, while managers have the highest score on Need for Cognition (with entrepreneurs in between employees and managers). A potential explanation for these seemingly mixed findings on the behavioral and the self-reported measures might be that, in line with their higher self-reported faith in intuition, entrepreneurs start from a stronger intuitive prior, but share with managers a higher need for cognition and (on average) take more time to think. This, in turn, makes them more inclined to move away from their instant intuitive choice. Moreover, entrepreneurs and managers also seem to use their time in a more effective way than employees do. In particular, in a regression framework, we see that the number of intuitive choices made (dependent variable) varies more strongly with response time (included as one of the explanatory variables) for entrepreneurs and managers than for employees (i.e., an estimated positive slope of a larger size).

The remainder of this paper is organized as follows. The next section discusses our design choices regarding measurement and sampling. Empirical findings are reported in Section 3. The final section discusses and concludes.

#### 2 Measurement and sampling

#### 2.1 Behavioral measures of decision-making style

For our behavioral measures, we rely on response times and the Contemplative Index (CI) as proposed by Rubinstein (2016). Rubinstein uses ten strategic games which all have intuitive actions (coded 0) and contemplative ones (coded 1). This distinction is based on the response time of subjects that chose the action being (on average) below or above the median response time of all subjects who played the games. Fast actions are thus the more intuitive ones, slow actions the more contemplative ones.<sup>2</sup> The CI equals the number of times (out of overall ten games) a contemplative action is chosen. Rubinstein (2016) finds that the index has predictive power when examining subjects' behavior in other games than the ten used for the construction of the CI.

We would have liked to include all ten games of Rubinstein (2016) in our survey. However, the nature of our subject pool (working participants) required that we kept it short (including all ten games in the

 $<sup>^{2}</sup>$ To further strengthen his case, Rubinstein (2016) also tested for agreement rates about the intuitive and contemplative classification of the different choice options among 17 graduate students who served as raters.

survey would have led to average response times of over 12 minutes only for the games). We therefore selected three games that arguably could serve as a decent proxy for the CI.<sup>3</sup> In selecting them, we used the following five criteria: (i) in terms of strategic considerations, the game setup remains close to the entrepreneur/manager world; (ii) the game can be well-understood in an online survey; (iii) the game can be played in a relatively short period of time; (iv) the game clearly differentiates between intuitive and contemplative thinkers; and (v) the game contains no obvious confounding factors. Applying these criteria, we ultimately chose to include the three games listed below (where the descriptions of the strategic situation are taken literally from Rubinstein (2016)). For convenience, we have marked the intuitive choices with an (I) and the contemplative ones with a (C). In line with Rubinstein (2016), we also recorded the response times for each participant on each of these three games.<sup>4</sup>

*No. 1: The one-shot chain store game* In your neighborhood, there is one grocery store and one tailor. At the moment, the profits of the grocery store owner are around \$120,000 per year while the tailor's profits are only \$50,000 per year. The tailor asks your advice about whether to change his shop into a grocery store. He figures that if the grocer does not respond aggressively to the new competition, each of them will earn about \$70,000 per year. On the other hand, if the grocer does respond aggressively and starts a price war, then the earnings of each store will be reduced to about \$25,000 per year. What is your advice to the tailor? [ENTER (C) or NOT ENTER (I)].

*No. 2: Hotelling's main street game* Imagine you are the manager of a chain of cafes competing with two

other similar chains. Each of you is about to rent a shop in one of the seven new identical huge apartment buildings standing along a beach strip. Once each of you knows exactly where the other two competitors locate, it will be too late to move to another location. You expect that the customers (the residents in the seven buildings) will not distinguish between the three cafes and will pick the one which is closest to their home. In which building (a number between 1 and 7) will you locate your cafe? [1 (I), 2 (C), 3 (C), 4 (I), 5 (C), 6 (C), or 7 (I)].

No. 3: The two-contests game Imagine you are participating in a game with over 200 participants worldwide. Each participant chooses to compete in one of two contests. In contest A, each contestant guesses the outcomes of 20 coin flips (heads or tails). In contest B, each contestant guesses the outcomes of 20 rolls of a die (i.e., each of the twenty guesses is a number 1, 2, 3, 4, 5, or 6). Each contest will be conducted independently. In each contest, you will be competing against people who, like you, chose that contest. After the guesses of all the participants are collected, a computer will simulate a series of 20 coin flips for contest A and a series of 20 rolls of a die for contest B. The winner of each contest will be the person with the most correct guesses. (In the case of a tie, the winner will be chosen by a lottery among those with the most correct guesses.) I choose to participate in: [CONTEST A (I) or CONTEST B (C)].

# 2.2 Self-reported measures of decision-making style

Our self-reported measures are taken from Epstein et al. (1996), who construct a Rational-Experiential Inventory (REI) based on cognitive-experiential selftheory (Epstein 2003). It distinguishes between two cognitive styles: the intuitive-experiential style, as measured by Faith in Intuition (FI), and the analytical-rational style, as measured by Need for Cognition (NFC). We use the short form of the REI to assess these two styles, which consists of the following ten items:

# Faith in Intuition (FI)

- I trust my initial feelings about people.
- I believe in trusting my hunches.
- My initial impressions of people are almost always right.

<sup>&</sup>lt;sup>3</sup>Initially, we had four games in our original survey, but decided to drop one of the games ("Relying on an other player's rationality") based on the updated version of Rubinstein (2016). There, he reports that the agreement rate among the 17 graduate students about what are the intuitive actions and what are the contemplative ones is low for this particular game.

<sup>&</sup>lt;sup>4</sup>Response time is measured as the time between opening the decision screen and the time the OK button is clicked to confirm one's choice. As Cappelen et al. (2016) note, the overall response time is the sum of the time spent on reading and understanding the decision problem, time spent on deliberating, and time taken to implement the decision. As such, it is an imperfect measure of deliberation time.

- When it comes to trusting people, I can usually rely on my "gut feelings."
- I can usually feel when a person is right or wrong even if I can't explain how I know.

# Need for Cognition (NFC)

- I don't like to have to do a lot of thinking. (R)
- I try to avoid situations that require thinking in depth about something. (R)
- I prefer to do something that challenges my thinking abilities rather than something that requires little thought.
- I prefer complex to simple problems.
- Thinking hard and for a long time about something gives me little satisfaction.

All ten items were rated on a 5-point Likert scale ranging from "Strongly disagree" to "Strongly agree." With the exception of the reversely scored items indicated by (R), "Strongly disagree" was assigned 1 point, "Disagree" 2 points, "Neutral" 3 points, "Agree" 4 points, and "Strongly agree" 5 points. To obtain overall scores for FI and NFC, all relevant individual scores were added up. Hence, the maximum (minimum) scores for both FI and NFC were 25 (5).

# 2.3 Other existing measures of decision-making style

In this study, we focus on particular behavioral and self-reported measures of decision-making style that are in the spirit of the two-systems approach: thinking fast ("intuitive") or slow ("contemplative"). Yet other measures (not employed in our study) do exist in the extant literature. Frederick (2005) developed the cognitive reflection test (CRT), which consists of three logical problems that all have an intuitive answer that immediately springs to mind, but is wrong. For instance, the first item of the CRT corresponds to the bat-and-ball problem and reads: "A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost?" Intuitively one would immediately answer 10 cents, yet after some reflection one would realize that the price difference in that case equals only 90 cents and thus the correct answer must be 5 cents. Frederick (2005) reports evidence that respondents' CRT scores correlate with choice behavior: those with higher CRT scores are more patient and

more (less) risk-taking in gains (losses). Moreover, men on average have a higher CRT score than women, suggesting that "...men are more likely to reflect on their answers and less inclined to go with their intuitive responses" (Frederick 2005, p. 37).<sup>5</sup> CRT scores also have a positive and significant correlation with the NFC scale based on self-reports.

