

# **The association between personality and entrepreneurial intentions**

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Bachelor Thesis

Erasmus School of Economics

September 25, 2018

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## 0. Abstract

For nearly 20 years, academic research neglected the role of personality and its relation with entrepreneurship. In fact, the methodology of distinguishing entrepreneurs from non-entrepreneurs on the premise of psychological attributes was regarded as essentially ineffective by most scholars. The present paper contributes to the reemergence of the big five model in entrepreneurial research. Through implementation of the big five model we will revise the notion concerning the discriminative potential of personality traits on individual entrepreneurial intentions. Ultimately, the present paper aims to help researchers better understand how entrepreneurial intentions are associated with personality. Empirical analysis is conducted by use of a dataset comprised of students. We find evidence that Openness to experience and Conscientiousness are positively associated with entrepreneurial intentions. We do not find significant association for Agreeableness, Extraversion, and Neuroticism with entrepreneurial intentions.

*Keywords:* entrepreneurship, intentions, personality, shorter inventory

## 1. Introduction

One way to illustrate the importance of entrepreneurship is by taking into account the amount of research devoted to it. Researchers are already concerned with entrepreneurship since the late seventeenth century (Brewer, 1992). Cantillon defined the entrepreneur in his manuscript *Essai Sur La Nature Du Commerce En Général* written in 1730 (Cantillon, 2010) as a person who pays a certain price for a product and resells it at an uncertain price, "making decisions about obtaining and using the resources while consequently admitting the risk of enterprise". Cantillon considered the entrepreneur to be a risk taker who deliberately allocates resources to exploit opportunities in order to maximize the financial return (Stevenson & Jarillo, 2007). Cantillon emphasized the willingness of the entrepreneur to assume the risk and to deal with uncertainty, thus he drew attention to the function of the entrepreneur and distinguished between the function of the entrepreneur and the proprietor who provided the funds.

Traditional economists thought entrepreneurship played a crucial role by matching demand in different places and different times. However, after the 70's of the twentieth century, the role of entrepreneurship has changed fundamentally. Several causes are the reason for this change. Globalization and the rise of international markets, large growth of the IT sector, and the transition from a managerial to an entrepreneurial economy. This transition is centered on the knowledge-based economy, which has occurred in most western countries (Audretsch & Thurik, 2001). In such economies, wherein knowledge is the central competitive advantage, entrepreneurs are needed. Entrepreneurship occurs in situation of uncertainty and complexity. Therefore, in a modern society, which is growing increasingly more complex and uncertain the importance of entrepreneurship is still growing. We see this for example in the high numbers of SME's.

Birch (1979) shows the positive effect of new businesses on employment levels. Small firms are more flexible and more creative, so the earlier advantage of large-scale production is replaced by the advantage of small-scale entrepreneurship in knowledge driven economies. Because of the importance of business creation, understanding which factors contribute to the decision of becoming an entrepreneur is an important area of research. A deeper understanding of such factors could lead to more efficient policy making, a deeper understanding of the induced effect of entrepreneurship on employment levels and its sustainability (quality of those jobs created through policy making). This could possibly enable the making of more accurate predictions concerning future economic growth. Earlier investigated factors associated with the formation entrepreneurial intentions are (social) capital (Fitzsimmons & Douglas, 2011), risk (Barbosa & Gerhardt, 2007), (economic) environment (Bird, 1988) age, sex, and personality Brandstätter (2011). The present paper is centered on the factor personality and the role it plays in the formation of entrepreneurial intentions. Hence, the research question is:

*Is there a relation between personality traits and developing entrepreneurial intentions?*

This research question has already been investigated in earlier research. For example, the meta-analysis by Brandstätter (2011) shows, through the use of the Big Five Personality model, that Extraversion (1) is positively associated with the formation of entrepreneurial intentions (FEI), Agreeableness (2) is insignificantly associated with the FEI, Conscientiousness (3) is positively associated with the FEI, Neuroticism (4) is negatively associated with the FEI, and lastly Openness to experience (5) is positively

associated with the FEI. Brandstätter (2011) concludes that the big five model should be implemented in any entrepreneurial research, as utilization of one single standard model is the only way to reliably compare results across studies. The present paper constitutes a replication study and its purpose is therefore to test whether the big five meta-analytic results differ from relations found in a recently collected dataset.

The remainder of this thesis is organized as follows: Section two discusses the related literature wherein the hypotheses are developed regarding the relation between personality and the formation of entrepreneurial intentions. Moreover, it explains the rationale behind the direction of the hypothesized relationships. Section three concerns our methodology, herein we will explain our sampling procedure, the construction and interpretation of our variables and coefficients, the assumptions we are required to make with respect to linear regression, and the data analysis in general. The fourth section concerns the interpretation of our results and deals with confirming or rejecting our hypotheses. Finally, the fifth section concerns a discussion, a conclusion, and directions for future research.

## 2. Literature review

In this section, the Big Five personality model is described, and hypotheses for the relation between each personality factor and the formation of entrepreneurial intentions are formulated.

### 2.1. The big five factor model

Many psychologists believe there are five basic dimensions of personality, namely Extraversion, Agreeableness, Openness, Conscientiousness, and Neuroticism. The earliest concept of the big five factor model was constructed by psychologists Tupes & Christal (1992). Upon the analyses of eight studies it became evident that five factors recurrently appeared (Tupes & Christal, 1992). The single difference only lies in terminology, which concerned three factors. Tupes and Christal labeled Extraversion as Surgency, Neuroticism as emotional stability and Openness and Intellect as Culture. Today, apart from the Culture and Surgency, the term Emotional stability is still commonly used. After their paper was published the five factors were not implemented into any other published work until Digman published his famous paper Personality structure: Emergence of the five-factor model in 1990. In that same year Lewis Goldberg published: An alternative "description of personality": the big-five factor structure. (Goldberg, 1990). This paper is an important part of literature covering the big five model for the reason that Goldberg reintroduced the model in his paper and because he introduced the name "the big five factor model", which has become a household name for the model in the academic literature ever since.

