

# Examining Entrepreneurial Potential

Pavlin Bonev<sup>1</sup>, Henrik Egbert<sup>2</sup> & Thomas Neumann<sup>2,3</sup>

<sup>1</sup> Department of Statistics and Econometrics, Faculty of Economics and Business Administration, Sofia, Sofia University “St. Kliment Ohridski”, Bulgaria

<sup>2</sup> Department of Economics, Anhalt University of Applied Sciences, Bernburg, Germany

<sup>3</sup> Faculty of Economics and Management, Empirical Economics, Otto-von-Guericke University Magdeburg, Magdeburg, Germany

Correspondence: Thomas Neumann, Faculty of Economics and Management, Empirical Economics, Otto-von-Guericke University Magdeburg, Postbox 4120, 39016 Magdeburg, Germany. Tel: 0049-391-671-1204. E-mail: mail@thomasneumann.net

Received: June 21, 2016

Accepted: September 1, 2016

Online Published: September 20, 2016

doi:10.5539/ijbm.v11n10p16

URL: <http://dx.doi.org/10.5539/ijbm.v11n10p16>

## Abstract

Employing public resources for promoting entrepreneurship demands careful selection of candidates who are most promising to set up a successful entrepreneurial career. This study addresses the relation between an individuals' entrepreneurial potential, identified through personality traits, and aspects of human and social capital, based on prior entrepreneurial exposure. A psychometric test, called F-DUP<sup>N</sup>, measures the strengths of personality traits considered relevant for successful entrepreneurial activity. To test our hypotheses, we collected data of 166 individuals. All of them are university students or graduates and have indicated a specific interest in entrepreneurial activity. A major result is that participants experienced in self-employment, with self-employed parents and with self-employed friends show a higher entrepreneurial potential than participants who do not have these experiences or relations. Furthermore, we find in line with other studies that differences in entrepreneurial potential become less pronounced with increasing age. An interpretation is that personality traits significant for entrepreneurial activity are not stable over time and can also be acquired at a later stage in life.

**Keywords:** entrepreneurship, entrepreneurial potential, personality traits, prior entrepreneurial exposure, personality traits, psychometric test

**JEL Classification:** L26, M13, D08

## 1. Introduction

For decades the importance of entrepreneurs as a driving force of economic growth and development has been emphasized (Knight, 1921; Schumpeter, 1934; Kilby, 1971; Kirzner, 1973). A society that allows its entrepreneurs to flourish (Baumol, 1990) benefits from their activities, by realizing more consumption opportunities, jobs and tax revenues. Thus entrepreneurial activities are to be considered the cause for providing positive externalities to a society.

Whether the state or other public organizations should play a role in promoting entrepreneurship has been addressed differently by societies. In continental Europe the role of the state for promoting economic growth, and consequently social development (Gerschenkron, 1962), has a long tradition. Such support results in initializing a societies' “take-off” (Rostow, 1960) or “spurt”, as Gerschenkron (1962) has put it. State support for specific industries—in the sense of a supply side oriented policy—needs justification since resources are scarce. For instance, if public investment is made in favor of promoting entrepreneurship, the same investment cannot be made for other societal needs, such as public education or health. Given such opportunity cost, and also for normative reasons related to distributional fairness and justice, it is necessary for a society to implement mechanisms that allow for effective public investments to promote entrepreneurship.

We focus on this problem and argue that if public support aims to foster specific groups, in our case individuals who have an interest in starting an entrepreneurial career; Their *individual entrepreneurial potential* to become a successful entrepreneur should be measured. The argument for validating an individual's entrepreneurial potential is that it is ‘better’-in an economic sense-to support those individuals who have a comparatively higher

potential and not to support those with a comparatively lower potential. This does neither mean that those identified with a high potential will indeed become more successful, nor that individuals with a lower potential will not be successful. But if, on average, individual entrepreneurial potential positively correlates with the probability of later success, then public subsidies should be allocated to those who show a higher potential rather than to those who lack such a potential.