Being similar in spirit, the CRT is an important predecessor of Rubinstein's CI and one that is often used. The latter may actually have made it less attractive over time, as by now a substantial fraction of respondents may have been exposed to the test before (e.g., Haigh 2016). More importantly perhaps, in an online experiment like ours, subjects could potentially easily look up the correct answer on the internet, with slower responses then reflecting search rather than contemplation effort. For the CI measure, this is not the case. Another attractive feature of the CI for our purposes is that it focuses on behavioral decision-making in *strategic* settings, i.e., decision situations that are of immediate practical relevance for both entrepreneurs and managers (cf. Busenitz and Barney 1997).<sup>6</sup>

Likewise, alternative self-reported measures related to intuitive decision-making exist. The Myers-Briggs Type Indicator (MBTI), for instance, contains four dichotomies or subscales, two of which directly relate to an intuitive or contemplative decision-making style. The intuitive/sensate subscale measures an individual's preference for theory and the abstract (intuitive) over reality and facts (sensate). The thinking/feeling subscale measures to what extent an individual prefers relying on logic rather than on emotions or feelings in making decisions. Pretz and Totz (2007) examined the correspondence between these two subscales and the

<sup>&</sup>lt;sup>5</sup>To the best of our knowledge, no study has compared CRT scores between entrepreneurs, managers, and employees. De Mel et al. (2010) report the CRT scores of wage workers, own-account workers, and SME owners in a sample from Sri Lanka and find that SME owners have significantly higher scores than the other two occupational groups (who do not differ significantly from each other).

<sup>&</sup>lt;sup>6</sup>In strategic settings, the outcome of one's choice also depends on the actions chosen by others. Beliefs about the choices of others are then likely to affect decisions. Holm et al. (2013) find that entrepreneurs are more willing to accept strategic uncertainty in economic decisions related to competition and trust than non-entrepreneurs. Yet they do not differ from other people when exposed to non-strategic forms of uncertainty.

Rational-Experiential Inventory (REI) underlying the FI and NFC scales used in this paper. They conclude that these measures pick up three different aspects of intuition to different degrees: holistic, heuristic (or inferential), and affective intuitions. In contrast to REI, MBTI does tap holistic intuitions, i.e., "...judgments based on a qualitatively non-analytical process, decisions made by integrating multiple, diverse cues into a whole that may or may not be explicit in nature" (Pretz et al 2014, p. 454). REI mainly measures affective intuitions that are based on feelings.<sup>7</sup> Note that this affective aspect corresponds well with Rubinstein's (2016) use of the concept "instinctive" in his typology, by which he means that when taking decisions "...the subject follows a gut feeling without applying any strategic analysis" (p. 874).<sup>8</sup> By employing CI and REI (i.e., FI and NFC) as our measures of intuition, we thus mainly focus on the affective aspect of intuition.

# 2.4 Sampling

Our sampling procedure was similar to Koudstaal et al. (2016) and we collaborated with the same business partners as reported there.<sup>9</sup> The survey included a part consisting of the selected games from Rubinstein (2016) as well as a part asking participants to what extent they agreed with the ten statements related to Faith in Intuition and Need for Cognition. As the payment for these two parts did not vary with the choices made, these choices could be considered hypothetical (in line with Rubinstein (2016)).<sup>10</sup>

Invitations to participate were sent to around 15,000 entrepreneurs, 4000 managers, and 8000 employees on December 16, 2014. All participants had 14 days to respond and a reminder was sent after 7 days. The survey was completed by 696 entrepreneurs, 265 managers, and 967 employees (n = 1928). Response rates were thus between 5 and 12%, in line with earlier experiences. Occupational groups were defined as in Koudstaal et al. (2016). Entrepreneurs are those who have founded, inherited, or taken over a company that they are currently (co-)managing. Also, individuals who obtained firm ownership over a company within 5 years after start-up and who are currently its (co-)manager were classified as entrepreneur. (With co-managing a necessary requirement, passive founders or owners are thus not included in our sample of entrepreneurs.) A manager is someone who has at least two subordinates for whom s/he is directly responsible in an organization that was not started up by him/herself. Project managers who have overall responsibility for their projects and at least two persons directly reporting to them in their role as project manager were also considered as managers. Employees are those who are employed by an organization but not belonging to the other two categories.

# **3** Empirical findings

# 3.1 Descriptive statistics

Panel A in Table 1 displays the sample descriptive statistics of both the behavioral and the selfreported measures of decision-making styles. The

<sup>&</sup>lt;sup>7</sup>The third aspect, inferential or heuristic intuitions, refers to "...judgments based on automated inferences, decision-making processes that were once analytical but have become intuitive with practice." (Pretz et al. 2014, p. 454).

<sup>&</sup>lt;sup>8</sup>In contrast, by contemplative, Rubinstein (2016, p. 874) means that "...the subject analyzes the strategic aspects of the game and bases his choice on what he expects the other players will do."

<sup>&</sup>lt;sup>9</sup>In fact, we combined the present survey on decision-making styles with a number of incentivized items on loss aversion that we needed for a robustness check of our first study on risk attitudes. The overall survey contained four parts. Parts 1 (high stakes lotteries with mixed prospects) and 4 (WTP/WTA for a fancy bread tray) measured loss aversion in various ways and are reported upon in Section 4.3 of Koudstaal et al. (2016). Part 2 consisted of the Rubinstein games and part 3 contained the FI and NFC statements studied here. Compared to the sample of n = 1931 participants reported in our previous study, we lose 3 participants for which response time is missing.

<sup>&</sup>lt;sup>10</sup>Before filling out each of these two parts, participants were informed that they would receive @200 in their accounts after completing the Rubinstein games and @175 upon completion of the part with the subjective FI and NFC statements. We included this element to ensure that participants could actually lose money in the incentivized choices in parts 1 and 4. Instead of paying out every participant, we opted to pay out 20 randomly drawn prize winners. For these prize winners, we added up all gains and losses in parts 1 and 4 and added the @375gained in parts 2 and 3 to determine the overall earnings.

Table 1         Descriptive           statistics decision-making           style	Panel A: means	Obs.	Mean	Median	St. dev.	Min.	Max.
	Behavioral measures						
	- Contemplative Index (CI)	1928	0.87	1	0.82	0	3
	- Response Time (RT)	1928	197.14 s	163.15 s	134.56 s	8.84 s	1406.19 s
	Self-reported measures						
	- Faith in Intuition (FI)	1928	18.92	19	2.78	7	25
	- Need for Cognition (NFC)	1928	17.74	18	3.09	7	25
	Panel B: correlations	CI	RT	FI			
	Behavioral measures						
	- Contemplative Index (CI)	_					
	- Response Time (RT)	0.14***	_				
	Self-reported measures						
*Significance at the 10% level	- Faith in Intuition (FI)	$-0.05^{**}$	$-0.08^{***}$	_			
**significance at the 5% level, and ***significance at the 1%	- Need for Cognition (NFC)	0.08***	0.11***	$-0.12^{***}$			
ievei							

total number of contemplative choices reported in the first row reveals that most individuals in our sample choose rather intuitively. Participants on average make 0.87 contemplative choices in the three games, while the median equals 1 out of 3. The average response time is close to 200 seconds, thus slightly more than one minute per game. Note though that there is a large variation in response times; the standard deviation equals 135 seconds. The fastest subject took less than 9 seconds to decide in all three games together, thus most likely making a choice without properly reading the questions. At the other extreme, the slowest subject took more than 23 minutes to choose, thus probably having taken a break in between. In order to verify that our results are not driven by these extreme values, in the next subsection, we also perform robustness checks by considering the trimmed sample where the 5% quickest and the 5% slowest participants are left out (and thereby considering only those who took in between 71 seconds and 445 seconds). The bottom two rows of panel A show that the average values for Faith in Intuition and Need for Cognition are 18.92 and 17.74, respectively (where the feasible range is 5 to 25).