According to Goldberg (1993) the lexical hypothesis paved the groundwork for establishing the Big Five personality model. The lexical hypothesis is based on two principles. The first principle is based on the assumption that personality traits which are deemed important to a group of people, within that particular group, will over time adopt names for those traits. The second principle states the more important a particular concept, in this case a particular trait, the more likely it will be given a name by a single word. Therefore, the more important a particular personality trait, the more likely it is to be labeled by a single name within the language of that particular group (Angleiter & Ostendorf, 1988). The lexical hypothesis constitutes the basis of the big five model of personality.

The big five factor model of personality is one of the most outstanding models in modern psychology for describing personality (Digman, 1990). These five different factors are also commonly referred to as The Big Five (Ewen, 1998). The model uses a questionnaire or inventory as input and is supported to predict individual personality as output. Individual personality is supported to significantly predict the corresponding individual behavior (Funder, 1994; Ciavarella, Buchholtz, Riordan, Gatewood, & Stokes, 2004). Lots of papers in the field of economics have implemented the big five factor model in order to predict financial behavior, such as salary level (Dore, 1998), but also to predict entrepreneurial behavior (Liñán & Chen, 2009).

There do exist other models similar to the five-factor model for describing personality, like the HEXACO personality model, which consists of six dimensions (Lee & Ashton, 2005), the Enneagram of personality (Riso & Hudson, 1996), which differentiates between nine different personality types, and Eysenck's three-factor model (Eysenck, 1991). Most of them are subject to an ongoing debate within the realm of psychology on whether to drop one or more factors of the five-factor model due to potential multicollinearity. Currently, the five-factor model dominates the field of psychological research (Ewen, 1998). According to Popkins, (1998) "the five-factor model appears to hold very well across linguistic and cultural lines. Due to the sliding scales in each of the variables, the model is easily quantifiable". Which

maybe justifies the widespread use of the model in different fields, besides economics the model is commonly implemented in psychology such as in the paper: Big five factors and facets and the prediction of behavior (Paunonen & Ashton, 2001). Denissen et al. (2008) conclude that "The high levels of internal consistency, factorial and external validity, and good applicability in different age groups of the Dutch Big Five Inventory are consistent with the psychometric quality of the English original" (John & Srivastava, 1999). Accordingly, we can correctly apply the Dutch version of the BFI to our sample. In the interest of scientific contribution, we choose to use the big five model as most recent authorities on this subject like Zhao, Seibert and Brandstätter implement studies in their meta-analyses which use the big five factor model as predictor variables. As mentioned in the introduction, Brandstätter (2011) advocates the use of a standard single model which allows for cross-sectional analyses. The main purpose of the present paper as a replication study is to be part of future meta-analyses. Hence, implementation of the five-factor model is in line with the main purpose of the present paper. Through implementation of the big five model results of the present paper can be compared to Brandstätter's and Zhao's meta-analytic results. "They (the big five factors) are also relevant in predicting entrepreneurial intention" (Brandstätter, 2011), hence we can also correctly apply the five-factor model to find their corresponding associations with entrepreneurial intentions.

In the following subsections, we review the relations between each factor of the Big Five model and entrepreneurial intentions.

## **2.2. Extraversion and entrepreneurial intentions**

Extraversion as opposed to introversion is characterized by a noticeable difference in engagement with external activities. The combination of personality traits which are applicable to extraversion such as social skills, high levels of energy and assertiveness are essential for leading a company successfully. For this reason, extraverts are more likely to be attracted to the idea of starting a business than introverts (Costa, McCrae & Holland, 1984). Moreover, extraverts are more inclined to take upon a leadership role than introverts (Judge, Higgins, Thoresen & Barrick, 1999). For the reason that leadership is in most entrepreneurial endeavors an essential trait or skill to possess, extraverts can be expected to be more inclined to take upon a leadership role. Hence, a positive association between extraversion and entrepreneurial intentions may be expected.

Holland (1984) points out that extraverts are more likely to engage in entrepreneurial activity, because starting an own business is perceived to be more thrilling and challenging as opposed to working for an employer, Also Zhao and Seibert (2006) state they "expect Extraversion to be even more important for entrepreneurs than for managers". Zhao et al. (2006) analyzed the difference between entrepreneurs and managers according to the big five model. In their meta-analysis they also expected Extraversion among entrepreneurs to be positively associated with entrepreneurial intentions. For these reasons the factor Extraversion is expected and hypothesized to be positively associated with entrepreneurial intentions.

H1: Extraversion is positively associated with entrepreneurial intentions.

### **2.3. Agreeableness and entrepreneurial intentions**

The factor Agreeableness can be described as the dimension that accounts for an individual's tendency to concern for the wellbeing of other people. The factor Agreeableness focuses on specific behaviors undertaken during interpersonal interactions, such as cooperating and trusting others (DeNeve & Cooper, 1998). Antagonists, who score low on agreeableness, have less of a need to be liked by others. In contrast with agreeable individuals, antagonists are more focused on their own needs than the needs of others and might be viewed by others as cold and aloof (Singh & DeNoble, 2003). Zhao et al. (2010) state "high levels of Agreeableness may inhibit one's willingness to drive hard bargains, look out for one's own self-interest, and influence or manipulate others, to his own advantage". Hence, the factor agreeableness is hypothesized to be negatively associated with entrepreneurial intentions.

H2: Agreeableness is negatively associated with entrepreneurial intentions.

### **2.4. Conscientiousness and entrepreneurial intentions**

Facets of the personality dimension conscientiousness are competence, order, dutifulness, achievement striving, self-discipline and Deliberation (Costa & McCrae, 1992). Individuals scoring high on this dimension choose planned behavior over impulsive behavior. Brandstätter (2011) confirms in his meta-analysis the research of Zhao and Seibert (2006) and Zhao et al. (2010) showing the personality factor conscientiousness to be positively associated with the intention to become an entrepreneur. Zhao and Seibert (2006) subdivided conscientiousness into separate facets. Then, they analyzed the effect on entrepreneurial intentions and performance for each different facet for entrepreneurs against managers. A significant association between the facet "achievement motivation" and entrepreneurial intentions was observed for entrepreneurs in comparison to managers. Despite no significant difference was found for the facet dependability, Zhao et al. (2010) analyzed the factor conscientiousness more generally, that is without subdivision into facets, and found conscientiousness to be positively correlated with entrepreneurial intentions and entrepreneurial performance. Hence observing the results of the meta-analysis, we are able to form our third hypothesis.