Choosing this approach, which embeds psychological, sociological and business administration research on entrepreneurship in a larger economic context, means that projects which are publicly financed have the task to identify within a group of individuals those who do not only have an interest in entrepreneurship but also those who have the highest potential to become successful. While Walter and Walter (2009) find that the existing entrepreneurial research - especially in the domain of examining entrepreneurial potential and the relation between variables such as personality traits, entrepreneurial potential and prior entrepreneurial exposure - does not focus (enough) on including cross-disciplinary research. Our study contributes to enlightening this matter.

In psychology the identification of individual traits and characteristics for successful entrepreneurs has a long tradition (McClelland, 1961; Rauch & Frese, 2000; Baum & Locke, 2004). We rely on these insights and use a method developed by psychologists in order to measure entrepreneurial potential.

### *1.1 Psychometric Test*

The data used for the analyses in this paper does not stem from a research project but from an EU-financed project that has been designed to identify high potential individuals as potential members of a founding-team, with the ultimate goal to realize a business idea in form of founding a business. In order to identify individuals who are not only interested in entrepreneurial activity in contrast to those with the highest entrepreneurial potential we use a psychometric test, called F-DUP<sup>N</sup> (Müller, 2010a).

Our sample consists of data from technology-oriented, university-related individuals who are (or have been) enrolled in a university degree program. More particularly, our sample includes individuals who are enrolled in bachelor's, master's or Ph.D. degree programs and individuals who have at least earned one of these degrees. Participants may or may not have professional experience. Firstly, we contacted research associates and Ph.D. students from across German universities. Secondly, we contacted potential participants through various university networks. The sampling process was carefully structured in that individuals should be technology-oriented or business-oriented, it was yet random in the sense that the decision which person would be contacted was made randomly. We received data from a comparatively small number of persons who have been contacted. This was in line with the project's idea to identify during the sampling process itself those who were interested in participating actively in a business team and business foundation.

In order to identify those individuals with a particularly high entrepreneurial potential we employed the F-DUP<sup>N</sup> test (Müller, 2010a). The test measures traits that are directly related to the individual. Additionally, we placed in context the relation between personality traits and selected aspects of human and social capital, and different types of prior entrepreneurial exposure (Note 1). By doing so, we combine facets discussed in different lines of research on entrepreneurship.

Firstly, specific personality traits which are more often to be found with entrepreneurs rather than with non-entrepreneurs have been identified (e.g., Müller & Stilz, 2009). These traits can be measured to a certain degree by a number of methods, e.g. the Big-Five-Model (Costa & McCrae, 1992) or other psychometric tests (King, 1985). Insights gained from this research strand allow identifying individuals who show above average potential for (successful) entrepreneurial activities as regards personality traits. Information gathered from the above tests can be used to provide guidance on the strengths and weaknesses of those who intend to start an entrepreneurial career (King, 1985; Müller, 1999a, 1999b).

Secondly, the impact of human and social capital on entrepreneurial behavior and business success has been extensively discussed in the respective literature (e.g., Bosma et al., 2004). Results show that the combination of rather heterogeneous aspects, personality-based as well as originating in an individual's social and institutional embeddedness, contribute to her ability (e.g., Hartog et al., 2010), propensity (e.g., Langowitz & Minniti, 2007) and willingness to become an entrepreneur, to setup a business and to run this business for a certain period of time (Ireland & Webb, 2007).

### *1.2 Human and Social Capital*

Selected aspects of human and social capital are directly related to different types of prior entrepreneurial exposure. Zapkau et al. (2015, p. 650) summarize that "prior entrepreneurial exposure can occur through the observation of role models as well as through direct experience". Self-employment experience, work experience

in a small or newly founded firm or different learning experiences are examples of prior entrepreneurial exposure which influence a persons' human and social capital. Based on the assumption that starting a business is intentional (Krueger & Carsrud, 1993; Zapkau, 2015) previous studies focus on the impact of prior entrepreneurial exposure on entrepreneurial intentions (Krueger, 1993; Davidsson, 1995; Davidsson & Honig, 2003; Bosma et al., 2011; Zapkau et al., 2015). Due to the fact that "many business founders had little intention of starting a business a few years before" (Krueger, Reilly, & Carsrud, 2000, p. 419) we focus on the relation of prior entrepreneurial exposure on specific personality traits reflecting the entrepreneurial potential and follow the suggestion of Krueger and Brazeal (1994, p. 95) to "observe potential".