Panel B reports the (Pearson) correlations between the four measures. In line with Rubinstein (2016), we find that response times are positively associated with contemplative thinking. Equally predictable, we also find that a higher score on Faith in Intuition is negatively associated with the Contemplative Index (CI) and response times, while the reverse holds for Need for Cognition. Consistent with this pattern, Faith in Intuition and Need for Cognition are negatively correlated.

In Table 2, we report some background and firm characteristics of our sample. Panel A focuses on age, gender, and education. In line with Koudstaal et al. (2016), entrepreneurs and managers are on average quite comparable to each other in terms of age and gender (although here we do find a significant difference in age), while employees are somewhat younger and more likely to be female. With respect to education, all three groups differ significantly from each other. On average, employees have the lowest level of education and managers the highest, with entrepreneurs falling in between.<sup>11</sup> Because education per se is likely to be an important driver of decision-making style, it is important to take these

<sup>&</sup>lt;sup>11</sup>Comparing the distribution of educational levels across occupational groups using a Chi-squared test, we find p < 0.001 for all three bilateral comparisons.

differences in educational background into account when comparing the occupational groups in the next subsection.

Panels B through D report a number of firmrelated characteristics. Panel B reveals that 82% of our entrepreneurs are the founders of their firm, while 18% acquired their firm through a takeover (only one entrepreneur bought himself into the business within 5 years after start-up and is currently co-managing). Most of our managers are general manager (67%). Panels C and D reveal that the firms which managers and employees work for are fairly comparable in age and size. The entrepreneurial firms are younger and smaller. Managers in our sample are thus more likely to be involved in larger organizations. On average, they also have a larger span of control than entrepreneurs. We return to these observations in our concluding discussion.

# 3.2 Differences between occupational groups

Table 3 reports the raw differences between entrepreneurs, managers, and employees. Entrepreneurs appear to make significantly less contemplative choices than managers (0.84 vs. 1.04) do, but equally so as employees (0.84). Somewhat surprisingly, the raw differences in response times do not fully match the findings on the Contemplative Index. Managers have a significantly higher response time than employees, as expected, but we also find that the same holds true for entrepreneurs vis-à-vis employees. In fact, entrepreneurs and managers do not differ in this regard. We will return to these seemingly mixed findings for the CI and response times in the next subsection. The results for the subjective measures show that entrepreneurs have the highest Faith in Intuition, followed by employees and managers (who do not differ from each other). On the Need for Cognition scale, managers score the highest, followed by entrepreneurs and then employees.

Table 3 reports raw differences, but does not take differences in background characteristics into account. It is however important to do so, because the three occupational groups differ significantly from each other in terms of education, and entrepreneurs and managers are more likely to be male than employees (see Table 2). We therefore next consider the occupational differences in a regression framework. Table 4 depicts the results when running OLS regressions on the four different measures of decision-making styles.<sup>12</sup> Column (1a) just confirms the earlier observation from Table 3 that entrepreneurs and employees are equally intuitive, while managers are more contemplative if background characteristics are left out. Adding controls for age, gender, and education in column (1b) does not change this result; the coefficient of the "Manager" dummy is somewhat lower, but still significant at the 5% level. Furthermore, we also find that younger, male, and higher—in particular, university—educated participants tend to behave more contemplative (in line with, e.g., Choi et al. (2014)). For our CI measure, we thus observe the same gender differences as reported by Frederick (2005) for the CRT (cf. Section 2.3).<sup>13</sup>

Columns (2a) and (2b) report the results for response time as the dependent variable. Just as in Table 3, column (2a) illustrates that entrepreneurs and managers have a significantly higher response time than employees. However, with controls, these differences become smaller. The occupational differences appear partly driven by gender and education (the coefficient of the university dummy is significantly different from the lower vocational education dummy, p < 0.01). Nevertheless, with controls, the entrepreneur dummy remains significant. The manager dummy is no longer significant but, as the final row shows, it can also not be rejected that entrepreneurs and managers are equal.14 Occupation per se thus appears one of the drivers of differences in response time. The last two sets of columns relate to Faith in Intuition and Need for Cognition. In line with the raw differences in Table 3, Column (3a) indicates that entrepreneurs have the highest Faith in Intuition, while column (4a) shows that managers stand out in their Need for Cognition (with entrepreneurs in

<sup>&</sup>lt;sup>12</sup>Using ordered probit regressions instead (for CI, FI, and NFC) leads to the exact same conclusions.

<sup>&</sup>lt;sup>13</sup>Note that the  $R^2$  of the regressions (although significant at p < 0.01) is very low. As we perform regressions to detect occupational differences in decision-making style while keeping other factors constant—rather than with the aim of predicting a person's decision-making style on the basis of her/his background characteristics—this is not a crucial concern. Nevertheless, it does indicate that occupation is far from a decisive determining factor of decision-making style, just as is the case for gender and education.

<sup>&</sup>lt;sup>14</sup>A Wald test that both dummies (entrepreneur and manager) equal zero at the same time yields p = 0.06.

Table 2	Background and f	firm characterist	tics of entre	preneurs, ma	inagers, and	employees

	Entrepreneurs $(n - 606)$		Managers $(n - 265)$	Employees $(n - 967)$
	(n = 0.90)		(n = 203)	(n = 907)
Panel A: general background		Panel A: general background		
Age	49.11 <sup>a,b</sup>	Age	47.22 <sup>b,c</sup>	43.88 <sup>a,c</sup>
Female (dummy)	$0.28^{a}$	Female (dummy)	0.32 <sup>c</sup>	0.44 <sup>a.c</sup>
Education (highest degree)	a,b	Education (highest degree)	b,c	a,c
- High school	5%	- High school	2%	10%
- Lower vocational degree	14%	- Lower vocational degree	4%	33%
- College education	46%	- College education	42%	38%
- University education	35%	- University education	52%	19%
Panel B: entrepreneur characteristics		Panel B: manager characteristic	s	
Founder	82%	CEO	17%	_
Business taken over	18%	General manager	67%	_
Joined the firm within 5 years	0%	Project manager	17%	_
Panel C: firm age and legal structure		Panel C: firm age and size		
Start-up phase (0–2 years)	12%	Firm age $\leq 5$ years	2%	6%
Survival phase (0–5 years)	31%	Firm age 6–50 years	51%	51%
		Firm age $> 50$ years	47%	37%
Incorporated	44%	Firm size $\leq 25$ FTE	10%	13%
Sole proprietorship	44%	Firm size 26–1000 FTE	52%	44%
Other	12%	Firm size > 1000 FTE	38%	37%
Panel D: management level		Panel D: management level		
No. of FTE in own firm		Direct reports		
0	18%	2–5	38%	_
1	30%	6-10	29%	_
2–5	23%	11–25	22%	_
6–10	10%	26–50	8%	_
11–25	11%	More than 50	3%	_
More than 50	5%			

Superscript letters in panel A indicate significant differences between two occupational groups at the 5% level (<sup>a</sup>entrepreneurs versus employees, <sup>b</sup>entrepreneurs versus managers, and <sup>c</sup>managers versus employees); for age and female using a two-sided t test and for education a Chi-squared test

between). When we include background characteristics in columns (3b) and (4b), these results keep standing. We only find that the difference between entrepreneurs and managers on Need for Cognition is no longer significant (p value is 0.22).

As noted in the previous subsection, the observed response times display quite some variation, with a number of extremely fast as well as a number of extremely slow respondents. To verify that the differences between occupational groups that we document in Table 4 are not due to incorporating these (arguably rather implausible) extreme values, we perform a robustness check by considering a trimmed sample. Following Rubinstein (2016, p. 863), we remove the 5% quickest from our sample, as well as the 5% slowest. Results are reported in Table 7 of the Appendix.