H3: Conscientiousness is positively associated with entrepreneurial intentions.

### **2.5. Neuroticism and entrepreneurial intentions**

Neuroticism is defined as the propensity to experience distress and negative emotions, including fear, sadness, anger, anxiety, irritability, loneliness, worry, self-consciousness, dissatisfaction, hostility, shyness, reduced self-confidence, and feelings of vulnerability (Thompson, 2008). Eysenck (1967) mentions in his theory of personality, neuroticism to be associated with little resilience to stress or adverse stimuli. The risk associated with entrepreneurship and hypersensitivity to stress of the neurotic is indicative of a negative relationship between the trait and entrepreneurial intentions. In psychology neuroticism is occasionally referred to as emotional instability, of which its definition is represents its inverse. Zhao et al. (2010) adopted emotional stability in their meta-analytic review. Zhao et al. (2010) show in their meta-analysis the factor emotional stability to be positively associated with entrepreneurial intentions. Therefore, neuroticism is hypothesized to be negatively associated with entrepreneurial intentions.



H4: Neuroticism is negatively associated with entrepreneurial intentions.

## 2.6. Openness to experience and entrepreneurial intentions

The factor Openness to experience is rather straightforward concerning its potential positive influence on an individual's entrepreneurial intentions. The supposed positive association is based on the argument that engaging in entrepreneurship requires an individual to have a great imagination, to come up with great ideas often, to have many intellectual interests, and therefore feature a wide set of different skills. Possession of a diverse set of skills is supported by Lazaer's Jack of all trades theory, which formulates that generalists, individuals being moderately good at wide range of skills ought to be more suited for entrepreneurship as opposed to specialists, individuals being proficient in a single skill (Lazaer, 2004). Therefore, specialists will earn more as they choose to work for an employer rather than starting their own business, as managing your own business requires a wider range of skills than regular employment does

Observing the name of the factor, less straightforward might be that intelligence is inherently part of Openness to experience. Some papers even define the factor openness to experience as "Intellect". That is because being interested in (or rather one's openness to) abstract ideas is a representation of one's level of intellectual curiosity. High scores on Openness to experience is associated with risky behavior (Ambridge, 2014), which is in line with a widely accepted economic theme regarding entrepreneurship: The recognition that income from an entrepreneur is more risky than from being an employee. This is for example also supported by the Khilstrom and Laffont model of occupational choice (Khilstrom & Laffont, 1979). Students scoring low on Openness to experience are not open to new experiences and do not have lots of great new ideas. Moreover, those scoring low on Openness to experience are not likely to be open to the idea of starting a business. Therefore, our last hypothesis is:

H5: Openness is positively associated with entrepreneurial intentions.

## **3. Methodology**

### **3.1. Sample description**

In the period May 2015 up to and including April 2016 questionnaires were sent by email to 182 students from Erasmus University Rotterdam, The Netherlands. The students were offered either money or course credits for completing the questionnaire. The final analysis sample consists of 150 students who returned the questionnaire (N=150) of whom 67 were male and 83 were female. Besides two foreign students, all other students were Dutch. The response rate amounts to 82 %, which is relatively high for an e-mail survey. One reason for the relatively high response rate could be that the survey was conducted by a renowned University as opposed to marketers, this suggests a more meaningful purpose of the survey than the marketers' sole purpose of profit maximization. Another reason for the high response rate is obviously the money or course credits to be earned through participation. The money or credits being offered for filling in the survey makes it probable for some form of participation bias to occur. However, a response rate of 82%% does limit the leeway for a substantial participation bias to occur (Fox, Crask & Kim, 1988). Concerning, the participation bias we will dig deeper into the subject in the conclusion section 5.3.

### **3.2. Dependent variable**

Just as in the study by Zhao et al (2010), the variable representing entrepreneurial intentions is used as the dependent variable. In this research, our dependent variable consists of a score of six questions. These questions are derived from the section Entrepreneurial Intention Guess in the questionnaire (see appendix of the present paper for an exact description of the items). For simplicity, the construction of our dependent variable limits itself to six statements constituting particularly to intention. Different measures which have to do with the formation of entrepreneurial intentions such as Personal attitude, Subjective Norm and Perceived behavioral control are ignored. The six items that measure one's entrepreneurial intentions are summed up and the resulting scores are divided by six to obtain a mean score for each subject.

### **3.3. Independent variables**

The main independent variables are measures for the big five personality factors. Our inventory consists of a list of 21 statements, of which our sample subjects have to select one of the following answers concerning the statement: strongly disagree (1) disagree (2) neutral (3) agree (4) strongly agree (5). Our inventory measurement procedure is derived from a 44-item inventory by John and Srivastava (1999), which is adopted, shortened and translated by the Erasmus University Rotterdam. See the appendix for the 21 specific items chosen and their corresponding translation. Concerning the translation method, Denissen, Geen, and van Aken (2008) prioritized preserving the authentic definition of the items. The 44 English items were translated into Dutch by two independent persons. Secondly, five experts chose the best translation through a general agreement. The next stage involved a backward translation of the concerning questionnaire from Dutch back to English by two Dutch-English bilingual students. Lastly, those statements translated back to English which differed from the original English statements were reevaluated and its final translations were formulated by agreement among the two bilingual students (Denissen et al.,2008).

Each of the five factors is constructed by an average score of four corresponding questions in the questionnaire, except for the factor Openness to experience, which is measured by an average score of five questions. Some statements are reversed, which will be accounted for. After having taken into account the reversals, the average of the facets for each factor trait is calculated to determine the value of a particular factor for each observation. Consequently, with respect to our independent variables, there is one average value for each of the five personality traits (our independent variables) for each of the 150 students.