In our study we link the variables (1) self-employment experience (as prior entrepreneurial exposure that stems from direct experience), (2) self-employed parents, and (3) self-employed friends (both stem from observation) with the entrepreneurial potential a person have.

While the importance of specific personality traits for successful entrepreneurial activities seems to be widely accepted, there is no consensus in the literature on the question of the stability of personality traits. Roberts (2009, p. 137) describes the field of personality development as "polarized" with "two camps fit neatly into two extreme positions [...]. One group emphasized stability, the other change." Given these two positions, we favor the approach of personality traits development.

As a case in point, human capital can be acquired through effort. This is particularly the case if formal human capital is measured by years of schooling, respectively university degrees. Degrees can be considered as proxies for different levels of formal human capital acquisition (cf. Becker, 1993). Other forms of human capital based on individual experience are less explicit, hence more difficult to identify and to classify. Social capital may also have a positive effect on entrepreneurship, however in contrast to human capital, an individual's social capital in the form to network access does not only depend on individual effort but might be ascribed to a person by birth (Aldrich & Waldinger, 1990).

We divided our sample into sub-groups according to factors which might influence the entrepreneurial potential. While subjects in one sub-group showed a specific factor, the subjects in the second sub-group did not. Thus we used the second sub-group as the comparison group. Given the nature of the project an external control group, i.e. data on individuals who do not have the necessary qualifications for participation in the project is absent in our sample.

The aim of this paper is to investigate the relation between personality traits and aspects of social and human capital which either occurs from education or from different types of prior entrepreneurial exposure. More precisely, we test whether test scores on personality traits, reflecting the entrepreneurial potential of a person, show systematic differences between sub-groups of potential entrepreneurs. The variables we test are educational background (formal human capital), self-employment experience (specific human capital, which stems from prior entrepreneurial exposure), self-employed friends (social capital) and self-employed parents. The latter two aspects are referred to as entrepreneurial role model exposure but can also be interpreted within social capital theory or within the theory of observational learning.

We find that individuals with prior entrepreneurial exposure have higher test scores than individuals in comparison groups. The data also indicates that the older the respondents, the less salient the differences in test scores are. This hints that personality traits relevant for entrepreneurial activity are less stable over time and can also be acquired at a later life stage.

The structure of the paper is as follows. In Section 2 we address findings in the different strands of the literature and place them in context in order to formulate our hypotheses. Section 3 describes the screening process and the data set used for testing the hypotheses. Section 4 provides results and interpretations. The last section concludes.

## **2. A Brief Review of Selected Findings**

A considerable number of factors addressing manifold facets of the relation between an individual and her entrepreneurial potential, her business activities and success have been identified in the last decades. Broadly speaking, theories from Psychology, Business and Economics, as well as from Sociology have distinguished factors that affect one or more aspects of entrepreneurial activity. Recently Walter and Walter (2009) provided a valuable survey on the findings of 99 studies published in peer reviewed journals. We use the survey of Walter and Walter (2009) as a starting point in order to pinpoint those factors that have a positive impact on founding a business and consequently derive our hypotheses.

The psychological literature on entrepreneurship makes the assumption that individual characteristics pertinent

to entrepreneurial behavior can be identified through tests. The focus is placed on research, which singles out the strength of specific personality traits, i.e. an individual's predisposition towards entrepreneurship (Allport, 1937; McClelland, 1987; Mueller & Plug, 2006; McCrae et al., 1999; Roberts et al., 2006). Repeated research has confirmed the robustness of dispositive factors, i.e. personality traits (Walter & Walter, 2009).

The psychological literature on measuring personality traits in the context of entrepreneurship has developed different approaches (Müller & Gappisch, 2005, pp. 738-739; Caliendo et al., 2014). Empirical measurement of dispositive factors plays an important role. In empirical research two test types are regularly applied. One is based on the Big-Five-Model (Costa & McCrae, 1992; Zhao & Seibert, 2006; also Caliendo et al., 2014) and the second is based on the *Entrepreneurial Potential Questionnaire* developed by King (1985) who employed a construct of questions addressing behavior and attitude. The latter type of research has been further developed and adapted to the German context by Müller (1999a, 1999b, 2000, 2010a, 2010b). In our study we use results from the psychometric test developed by Müller (2010a) in order to differentiate between individuals who have above average scores with respect to personality traits and those who do not.