	Entrepreneurs $(n = 696)$	Managers $(n = 265)$	Employees $(n = 967)$	<i>p</i> value of ANOVA test
	(	(	(	
Behavioral measures				
- Contemplative Index (CI)	0.84 <sup>b</sup>	1.04 <sup>b,c</sup>	0.84 <sup>c</sup>	< 0.01
- Response Time (RT)	210.14s <sup>a</sup>	209.99s <sup>c</sup>	184.25s <sup>a,c</sup>	< 0.01
Self-reported measures				
- Faith in Intuition (FI)	19.12 <sup>b</sup>	18.61 <sup>b</sup>	18.87	0.03
- Need for Cognition (NFC)	17.93 <sup>a,b</sup>	18.55 <sup>b,c</sup>	17.38 <sup>a,c</sup>	< 0.01

 Table 3 Raw differences in decision-making styles between occupational groups

Superscript letters indicate significant differences between two occupational groups at the 5% level using a two-sided t test (<sup>a</sup>entrepreneurs versus employees, <sup>b</sup>entrepreneurs versus managers, and <sup>c</sup>managers versus employees). The final column reports the p value of an ANOVA test comparing all three occupational groups at the same time

Conclusions remain essentially unchanged; although with fewer observations, we sometimes lose significance. In particular, we no longer find that managers have a significantly higher Need for Cognition when background characteristics are controlled for. Another robustness check concerns our definition of entrepreneurs. An often used alternative definition is to restrict them to founders of a firm only. If we do so and leave the non-founding entrepreneurs out of our sample, conclusions are identical to those obtained from Table 4 (see Table 8 in the Appendix). A final robustness check concerns the role of education. The estimates in Table 4 reveal that, as expected, higher educated people tend to behave more contemplative, and the impact of a higher level of education is (especially for NFC) relatively large. It thus might be the case that occupational differences disappear for the highly educated. In Tables 9 through 11 in the Appendix, we indeed find some evidence for this. Focusing on people with either high school or lower vocational education as highest level only (with these categories taken together to get a meaningful sample size), occupational differences are as in Table 4 but even more pronounced (see Table 11). For people with either university (Table 9) or college (Table 10) education, differences mostly become smaller or insignificant. Nevertheless, also for those with a university degree, we observe that managers make significantly more contemplative choices than both entrepreneurs and employees, while for those with a college degree entrepreneurs have a significantly higher Faith in Intuition. A higher level of

education thus diminishes occupational differences, but does not completely eliminate them.

Overall, the following picture emerges. Entrepreneurs make more intuitive choices than managers do, but are equally intuitive as employees. At the same time, the response time of entrepreneurs equals that of managers, both taking more time than employees. Entrepreneurs also subjectively report a stronger Faith in Intuition than managers and employees have, but share a stronger Need for Cognition with managers that is larger than that of employees (albeit to a smaller extent). Differences are particularly pronounced for lower educated people and become smaller for the highly educated. The next subsection explores how to potentially reconcile these findings.

#### 3.3 Prior intuition and the effect of taking more time

The games selected by Rubinstein (2016) all share the common feature that the instinctive actions a person a priori is inclined to choose differ from the contemplative actions that one would more likely choose after taking sufficient time to think the decisions over. However, besides different choices directly resulting from deciding either fast or slow, people may also differ in the strength of their prior intuition, i.e., the inclination to choose the intuitive option when response times are low, as well as the amount of time it takes to realize that one's prior intuition might perhaps be misguided. (Simply put, people who take an equal amount of time may still make different choices.) In this subsection, we conduct an exploratory

	Behaviora	l measures			Self-reported measures			
Dep. variable	(1a) CI	(1b) CI	(2a) RT	(2b) RT	(3a) FI	(3b) FI	(4a) NFC	(4b) NFC
Entrepreneur	-0.003	-0.010	25.886 <sup>***</sup>	16.881 <sup>**</sup> [7 419]	0.251 <sup>*</sup> [0.137]	0.558 <sup>***</sup> [0.146]	0.552 <sup>***</sup>	0.129
Manager	0.196 <sup>***</sup>	0.158 <sup>**</sup>	25.741 <sup>***</sup>	13.409	-0.254	0.100	1.178 <sup>***</sup>	0.386*
Age/10	[0.000]	$-0.068^{***}$	[7:020]	-0.638	[0.190]	$-0.137^{**}$	[0.139]	$-0.255^{***}$
Female		$-0.130^{***}$		$-20.452^{***}$ [6.395]		0.738***		- 0.476*** [0.141]
University		0.161**		15.594 [13.438]		$-0.565^{**}$		2.380 <sup>***</sup>
College		0.027		2.576		-0.007		1.459*** [0.288]
Lower Voc.		0.034		-16.673		0.111		0.134
Constant	0.842 <sup>***</sup> [0.026]	1.145 <sup>***</sup> [0.113]	184.253 <sup>***</sup> [4.002]	197.642 <sup>***</sup>	18.866 <sup>***</sup> [0.089]	19.215 <sup>***</sup>	17.377 <sup>***</sup> [0.101]	17.666 <sup>****</sup> [0.403]
Obs. $R^2$	1928 0.01	1928 0.03	1928 0.01	1928 0.02	1928 0.01	1928 0.03	1928 0.02	1928 0.11
ENT = MAN	< 0.01	< 0.01	0.99	0.73	0.01	0.03	< 0.01	0.22

Table 4 OLS regressions on decision-making styles of occupational groups

Age is divided by 10 for presentational purposes. University, college, and lower vocational are all dummy variables equal to one if this is the highest education level attained by the participant (with High school the reference category, cf. Table 2). \*Significance at the 10% level, \*\*significance at the 5% level, and \*\*\*significance at the 1% level, with robust standard errors reported in square brackets. The final row reports the *p* value of a Wald test that "Entrepreneur" = "Manager"

analysis to see whether this may potentially provide an explanation for the seemingly mixed finding that entrepreneurs make more intuitive choices than managers, but on average have equal response times. And similarly so for the observation that entrepreneurs are equally intuitive in their choices as employees, while at the same time take more time to think. In particular, a potential explanation for these findings might be that entrepreneurs start from a stronger prior intuition, making them ceteris paribus more intuitive than others, but at the same time share with managers a higher need for cognition, and therefore take more time to think than employees (bringing them close(r) to employees again in terms of intuitive choices). Table 5 provides some suggestive evidence in this regard. It is constructed by first ranking all participants from quickest to slowest. The quickest (bottom) 25% and the slowest (top) 25% are subsequently separated from the rest (25–75%). For each of these three response time classes, the table reports the average CI score per occupational group, together with the percentage of participants from that occupational group within that class. Row-wise (i.e., for each occupational group and overall) percentages add up to 100%. As expected, the average CI score increases moving from the quickest 25% to the slowest 25%, irrespective of occupational group. Focusing on the quickest 25%, the entrepreneurs within this class have a significantly

	Response Time clas		<i>p</i> value of	
	Quickest 25%	Intermediate 25–75%	Slowest 25%	ANOVA test
Entrepreneurs $(n = 696)$	0.67 <sup>b</sup>	0.74 <sup>b</sup>	1.14	< 0.01
	20%	53%	28%	
Managers $(n = 265)$	0.94 <sup>b</sup>	0.96 <sup>b,c</sup>	1.25 <sup>c</sup>	0.05
	18%	53%	29%	
Employees $(n = 967)$	0.80	$0.80^{c}$	0.98 <sup>c</sup>	0.03
	31%	47%	22%	
All ( <i>n</i> = 1928)	0.78	0.80	1.09	< 0.01
	25%	50%	25%	

 Table 5
 Differences in CI scores between occupational groups controlling for response time