### **3.4. Control variables**

Our decision to control for Age and Gender is to mimic Brandstätter's quantitative review. Controlling for Age and Gender appears to be standard practice in the concerning literature: Zhao's meta-analyses also included the control variables of Age and Gender. Additionally, our attempt to control for gender is also based on consistent differences in factor scores between men and women. Costa and McCrae (2001) show men score persistently lower on the factor Agreeableness and Neuroticism, whilst scoring higher on assertiveness, which is a facet of the factor Extraversion.

### **3.5. Regression analysis**

We use a multiple linear regression to explain entrepreneurial intentions by our five independent variables plus the demographic control variables for age and gender at a significance level of 5%. In order to perform a regression properly, we have to be aware of its assumptions regarding epsilon or the error term. The error terms are assumed to be independently, identically, distributed (i.i.d.). The distribution of the errors is assumed to follow a normal distribution with a mean of zero and with a variance given by sigma, which is the standard deviation squared and is fixed across all observations. This implies that knowing something about an error term does not provide us with any information at all to predict the value of any other error term. This assumption is a requirement for performing the regressions the error terms must be independently identically distributed (i.i.d.). So, we are assuming that a student's entrepreneurial intention does not depend on the entrepreneurial intentions score of any other student. This assumption could, for example, be violated if students were to fill in the questionnaires whilst communicating. However, since the questionnaire had been sent by email it is highly unlikely that the errors of the student's scores on entrepreneurial intention depend on each other.

We tested for the independence assumptions regarding epsilon by creating and analyzing residual plots for each of our independent variables against their residuals (see appendix B). Besides one outlier, regarding the residual of conscientiousness no further major outliers for any of the independent variables were present. When we examine the residual plots and their second order polynomial trend lines, no severe systematic curvatures were observed either. The absence of any severe curvatures in our residual plots for our independent variables is indicative of the assumption of independence of errors to hold.

Regarding the observation of our residual plots for our independent variables, one could argue that the variance of the residuals attributed to conscientiousness is increasing when conscientiousness increases, which would violate the homoscedasticity assumption. However, besides one outlier (the strongest outlier to the left), the effect seems to be non-substantial. Regarding the procedure of testing for the assumption of homoscedasticity, we plotted the fitted values against the standardized residuals and included a second order polynomial trend line. The trend does show some minor curvature, however, either a cone shape or reverse cone shape is rather indicative of heteroscedasticity, while significant curvature could be a sign of violation of the independence of errors. However, its curvature does not appear sufficiently substantial to

violate the assumption of independence of error. Consequently, the confidence interval, the forecasts, and the scientific insights of our multiple linear regression model are not at risk of being misleading or biased as the concerned assumptions are not remarkably violated (Learn Analytics, 2015).

### 3.6. Interpretation of coefficients

We perform a multiple regression in order to test our hypotheses. In the multiple regression, we have to be careful concerning the interpretation of the coefficients of the regressors. Due to the different magnitude of the Likert scale used for our independent variable (five-point Likert scale) and our dependent variable (seven-point Likert scale), the coefficient for our independent variable represents the magnitude of change in the dependent variable. For the reason that our independent variable is measured on a scale of 5 units, whilst our dependent variable is measured on a scale of 7 units, the concerning coefficients are calculated by different measurement scales and should, therefore, be interpreted accordingly. For example, if the coefficient of our independent variable Openness to experience (X5) is 0.609, which represents the change of our dependent variable will be 0.609 on a seven-point Likert scale as X5 increases by one point, which domain ranges from 1 to 5. If one misinterprets the x and y variables both based on a five-point Likert scale of 5, then the coefficient of X would be misinterpreted by assigning too much weight and thereby overestimating the particular coefficient, thus the amount of impact a change in X has on the change of Y would be overestimated. The overestimation in this example would result in an inflated coefficient of the magnitude 0.8526 instead of 0.609  $((7/5) * 0.609 = 0.8526)$ .

## 4. Results

### 4.1. Descriptive statistics

Table 1 depicts the inter-correlations for each pair of our variables. Furthermore, mean factor score and corresponding standard deviations are shown.

*Table 1. Descriptive statistics and correlations for all independent variables (N = 150)*

	<i>M</i>	<i>SD</i>	(1)	(2)	(3)	(4)	(5)
(1) Extraversion	3.080	0.708	1.00				
(2) Agreeableness	2.620	0.642	0.06 (0.45)	1.00			
(3) Conscientiousness	3.382	0.647	0.12 (0.14)	0.08 (0.31)	1.00		
(4) Neuroticism	2.560	0.872	-0.04 (0.59)	-0.12 (0.15)	-0.07 (0.41)	1.00	
(5) Openness	3.525	0.736	0.20* (0.01)	-0.03 (0.70)	-0.08 (0.33)	0.01 (0.86)	1.00
(6) Entrepreneurial Intentions	3.282	1.592	0.14 (0.08)	-0.12 (0.16)	0.17* (0.04)	-0.16* (0.05)	0.28** (0.00)

Note: *p*-values in parentheses, \* *p* < .05; \*\* *p* < .01.

Performing a multiple regression does have the potential drawback of multicollinearity among the independent variables (See table 1 for the correlation among our independent variables). There is a positive correlation between Openness and Extraversion ( $r = .20, p = .01$ ). An increase in Openness will result in an increase in Extraversion as well and vice versa. No other significant correlations are observed among the independent variables, as well as no correlations above 0.80 or below -0.80. Thus, there is no (severe) multicollinearity present in our multiple regression model. For the reason that our multiple regression model does not contain severely collinear explanatory variables, our explanatory variables do not overlap much in explaining the variance of our dependent variable.

Table.2 Reports the coefficients of our independent variables expressed in terms of entrepreneurial intentions. Furthermore, some regression statistics are reported. Despite our multiple regression model being significant ( $F = 4.559, p < .001$ ), it shows that our demographic control variables, Age ( $\beta = 0.104, p = 0.084$ ) and Gender ( $\beta = -0.114, p = 0.625$ ) are insignificant. The insignificance of the control variable Age is likely due to the fact that our data comprises students only, hence the age of our subjects did not have sufficient variance to explain differences in age associated with the dependent variable. Moreover, the factor Extraversion appears to be positively associated with entrepreneurial intentions, however not statistically significant at  $p = 0.46 > \alpha = 0.05$ . Therefore, we do not accept H1 as this effect being present merely due to chance is too high.

Next, our independent variable Agreeableness is negatively associated with entrepreneurial intentions as hypothesized. However, this effect is not statistically significant either at a *p*-value of  $0.108 > \alpha = 0.05$ . Therefore, we do not accept H2. However, the personality trait Conscientiousness turns out to be statistically significant and positively correlated with entrepreneurial intentions. Its coefficient is 0.489, which implies when a student's score on the personality factor Conscientiousness increases with one point

(on a five-point Likert scale), this will on average result in an increase of 0.489 of his or her entrepreneurial intentions (on a seven-point Likert scale). In plain English, students who are more contentious tend to have stronger entrepreneurial intentions. Its corresponding  $p$ -value =  $0.011 < \alpha = 0.05$ , which makes it statistically significant, therefore we accept H3. There is a negative effect of Neuroticism on entrepreneurial intentions ( $\beta = -0.263, p = .086$ ). It is however not significant:  $p = 0.086 < \alpha = 0.05$ , therefore we do not accept H4. The coefficient Openness to experience is positive, as hypothesized, and shows to have the strongest association of all of the five traits ( $\beta = 0.621, p < 0.0004$ ). A coefficient of 0.621 for Openness to experience means that on average students' entrepreneurial intentions rise with 0.621 (on a seven-point Likert scale) for each point they score on Openness to experience (on a five –point Likert scale). In plain English, students who are more open to experience tend to have stronger entrepreneurial intentions. Its coefficient is statistically significant with a  $p$ -value of  $0.0004 < 0.05$ . Therefore, we accept H5.

**Table 2. Results OLS regression**

Variables	Entrepreneurial intentions
Constant	-1.569 (-0.87)
(1) Extraversion	0.130 (0.72)
(2) Agreeableness	-0.313 (-1.62)
(3) Conscientiousness	0.488* (2.56)
(4) Neuroticism	-0.263 (-1.73)
(5) Openness	0.621** (3.59)
(6) Age	0.104 (1.74)
(7) Gender	-0.11 (-0.42)
Observations	150
R <sup>2</sup>	0.184
R <sup>2</sup> <sub>adj</sub>	0.143
√mse	1.473
F(model)	4.571**

Notes: t-statistics in parentheses. Coefficients are statistically insignificant unless indicated as follows: \*\*  $p < .01$ ; \*  $p < .05$ .

For spotting potential redundant independent variables, we are concerned with the possible multicollinearity in our model, we have calculated the Variance Inflation Factors for each of our independent variables (Keith, 2017), see appendix B. The lowest VIF of all our independent variables was the variable Age (1.036) and the highest VIF applied to the variable Gender (1.280). Accordingly, all remaining independent variables reside within that range. Upon observing our independent variables not exceeding the VIF of 1.3 we do not have to worry, based on a statistical education website (Minitab blog, 2013). Consequently, our independent variables are not strongly correlated enough, that is no substantial multicollinearity exists, to conclude any suggestion of our independent variables being potentially redundant in our model.

## 5. Discussion and conclusion

### 5.1. Summary of results

The findings of the present study show a positive association between Conscientiousness and entrepreneurial intentions, as well as a positive association between openness to experience and entrepreneurial intentions. Our findings suggest that Dutch students who are highly conscientious or open to experience are likely to form stronger entrepreneurial intentions than students who are not. Excluding, Risk propensity, Noteworthy is the fact that the factor Openness to Experience has the strongest relationship with the formation of entrepreneurial intentions in our model ( $r = 0.28$ ), which is consistent with Zhao et al (2010) results' ( $r=0.24$ ). Another nearly consistent match of outcomes between Zhao et al (2010) results' ( $r=0.18$ ) and ours ( $r=0.17$ ) worth noting is the effect of the significant relationship between the factor Conscientiousness and the formation of entrepreneurial intentions. Our findings regarding the significance of the relationship of the factors Conscientiousness and Openness to experience with the formation of entrepreneurial intentions correspond with Brandstätter's (2011) meta-analytical results. Furthermore, the personality factor Agreeableness appears neither in our study nor in Brandstätter's to be statistically significant. As opposed to Brandstätter's results, which showed a statistically significant positive association of the factor Extraversion with the formation of entrepreneurial intentions, our findings concerning the relationship of the personality factor Extraversion appear to be statistically insignificant with the formation of entrepreneurial intentions. Another outcome discrepancy was observed for the personality factor Neuroticism; in Brandstätter's quantitative review, the factor Neuroticism was statistically significant with a negative association with the formation of entrepreneurial intentions as opposed to our insignificant results. If we have had a larger sample size, it would have been probable for the factor Neuroticism to turn out statistically significant, as neuroticism was close to being significant at a p-value of 0.09. Moreover, Zhao et al. (2010) show a significant positive effect of emotional stability (which is consistent with our beta as we defined emotional stability as neuroticism, which is the opposite trait) in their meta-analysis with a total sample size of 15423 individuals. In spite of Zhao's meta-analysis not comprising exclusively students, both Zhao's and Brandstätter's findings support our idea that our insignificant result concerning the factor Neuroticism is mainly due to a too small analysis size.

### 5.2. Practical implications

Our results might be insightful for anyone who is interested in the formation of entrepreneurial intentions among students. For example, students who are considering to start a business by reflecting upon their scores for the big five traits. As students become more familiar with their score of the significant personality factors Conscientiousness and Openness to experience, they might be able to assess more clearly whether they would actually enjoy engagement in entrepreneurship. Moreover, students or future job candidates could become more aware of their personality through extensive research on psychological models like the big five model. Barrick & Mount (1991) conducted a research on the relation of the big five model and job performance. The most significant finding of their study related to the factor Conscientiousness, which was found to be a valid consistent predictor of all five occupational groups studied (professionals, Police, managers, sales, and skilled/semi-skilled). Furthermore, could banks or other lending institutions be interested in incorporating the process of formation of entrepreneurial intentions in their decision-making process (to estimate the risk of defaults on loans and their matching

interest rate charged) for those loans being granted. For example, in relation to loan applications associated with University spinoffs.