Superscript letters indicate significant within-RT-class differences between two occupational groups at the 5% level using a two-sided t test (<sup>a</sup>entrepreneurs versus employees, <sup>b</sup>entrepreneurs versus managers, and <sup>c</sup>managers versus employees). The final column reports the p value of an ANOVA test comparing all three response time classes at the same time

lower CI score and thus make significantly more intuitive choices than managers do; at the 10% level, this also holds true for the comparison with employees. Assuming that people within this class have to rely strongly on their "gut feeling," this arguably suggests that entrepreneurs have a stronger prior intuition. Also note that both entrepreneurs and managers are underrepresented in this class, given that on average



**Fig. 1** CI score as function of response time for each occupational group. Figure is based on the estimates in column (1) of Table 6. Control variables are evaluated at the overall sample means

Table 6         Additional OLS Regressions explaining the CI sc
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	(1)	(2)	(3)	(4)	(5)
Dependent variable:	CI	CI	CI	CI	CI
Entrepreneur	-0.149**	-0.016	-0.019	-0.019	$-0.134^{*}$
	[0.073]	[0.043]	[0.043]	[0.043]	[0.076]
Manager	0.016	0.153**	0.152**	0.146**	0.062
	[0.112]	[0.063]	[0.063]	[0.063]	[0.113]
Response Time / 100	$0.044^{*}$	0.008	$0.224^{**}$	$-0.154^{**}$	$-0.206^{**}$
	[0.024]	[0.033]	[0.104]	[0.069]	[0.082]
Entrepreneur x Response Time / 100	$0.062^{**}$				$0.060^{*}$
	[0.031]				[0.032]
Manager x Response Time / 100	0.065				0.044
	[0.045]				[0.046]
University x Response Time / 100		0.116***			0.067
		[0.041]			[0.045]
College x Response Time / 100		$0.078^{**}$			0.060
		[0.039]			[0.039]
Faith in Intuition (FI)			0.009		
			[0.013]		
Faith in Intuition x Response Time / 100			-0.008		
			[0.006]		
Need for Cognition (NFC)				$-0.017^{*}$	-0.013
				[0.010]	[0.011]
Need for Cognition x Response Time / 100				0.013***	0.011***
				[0.004]	[0.004]
Age / 10	$-0.068^{***}$	$-0.069^{***}$	$-0.071^{***}$	$-0.065^{***}$	$-0.064^{***}$
	[0.017]	[0.017]	[0.017]	[0.017]	[0.017]
Female	$-0.118^{***}$	$-0.114^{***}$	$-0.109^{***}$	$-0.108^{***}$	$-0.112^{***}$
	[0.039]	[0.038]	[0.039]	[0.039]	[0.039]
University	$0.122^{**}$	-0.113	$0.110^{**}$	$0.099^{*}$	-0.024
	[0.052]	[0.093]	[0.052]	[0.054]	[0.103]
College	-0.003	$-0.152^{*}$	-0.012	-0.017	-0.123
	[0.046]	[0.083]	[0.046]	[0.047]	[0.086]
Constant	$1.088^{***}$	1.155***	$0.882^{***}$	1.326***	1.396***
	[0.100]	[0.110]	[0.268]	[0.193]	[0.206]
Obs.	1928	1928	1928	1928	1928
$R^2$	0.05	0.05	0.05	0.05	0.05
ENT=MAN	0.13	< 0.01	< 0.01	< 0.01	0.07
ENT x RT= MANx RT	0.95				0.71

*Notes*: Significance at the 10% level is denoted by \*, 5% by \*\*, and 1% by \*\*\*, with robust standard errors reported in square brackets. The next to final row reports the p-value of a Wald test that 'Entrepreneur' = 'Manager', the final row the p-value of a Wald test for the interaction terms with response time

they decide slower than employees do, e.g., 20% of the entrepreneurs fall within this class, while 25% would logically result if response time and occupation were independent. For the slowest 25% opposite results are found. Here, entrepreneurs and managers are overrepresented and both make more contemplative choices than employees do (the *p* value for the comparison between entrepreneurs and employees in this class equals p = 0.057).

Another observation from Table 5 is that the effect of taking more time to think one's choices over seems larger for entrepreneurs as compared to (especially) employees. We further explore this in our earlier regression framework explaining the CI score. Taking column (1b) in Table 4 as a starting point, we add response time (scaled to units of 100 seconds) and its interactions with the two respective occupational dummies "Entrepreneur" and "Manager" as additional regressors.<sup>15</sup> Moreover, we now take the lowest two educational categories together as benchmark group since the lower vocational dummy is never significant in Table 4 (and neither in any of our robustness checks in Tables 7, 8 and 11). Column (1) in Table 6 reports the results. We indeed observe that the "Entrepreneur" dummy is significantly negative, again pointing at entrepreneurs having a stronger intuitive prior. The interaction term between response time and the entrepreneurship dummy is significantly positive. For "Manager," this interaction is insignificant, yet the coefficient is of similar magnitude and does not differ significantly from the one of interaction term for entrepreneurs. This provides some suggestive evidence that entrepreneurs and managers become relatively more contemplative over time than employees. Based on the estimated coefficients in column (1), Fig. 1 graphically illustrates the relationship between response time and the CI score for each occupational group (with the controls evaluated at the overall sample means).

Because the three occupational groups differ from each other in their level of education (cf. Table 2), the observed differential effect of taking more time may potentially be driven by this. A plausible conjecture is that especially the higher educated are more likely to deviate from making the a priori intuitive choice when they take more time to carefully think about the decision. Column (2) explores this potential explanation. Instead of interaction terms with occupation, it includes the interactions between response time and university and college, respectively. Both interactions appears to be significant; hence, we indeed find evidence that higher educated participants are relatively more contemplative per unit of time. (Note that the benchmark group of those with lower vocational education or below appears to not benefit at all from taking more time.) A similar explanation could be that it is especially those participants with a higher Faith in Intuition or a higher Need for Cognition who are different, rather than occupation per se. For Faith in Intuition, this does not appear to be the case (see column (3)). But as column (4) reveals, those with a higher Need for Cognition are relatively more contemplative per unit of time; the interaction with response time is significantly positive. In the final specification of column (5), we therefore include all the interactions with occupation, education, and NFC. We find that the interactions with being an entrepreneur and with NFC remain significant and of similar size.

Altogether, Table 6 tentatively suggests that entrepreneurs, managers, and employees differ in their prior intuition as well as in their inclination to, and the effect of, taking more time. Part of these differences is driven by differences in education and Need for Cognition between occupations.

#### 4 Concluding discussion

Decision-making styles have been of interest to economists and psychologists alike. Most studies in psychology have relied on the Faith in Intuition and Need for Cognition self-assessment scales. Economists in general favor more "objective" behavioral measures based on actual decision behavior (cf. Holm et al. 2013, 2016). In a recent stream of work Rubinstein (2007, 2013, 2016) uses response times to classify action choices in strategic games as either instinctive or contemplative. "Fast actions" are considered instinctive while "slow actions" are seen as more contemplative.

In this paper, we use both approaches in examining whether entrepreneurs have a different decision-making style than other occupational groups do. Our final sample consists of 696 established entrepreneurs, 265 managers, and 967 employees (hence n = 1928).

<sup>&</sup>lt;sup>15</sup>Table 5 suggests that the effect of response time might be nonlinear. Including a quadratic term of response time (and also in the interactions with other explanatory variables) does not yield significant coefficients though.

The results on the behavioral measures show that entrepreneurs make more intuitive choices than managers, but not than employees. Put differently, managers are more likely to make contemplative strategic choices than the other two groups. Intuitively, this finding makes sense. Managers are likely to be trained professionals purposely hired to make careful strategic decisions. The managers in our sample on average work in larger organizations and have a larger span of control than entrepreneurs (cf. Table 2). Larger organizations typically rely on more elaborate decision-making procedures and well-demarcated decision responsibilities, thus enabling its managers to use more comprehensive decision-making and to not just go by their intuition. This, in turn, may attract a specific, i.e., more contemplative, type of decision-makers (cf. Busenitz and Barney 1997).