### 5.3. Limitations and directions for future research

As mentioned in the literature review there is an ongoing debate in the academic scene, in fields such as psychology and economics, on whether to drop one or more variables in personality models. However, deviating from the five-factor model to a four-factor model or even possibly a three-factor model could possibly have threatened the scientific validity of our model and is thus beyond the scope of our research. Nonetheless, the consistent insignificant results, not only in this study but also in Brandstätter's quantitative meta-review for Agreeableness does suggest the potential need for revision of the particular personality model, which ought to be applied, either through omission or substitution of the factor Agreeableness in the big five-factor model. Moreover, some psychologists critique the big five model for the absence of a risk factor (Pauvonen & Jackson, 2000) (Pauvonen, Haddock & Fosterling, 2003). Zhao et al (2009) included "risk propensity" as a separate dimension of personality, which did yield a significant relationship with the formation of entrepreneurial intentions, however an insignificant relationship with entrepreneurial performance. Hence, in accordance with the limited scope of our research, a direction for future research could be the substitution of the factor Agreeableness for a risk factor. However, dropping or replacing the factor Agreeableness is debatable, an argument against its omission or replacement is the low VIF inherent to agreeableness (1.045).

The present paper has shown that the use of a 21-item inventory for the Big Five as compared to the 44-item inventory by John and Srivastava (1999) produces insignificant results except for the factors Openness to experience and conscientiousness. In collection data, time is arguably the most valuable resource. As a questionnaire takes more time to fill in, the costlier it becomes for both the survey conductor and the sample subjects. Our research has shed more light on the potential utility of the application of shortened inventories. The present paper may be useful for further research concerning the efficiency or validity of a shortened inventory. However, we advise the use of a larger sample size as our small sample size is speculated to be the main cause of our insignificant result, as the factor Neuroticism was on the border of significance.

For the sake of simplicity, accounting for any potential sampling bias goes beyond the scope of our research as well. However, the sampling bias is worth mentioning. Bias in our sample can come from the manner in which it was taken from the corresponding population, or it might come from the way information is obtained (Porinchak, 2015). Due to the fact that either money or credits were offered, our sample might be biased toward students in need of either money or credits. This could suggest a selection bias or a selection effect being present, as the money or credits offered to undermine the randomization of the sample taken. When the selection bias would indeed be significant in our sample, this could imply that our results obtained from the sample are not representative of the population, students from Erasmus University. As already mentioned in the sample description, regarding the non-response bias (or the participation bias) the survey was emailed to 182 students out of which 150 responded. So, as mentioned in the sample description a response rate of 82% does limit the leeway for a substantial participation bias to occur. "The extensive use of email surveys coupled with the low response rates typically encountered has made the issue of mail survey response rate improvement an intriguing topic. High response rates have the obvious benefits of increased sample size, reduced costs associated with follow-up contacts, and reduced concern over nonresponse bias" (Fox, Crask & Kim, 1988). Baruch (1999) reported an average



response rate of 57.6% in academic surveys among students. Consequently, in our study, we have a relatively high response rate, but thereby disregarding participation bias completely would not be scientifically valid.

Furthermore, in this paper, the dependent variable is solely accounted for by these six questions, as the other are different measures which have to do with entrepreneurial intentions such as Personal Attitude, Subjective Norm and Perceived Behavioral control. Therefore, this paper limits itself to the particular six questions part of Entrepreneurial Intentions, thus limiting the scope of construction with respect to our dependent variable. Future studies most likely could get a more accurate measurement of entrepreneurial intentions by including the questions that make up entrepreneurial intentions based on a wider spectrum, thus incorporating Personal Attitude, Subjective Norm and Perceived Behavioral control (Linan & Chen, 2009).

Concerning the theoretical contribution, the possible explanatory value of models based on intentions which attempt to describe entrepreneurial behavior, the most significant contribution of the present study is the attempt of implementing a shorter inventory to form the five factors of personality, the big five factor model, to observe in which manner personality and entrepreneurial intentions relate to one another. The success of the shorter inventory is debatable as our findings merely partially correspond with Brandstätter's results. The question is whether or not and if so, to what extent the shorter inventory is responsible for the difference between our results and Brandstätter's. In our view, as mentioned above, the small sample size is likely to be the main contributor to the difference in results rather than a shorter inventory. However, it is not that simple. In practice, different factors affect the representativeness of our sample in different unpredictable ways, and hence both the sample size and a shorter inventory could simultaneously affect the significance level of our regression. Furthermore, Brandstätter's results could deviate from our study results due to the specific nature of the sample (students from Erasmus University Rotterdam). In other words, the difference between study groups (samples) is likely to be a third contributor of which its effect is unknown (an unknown magnitude and direction on the dependent variable) on the differences between study results (in our case the relationship between our independent variables and our dependent variable). Therefore, regarding future research, we recommend either test the application of a different inventory or analyze a specific population (in our case students). As it is evident that in order to conduct a successful analysis, a balanced research design must take precedence over multiple unknown independent factors, as mathematics cannot be fooled.

## 6. References

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## 7. Appendix A

Translations are in parentheses, whether items are reversed is not mentioned in the translation. The translated items are obtained from John & Srivastava (1999), see references. The translated statements used to measure the big five personality factors: Geef aan in hoeverre de volgende stellingen op u van toepassing zijn. 'Ik ben iemand die...' (Do you agree that you are someone who...)

### Extraversion:

- Hartelijk / een gezelschapsmens is. (Is outgoing, sociable)
- Veel enthousiasme opwekt. (Generates a lot of enthusiasm)
- Doorgaans stil is. (Reversed) (Tends to be quiet)
- Terughoudend is. (Reversed) (Is reserved)

### Agreeableness:

- Mensen over het algemeen vertrouwt. (Is generally trusting)
- Geneigd is kritiek te hebben op anderen. (Reversed) (Tends to find fault with others)
- Koud en afstandelijk kan zijn. (Reversed) (Can be cold and aloof)
- Soms grof tegen anderen is. (Reversed) (Is sometimes rude to others)

### Conscientiousness:

- Dingen efficiënt doet. (Does things efficiently)
- Grondig te werk gaat. (Does a thorough job)
- Plannen maakt en deze doorzet. (Perseveres until the task is finished)
- Geneigd is lui te zijn. (Reversed) (Tends to be lazy)

### Neuroticism:

- Gemakkelijk zenuwachtig wordt. (Gets nervous easily)
- Zich veel zorgen maakt. (Worries a lot)
- Somber is. (Is depressed, blue)
- Ontspannen is, goed met stress kan omgaan. (Reverse) (Is relaxed, handles stress well)

Intellect/Openness to experience:

Waarde hecht aan kunstzinnige ervaringen. (Values artistic, aesthetic experiences)

Benieuwd is naar veel verschillende dingen. (Is curious about many different things)

Een levendige fantasie heeft. (Has an active imagination)

Scherpzinnig / een denker is. (Is ingenious, a deep thinker)

Weinig interesse voor kunst heeft. (Reversed) (Has few artistic interests)

Translations are in parentheses by myself. The translated statements used to measure entrepreneurial intentions:

Geef aan in hoeverre je het eens bent met de volgende stellingen. (Indicate to what degree you agree with the following statements).

(1=Erg mee oneens 7=Erg mee eens) (1= strongly disagree 7= strongly agree)

Ik ben bereid er alles aan te doen om ondernemer te zijn. (I am willing to do everything to become an entrepreneur)

Mijn professionele doel is om ondernemer te worden. (My professional goal is to become an entrepreneur)

Ik zal er veel moeite voor doen om mijn eigen bedrijf te starten en te leiden. (I will make every possible effort to start up and run my own business)

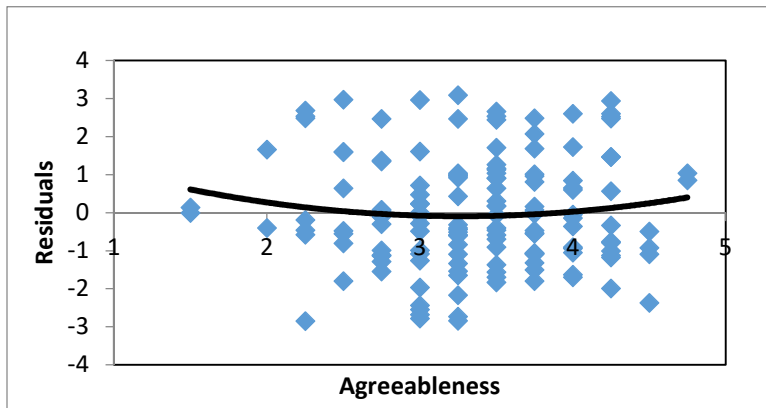
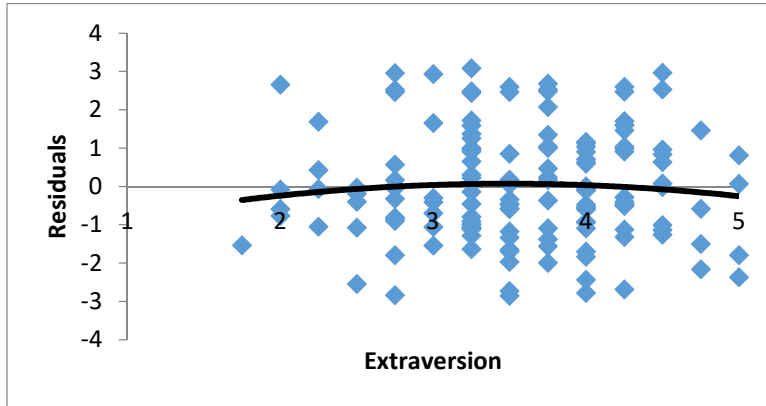
Ik ben vastbesloten in de toekomst een bedrijf te starten. (I'm determined to start a business in the future)

Ik heb serieus nagedacht over het starten van een bedrijf. (I have seriously thought about starting a business)

Ik wil later graag een bedrijf starten. (I want to start a business later)

## 7.2 Appendix B

Residual plots of the independent variables with a second order polynomial trend line:





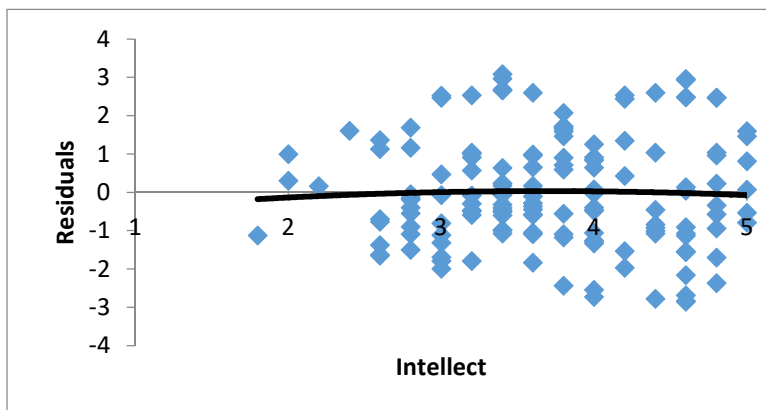
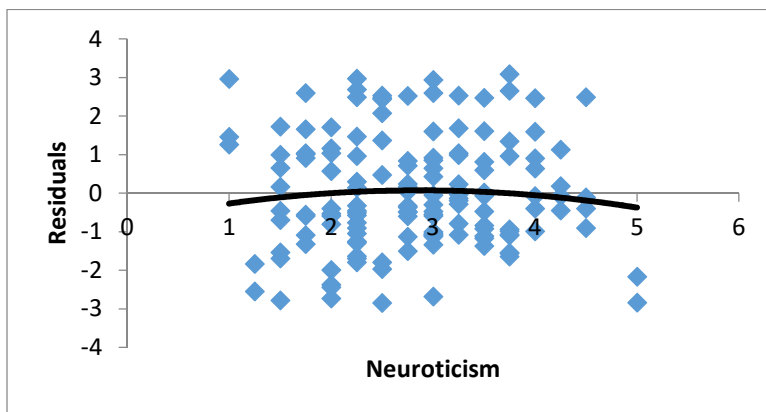
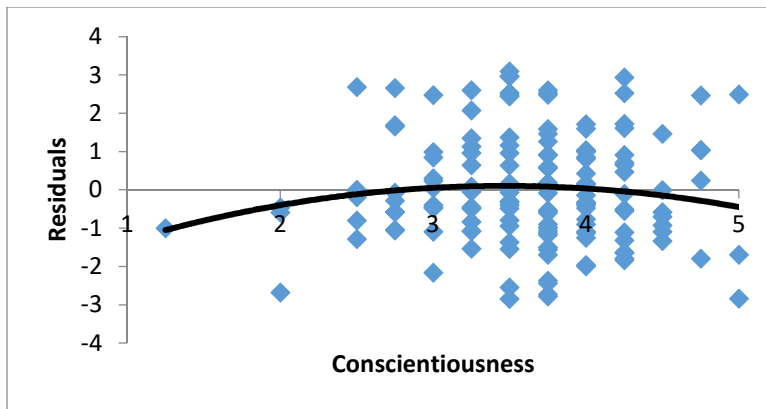