In terms of response times, entrepreneurs take on average an equal amount of time to think as managers, but more time than employees. Because Rubinstein's classification of intuitive versus contemplative actions is based on the (in his sample) observed response times being below or above the median, one would thus have expected that entrepreneurs are equally likely to make contemplative choices as managers, and more so than employees. Our results for the selfreported measures point at a potential explanation for the mixed findings on the behavioral measures. Entrepreneurs report a stronger Faith in Intuition than both managers and employees have, but share with managers that their Need for Cognition is higher than those of employees. This suggests that entrepreneurs may start from a stronger intuitive prior, i.e., have a stronger predisposition to choose the intuitive action, but share with managers that they take more time to think and thereby are in the end more inclined to move away from their instant intuitive choice. In a more exploratory analysis, we indeed find some tentative evidence for this explanation. Regressing the number of intuitive choices made on response times (besides controls), we find that the estimated intercept is smallest for entrepreneurs while the estimated slope is higher for entrepreneurs and managers than for employees. Entrepreneurs and managers thus not only take more time to think than employees, they also seem more effective with their time invested. An important driver of this higher effectiveness appears to be their higher level of education.

Obviously, our study comes with a number of limitations. First, although comparable to other studies (cf. Koudstaal et al. 2016), the response rates to our survey are low and differ between the occupational groups (and significantly so at the 1% level using tests of proportions). It is hard to know exactly how nonrepresentativeness within the occupational subsamples affects the results about occupational differences. Yet if a person's decision-making style is correlated with-or even a driver of-her/his inclination to complete our survey, the differences between groups that we document might be biased. For instance, if only the more intuitive decision-makers respond to our survey, the higher response rate among employees as compared to entrepreneurs may make these two groups appear more similar in terms of intuitive decisionmaking than they actually are. On the other hand, if the correlation goes the other way and the more contemplative types are more likely to complete the survey, a bias in the other direction might be the result. Little can be said about this, however, without detailed information about the overall population distribution of decision-making styles within occupational groups (which is unknown). The significant differences between response rates across occupational groups that we observe (5% for entrepreneurs, 7% for managers, and 12% for employees), together with response rates being rather low in absolute terms, are thus potentially troublesome. A priori, we have no reason to suspect though that response rate and decision-making style are correlated. A more straightforward explanation for the substantial higher response rate among employees seems to be that these were recruited via a Dutch market research agency, in whose data base people only end up if they explicitly signed up that they would like to be approached for surveys (and being compensated for that). The other two groups were mainly drawn from databases resulting from earlier participation in conferences and training programs (see Koudstaal et al. 2016 for details), thus not necessarily those with a willingness to participate in surveys. An alternative reason might be differences in the amount of (leisure) time people have available for completing surveys, yet all of this remains mere speculation.

As our study is purely descriptive in nature, a second important limitation is that our study cannot disentangle personality traits (i.e., "nature") from

environmental effects (i.e., "nurture"). That is, it could be the case that the uncertain environments that entrepreneurs are typically facing trigger more intuitive decision-making (cf. Busenitz and Barney 1997). Alternatively, if there is a predominance of one of the two decision-making styles, as suggested by Kahneman (2011, p. 48), our findings could be the result of different types sorting into different occupations with different skill requirements. Disentangling the underlying mechanisms at work seems a promising avenue for future research. One potential way to do so might be to compare individuals who clearly differ in their intention to become an entrepreneur, but have not made their occupational choice yet (and thus have not been exposed to the environmental effects). For instance, one could compare the decision-making styles of students that follow a college or university program in entrepreneurship with those of students that follow such a program in management. Because education per se may affect decision-making style (as our results also suggest), one could alternatively look at other antecedents of entrepreneurship, like parental entrepreneurship (cf. Lindquist 2015), and compare the decision-making style of those who strongly differ in these antecedents (before they enter the labor market). A different possibility might perhaps be to look at changes in decision-making style over time of individuals who (ideally for largely exogenous reasons) moved into or out of entrepreneurship. Another way to arguably keep the nature component constant is to use propensity score matching and compare individuals who were (based on their antecedents) equally likely to enter entrepreneurship, but in the end ended up in different occupations for random reasons.

Another related topic for future research concerns the performance implications of entrepreneurs' distinct decision-making style. Does the fact that they make more intuitive decisions than managers mean that they make more bad decisions (thus contributing to the entrepreneurial earnings puzzle)? For the games considered in this paper, and without measuring beliefs about the choices of the other players in the game, one cannot tell. In the one-shot chain store game, for instance, a contemplative decision-maker advises to enter, because he realizes that the fear that the grocer will respond aggressively is largely unwarranted, as it would not be in the grocer's own interest to do so. Making good strategic decisions thus in general includes two components: best respond given your expectations what the other players will do, and form expectations that are in line with what these other players actually do. The intuitive choice for "Not enter" in the chain store game is then not necessarily a priori bad, as it could be rationalized by expectations that most people in the role of grocer would respond aggressively nevertheless (e.g., because grocers mostly choose intuitively themselves).<sup>16</sup> Holm et al. (2016) have started exploring the quality of strategic decision-making by different occupational groups. They compare the choices of 199 CEOs/entrepreneurs in three strategic games (Prisoners' dilemma, Battle of the Sexes, Chicken) with those of 200 comparable other people and measure their beliefs (in an incentive compatible way) at the same time.<sup>17</sup> The beliefs of the CEOs/entrepreneurs appear on average more accurate than those of the control group. Moreover, as a group they obtain higher average earnings than the control group, not because they are smarter (i.e., better responding) but rather because they behave more cooperatively as a group. These findings suggest that entrepreneurs are not worse strategic decision-makers. It would be interesting to explore this further for games that allow for a clear distinction between intuitive and more contemplative choices (again measuring beliefs at the same time).

Besides being a potential independent behavioral driver of its own, a person's decision-making style might also be closely related to other established behavioral drivers of entry into entrepreneurship (cf. Åstebro et al. 2014). In particular, it could be the case that entrepreneurs' intuitive decision-making derives from them being overconfident/optimistic. Entrepreneurs' strong Faith in Intuition then results from overly optimistic beliefs that gut feelings are always right (and thereby leading to excessive entry). The relationship between decision-making style and overconfidence/optimism thus also seems worthwhile to explore further.

<sup>&</sup>lt;sup>16</sup>Indeed, besides the subgame perfect equilibrium in which the tailor enters, there is another Nash equilibrium of the game in which he does not. The latter Nash equilibrium is based on the (theoretically non-credible, but in the equilibrium untested) threat that entry will be met with an aggressive response.

<sup>&</sup>lt;sup>17</sup>As 182 CEOs own the firm they manage and 166 founded it, the far majority of the CEOs in their sample could equally well be classified as entrepreneur (cf. Holm et al. 2016, Section V.C).