Table 3.0. Variance Inflation Factors for all independent variables

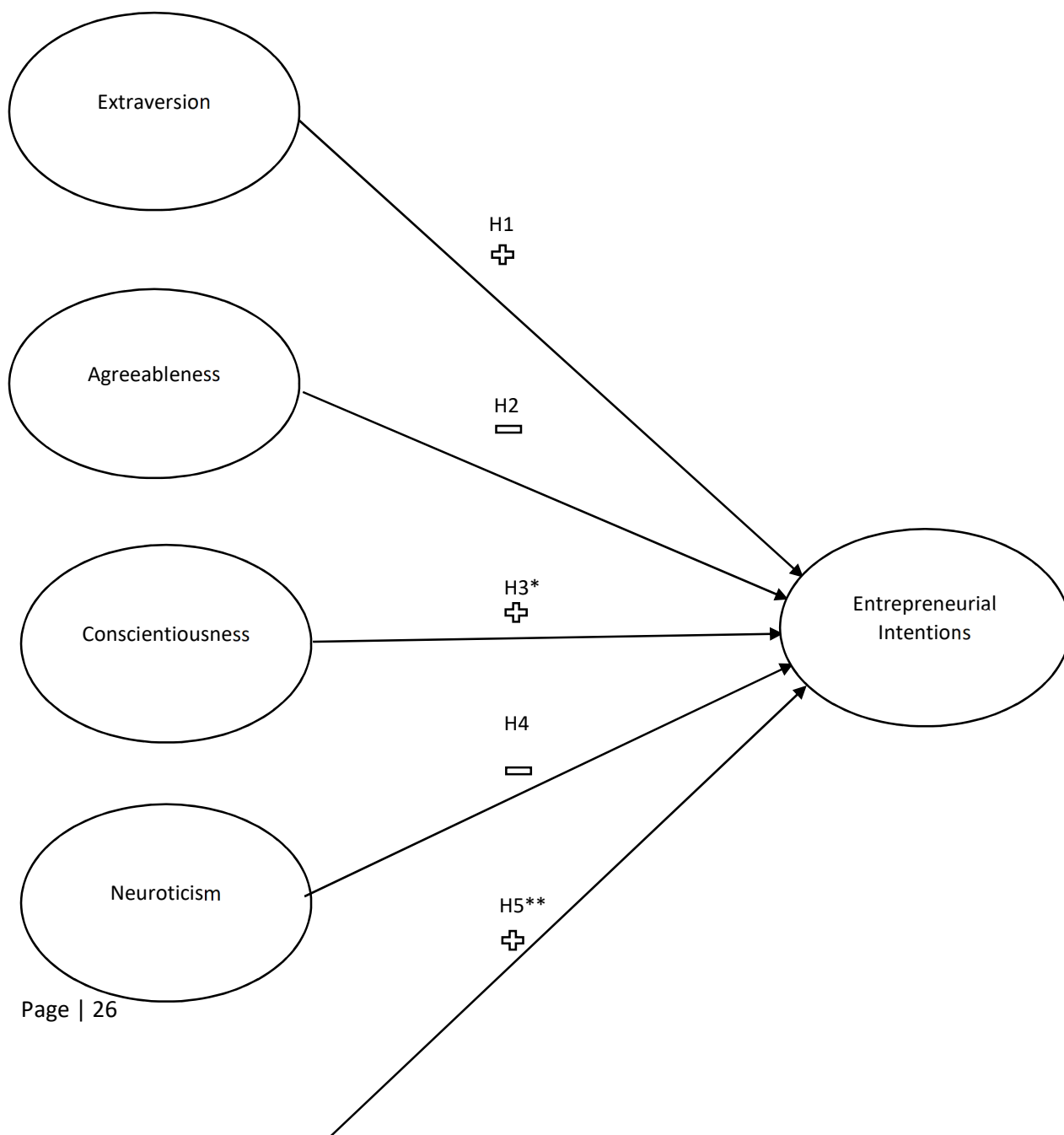
Independent variables	Variance Inflation Factor
Extraversion	1,112269
Agreeableness	1,056722
Conscientiousness	1,045296
Neuroticism	1,208488
Openness to experience	1,102197
Age	1,036275

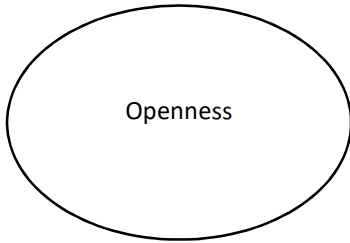
Gender	1,279506
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Note: The Variance Inflation Factors are calculated in excel by the formula:  $1/(1-R^2)$

### 7.3 Appendix C

Figure 1. **Conceptual research model (a many to one relationship)**





Coefficients are statistically insignificant unless indicated as follows: \*\*  $p < .01$ ; \*  $p < .05$ .