#### **Appendix:** robustness checks

	Behavioral	l measures			Self-reported measures			
Dep. variable	(1a) CI	(1b) CI	(2a) RT	(2b) RT	(3a) FI	(3b) FI	(4a) NFC	(4b) NFC
Entrepreneur	0.005	- 0.001	10.095**	6.016	0.299**	0.602***	0.502***	0.069
Manager	[0.042] 0.196 <sup>***</sup> [0.062]	[0.045] 0.159** [0.066]	[3.970] 15.545*** [5.546]	[4.432] 10.623 <sup>*</sup> [6.063]	[0.145] - 0.340	[0.155] 0.04 [0.218]	[0.162] 1.090 <sup>***</sup> [0.208]	[0.166] 0.297 [0.214]
Age / 10	[0.002]	$-0.074^{***}$	[3.340]	-0.142	[0.207]	$-0.144^{**}$	[0.200]	$-0.218^{***}$
Female		[0.018] - 0.121***		(1.740) - 13.660***		[0.064] 0.684 <sup>***</sup>		[0.064] - 0.449 <sup>***</sup>
University		[0.040] 0.132		[3.743] 4.921		[0.138] - 0.641**		[0.149] 2.434 <sup>***</sup>
College		[0.082] 0.014		[8.267] - 3.723		[0.276] 0.001		[0.310] 1.549***
Lower Voc.		[0.079] - 0.018		[7.874] - 7.812		[0.260] 0.074		[0.302] 0.171
Constant	0.813***	[0.082] 1.163 <sup>***</sup>	175.469***	[8.142] 184.976 <sup>***</sup>	18.898***	[0.276] 19.332***	17.455***	[0.323] 17.495 <sup>***</sup>
Obs.	[0.027] 1734	[0.118] 1734	[2.667] 1734	[11.505] 1734	[0.093] 1734	[0.393] 1734	[0.108] 1734	[0.427] 1734
$R^2$ ENT = MAN	0.01 < 0.01	0.03 0.01	0.01 0.34	0.02 0.42	0.01 < 0.01	0.03 < 0.01	0.02 < 0.01	0.11 0.29

 Table 7
 OLS Regressions on decision-making styles: trimmed sample

This table is the equivalent of Table 4, leaving the quickest 5% and the slowest 5% of respondents out. University, college, and lower vocational are all dummy variables equal to one if this is the highest education level attained by the participant (with High school the reference category, cf. Table 2). \*Significance at the 10% level, \*\*significance at the 5% level, and \*\*\*significance at the 1% level, with robust standard errors reported in square brackets. The final row reports the *p* value of a Wald test that "Entrepreneur" = "Manager"

Table 8 OLS Regressions on decision-making styles: founding entrepreneurs

	Behavioral	measures	measures			Self-reported measures		
Dep. variable	(1a) CI	(1b) CI	(2a) RT	(2b) RT	(3a) FI	(3b) FI	(4a) NFC	(4b) NFC
Founding Entr.	0.011	0.002	27.739***	17.565**	$0.280^{*}$	0.596***	0.529***	0.078
	[0.043]	[0.047]	[7.503]	[8.083]	[0.147]	[0.157]	[0.162]	[0.169]
Manager	0.196***	0.156**	25.741***	12.052	-0.254	0.110	$1.178^{***}$	$0.398^{*}$
	[0.060]	[0.064]	[9.029]	[9.938]	[0.198]	[0.209]	[0.199]	[0.207]
Age / 10		$-0.060^{***}$		-0.203		$-0.143^{**}$		$-0.243^{***}$
		[0.018]		[3.117]		[0.063]		[0.063]
Female		$-0.126^{***}$		- 21.123***		0.736***		$-0.509^{***}$
		[0.040]		[6.511]		[0.135]		[0.145]

	Behavioral	ehavioral measures			Self-reporte	Self-reported measures		
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
Dep. variable	CI	CI	RT	RT	FI	FI	NFC	NFC
University		0.194**		20.704		- 0.613**		2.383***
		[0.082]		[14.170]		[0.275]		[0.310]
College		0.036		5.794		- 0.033		$1.508^{***}$
		[0.077]		[13.384]		[0.258]		[0.300]
Lower Voc.		0.072		- 14.177		0.081		0.215
		[0.80]		[12.998]		[0.272]		[0.317]
Constant	$0.842^{***}$	$1.087^{***}$	184.253***	193.034***	18.866***	19.272***	17.376***	17.582***
	[0.026]	[0.116]	[4.003]	[19.879]	[0.089]	[0.388]	[0.101]	[0.417]
Obs.	1804	1804	1804	1804	1804	1804	1804	1804
$R^2$	0.01	0.03	0.01	0.02	0.01	0.03	0.02	0.11
ENT = MAN	< 0.01	0.01	0.85	0.59	0.01	0.02	< 0.01	0.13

Table 8(continued)

This table is the equivalent of Table 4, leaving entrepreneurs that are not founders out. University, college, and lower vocational are all dummy variables equal to one if this is the highest education level attained by the participant (with high school the reference category, cf. Table 2). \*Significance at the 10% level, \*\*significance at the 5% level, and \*\*\*significance at the 1% level, with robust standard errors reported in square brackets. The final row reports the *p* value of a Wald test that "Entrepreneur" = "Manager"

Table 9	OLS regressions	on decision-,making styles:	university degree

	Behavioral measures				Self-reported measures				
Dep. variable	(1a) CI	(1b) CI	(2a) RT	(2b) RT	(3a) FI	(3b) FI	(4a) NFC	(4b) NFC	
Entrepreneur	- 0.054 [0.081]	0.059 [0.089]	2.453 [13.484]	0.159 [16.229]	0.238 [0.274]	0.431 [0.307]	$-0.498^{*}$ [0.280]	- 0.400 [0.301]	
Manager	0.151 [0.100]	0.232 <sup>**</sup> [0.104]	3.767 [14.433]	3.859 [15.901]	0.015 [0.330]	0.111 [0.341]	- 0.097 [0.313]	0.027 [0.313]	
Age / 10		$-0.113^{***}$ [0.035]		2.283 [6.720]		- 0.193 [0.124]		- 0.098 [0.116]	
Female		- 0.064 [0.072]		- 22.051 <sup>*</sup> [11.991]		0.462 <sup>**</sup> [0.252]		$-0.772^{***}$ [0.253]	
Constant	0.973 <sup>***</sup> [0.065]	1.442 <sup>***</sup> [0.155]	211.919 <sup>***</sup> [9.556]	209.982 <sup>***</sup> [9.556]	18.434 <sup>***</sup> [0.211]	19.051 <sup>***</sup> [0.528]	19.104 <sup>***</sup> [0.205]	19.742 <sup>***</sup> [0.519]	
Obs. $R^2$	564 0.01	564 0.03	564 0.01	564 0.01	564 0.01	564 0.01	564 0.01	564 0.02	
ENT = MAN	0.02	0.06	0.93	0.80	0.47	0.31	0.19	0.17	

This table is the equivalent of Table 4, including only participants that have a university degree. \*Significance at the 10% level, \*\*significance at the 5% level, and \*\*\*significance at the 1% level, with robust standard errors reported in square brackets. The final row reports the p value of a Wald test that "Entrepreneur" = "Manager"

					Self-reported measures					
Dep. variable	(1a) CI	(1b) CI	(2a) RT	(2b) RT	(3a) FI	(3b) FI	(4a) NEC	(4b) NEC		
	er	CI	KI	Ki	11	11	iu c	iu e		
Entrepreneur	-0.021	-0.022	16.232	13.017	$0.426^{**}$	$0.659^{***}$	0.138	0.220		
	[0.063]	[0.066]	[10.951]	[11.046]	[0.211]	[0.219]	[0.222]	[0.230]		
Manager	0.060	0.050	11.598	7.794	-0.098	0.142	0.225	0.291		
	[0.089]	[0.090]	[14.941]	[15.094]	[0.294]	[0.298]	[0.296]	[0.302]		
Age / 10		$-0.074^{***}$		- 1.939		- 0.132		$-0.181^{**}$		
		[0.026]		[5.026]		[0.090]		[0.089]		
Female		$-0.210^{***}$		$-22.543^{**}$		$0.870^{**}$		-0.070		
	[0.062]		[10.918]			[0.205]		[0.224]		
Constant	0.832***	1.245***	190.928***	$209.278^{***}$	18.901***	19.092***	17.802***	18.619***		
	[0.043]	[0.129]	[7.209]	[25.308]	[0.143]	[0.429]	[0.150]	[0.435]		
Obs.	794	794	794	794	794	794	794	794		
$R^2$	0.01	0.02	0.01	0.01	0.01	0.03	0.01	0.01		
ENT = MAN	0.37	0.42	0.76	0.73	0.08	0.09	0.78	0.81		

Table 10 OLS regressions on decision-making styles: college degree

This table is the equivalent of Table 4, including only participants that have a college degree. \*Significance at the 10% level, \*\*significance at the 5% level, and \*\*\*significance at the 1% level, with robust standard errors reported in square brackets. The final row reports the p value of a Wald test that "Entrepreneur" = "Manager"

Table 11	OLS	regressions on	decision-making	g stv	vles:	high	school	or	lower	vocational	degi	ree
		0			r	<u> </u>					<u> </u>	

	Behavioral measures				Self-reported measures				
Dep. variable	(1a) CI	(1b) CI	(2a) RT	(2b) RT	(3a) FI	(3b) FI	(4a) NFC	(4b) NFC	
Entrepreneur	- 0.050	- 0.068	38.467***	35.224***	0.439*	0.674**	0.382	0.360	
	[0.079]	[0.080]	[12.835]	[13.033]	[0.265]	[0.273]	[0.309]	[0.324]	
Manager	$0.535^{**}$	$0.517^{**}$	46.822	43.950	-0.360	-0.152	$2.074^{**}$	2.025**	
	[0.228]	[0.224]	[32.113]	[31.603]	[0.801]	[0.789]	[0.826]	[0.807]	
Age / 10		-0.027		- 1.075		- 0.069		$-0.470^{***}$	
		[0.033]		[3.871]		[0.113]		[0.120]	
Female		-0.107		- 11.638		0.843***		$-0.570^{**}$	
		[0.069]		[9.634]		[0.237]		[0.268]	
Lower Voc.		0.053		- 12.689		0.113		0.062	
		[0.081]		[12.178]		[0.268]		[0.317]	
Constant	$0.798^{***}$	0.934***	166.567***	186.974 <sup>***</sup>	19.026***	18.840***	16.260***	18.659***	
	[0.039]	[0.184]	[5.258]	[22.982]	[0.136]	[0.619]	[0.153]	[0.153]	
Obs.	562	562	562	562	562	562	562	562	
$R^2$	0.01	0.02	0.02	0.03	0.01	0.03	0.01	0.05	
ENT = MAN	0.01	0.01	0.80	0.79	0.33	0.31	0.05	0.05	

This table is the equivalent of Table 4, including only participants that either have high school or a lower vocational degree. Lower vocational is a dummy variable equal to one if this is the highest education level attained by the participant (with high school the reference category, cf. Table 2). \*Significance at the 10% level, \*\*significance at the 5% level, and \*\*\*significance at the 1% level, with robust standard errors reported in square brackets. The final row reports the *p* value of a Wald test that "Entrepreneur" = "Manager"

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#### References

- Åstebro, T.H., Herz, H., Nanda, R., Weber, R.A. (2014). Seeking the roots of entrepreneurship: insights from behavioral economics. *Journal of Economic Perspectives*, 28, 49–70. https://doi.org/10.1257/jep.28.3.49.
- Burmeister, K., & Schade, C. (2007). Are entrepreneurs' decisions more biased? An experimental investigation of the susceptibility to status quo bias. *Journal of Business Venturing*, 22(3), 340–362. https://doi.org/10.1016/j.jbusvent. 2006.04.002.
- Busenitz, L.W., & Barney, J.B. (1997). Differences between entrepreneurs and managers in large organizations: biases and heuristics in strategic decision-making. *Journal of Business Venturing*, *12*, 9–30. https://doi.org/10.1016/S0883-9026(96)00003-1.
- Cappelen, A.W., Nielsen, U.H., Tungodden, B., Tyran, J.R., Wengstrom, E. (2016). Fairness is intuitive. *Experimental Economics*, 19, 727–740. https://doi.org/10.1007/s10683-015-9463-y.
- Choi, S., Kariv, S., Müller, W., Silverman, D. (2014). Who is (more) rational American Economic Review, 104(6), 1518– 1550. https://doi.org/10.1257/aer.104.6.1518.
- De Mel, S., McKenzie, D., Woodruff, C.H. (2010). Who are the microenterprise owners? Evidence from Sri Lanka on Tokman versus De Soto. In Lerner, J., & Schoar, A. (Eds.) *International differences in entrepreneurship*: University of Chicago Press.
- Epstein, S. (2003). Cognitive-experiential self-theory of personality, chap. In Millon, T., & Lerner, M.J. (Eds.) Comprehensive handbook of psychology, vol. 5: personality and social psychology (pp. 159–184). Hoboken: Wiley.
- Epstein, S., Pacini, R., Denes-Raj, V., Heier, H. (1996). Individual differences in intuitive-experiential and analyticalrational thinking styles. *Journal of Personality and Social Psychology*, 71(2), 390–405. https://doi.org/10.1037/0022-3514.71.2.390.
- Evans, J.S.B.T. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychol*ogy, 59, 255–278. https://doi.org/10.1146/annurev.psych. 59.103006.093629.
- Frederick, S. (2005). Cognitive reflection and decision making. Journal of Economic Perspectives, 19, 25–42. https://doi. org/10.1257/089533005775196732.

- Haigh, M. (2016). Has the standard cognitive reflection test become a victim of its own success? Advances in Cognitive Psychology, 12(3), 145–149. https://doi.org/10.5709/acp-0193-5.
- Holm, H.J., Nee, V., Opper, S. (2016). Strategic decisions: behavioral differences between CEOs and others. working paper.
- Holm, H.J., Opper, S., Nee, V. (2013). Entrepreneurs under uncertainty: an economic experiment in China. *Management Science*, 59(7), 1671–1687. https://doi.org/10.1287/ mnsc.1120.1670.
- Hsu, D.K., Simmons, S.A., Wieland, A.M. (2017). Designing entrepreneurship experiments: a review, typology and research agenda. *Organisational Research Methods*, 20, 379–412. https://doi.org/10.1177/1094428116685613.
- Kahneman, D. (2011). *Thinking, fast and slow. Farrar*. New York: Straus and Giroux.
- Koudstaal, M., Sloof, R., van Praag, C.M. (2016). Risk, uncertainty and entrepreneurship: evidence from a large lab-inthe-field experiment. *Management Science*, 62, 2897–2915. https://doi.org/10.1287/mnsc.2015.2249.
- Kraus, S., Meier, F., Niemand, Th. (2016). Experimental methods in entrepreneurship research: the status quo. *International Journal of Entrepreneurial Behavior and Research*, 22, 958–983. https://doi.org/10.1108/IJEBR-05-2016-0135.
- Lindquist, M.J., Sol, J., van Praag, C.M. (2015). Why do entrepreneurial parents have entrepreneurial children *Jour*nal of Labor Economics, 33, 269–296. https://doi.org/10. 1086/678493.
- Pretz, J.E., Brookings, J.B., Carlson, L.A., Keiter Humbert, T., Roy, M., Jones, M., Memmert, D. (2014). Development and validation of a new measure of intuition: the types of intuition scale. *Journal of Behavioral Decision Making*, 27, 454–467. https://doi.org/10.1002/bdm.1820.
- Pretz, J.E., & Totz, K.S. (2007). Measuring individual differences in affective, heuristic, and holistic intuition. *Personality and Individual Differences*, 43, 1247–1257. https://doi.org/10.1016/j.paid.2007.03.015.
- Rubinstein, A. (2007). Instinctive and cognitive reasoning: a study of response times. *The Economic Journal*, 117, 1243– 1259. https://doi.org/10.1111/j.1468-0297.2007.02081.x.
- Rubinstein, A. (2013). Response time and decision making: an experimental study. *Judgment and Decision Making*, 8, 540–551.
- Rubinstein, A. (2016). A typology of players: between instinctive and contemplative. *Quarterly Journal of Economics*, 131, 859–890. https://doi.org/10.1093/qje/qjw008.
- Shepherd, D.A., Williams, T.A., Patzelt, H. (2015). Thinking about entrepreneurial decision making: review and research agenda. *Journal of Management*, 41, 11–46. https://doi.org/10.1177/0149206314541153.