The concepts of human capital (Schultz, 1961; 1963; Becker, 1962; 1964) are applied to describe a person's entrepreneurial ability, her entrepreneurial options and also the success of her enterprise. We follow Becker (1993, p. 17) who considers education and training as "[...] the most important investments in human capital. [...] The earnings of more educated people are almost always well above average [...]". Education is typically assessed by years of schooling or the formal degree obtained. Training can be measured by an individual's experience and duration of activities.

For instance, in a seminal study Bates (1990) shows that companies of owners with a high educational background survive comparatively longer. General as well as specific human capital plays an important role when a business requires the use of high technology or large financial resources. Preisdörfer and Voss (1990, pp. 116-117) find that individuals with relatively higher human capital more often found a company in the manufacturing sector and that richer human capital also positively correlates with organizational survival and profitability (cf. also Cooper et al., 1994; Gimeno et al., 1997; Colombo & Grilli, 2005).

The positive impact of formal human capital on business founding and business success is validated in a considerable number of studies (Walter & Walter, 2009). The same positive influence is documented for another form of human capital, namely an individual's previous experience in business-related activities. Davidsson and Honig (2003) found a positive impact of previous start-up experience. Walter and Walter (2009) confirm in their survey the results reached in a number of other papers. In our study all individuals have a comparatively high level of formal human capital, they are however heterogeneous with respect to previous self-employed experience. Therefore, we focus on previous experience as a form of specific human capital.

Other psychologists follow a social cognitive perspective. This perspective leads to another strand of research. Rotter (1954) and Bandura (1971) emphasize the importance of learning for psychological functioning. An individual's observational learning can be a factor that affects her personality traits. The idea of observational learning can also be related to the sociological concept of roles (Linton, 1936; Parsons, 1951; Mead, 1934). It can be argued that if children are able to observe and learn from parents who play the role of entrepreneurs, children tend to adapt specific personality traits relevant for their own entrepreneurial activities in later years (cf. Chlostra et al., 2014). The importance of the opportunity to learn from parents or relatives who are entrepreneurs is prominent in this line of behaviorist approach to entrepreneurship. In line with the majority of the literature addressing this field (Walter & Walter, 2009), we expect that the possibility to learn from parents influences positively relevant personality traits. Therefore, we distinguish those individuals whose parents have been self-employed from those individuals whose parents have not been self-employed.

Furthermore, entrepreneurial family background can also be tackled from sociological perspective, i.e. the perspective of being a member of a group. The significance of being a group member (or non-member) is emphasized in the theoretical context of social capital (Note 2), articulated for entrepreneurship by Granovetter (1985) as 'social embeddedness' and by Aldrich and Zimmer (1986) as the 'network approach to entrepreneurship'. A person's access to social capital, understood as the network links to others network members, is influenced by two variables. On the one hand, she has access to social capital because she is a member of a group by birth or ascribed status. Examples are ethnic groups, families (aristocracy), or distinctive religious groups. On the other hand, she may build up private networks including friends, fellow students, acquaintances, etc. (Glaeser et al., 2002). Such social contacts, concentrated in networks, can be activated to provide resources, such as information and capital for a business setup as well as in other cases (Granovetter, 1973).

The impact of social capital or networks on entrepreneurship and business success is less clear than that of human capital. In this line of research both positive and negative effects of social networks have been identified. Ethnicity and membership in distinctive religious groups can have positive as well as negative influence on business activities (Egbert, 1998). The same applies to the influence of the entrepreneur's family on business success (Nafziger, 1969; Egbert, 2009). Walter and Walter (2009) also reach inconclusive results and show that only a comparatively small number of studies really test the impact of social capital or social networks on business founding and performance. One reason can be that these concepts have become catch-all terms (Portes, 1998, p. 2) and difficult to apply in quantitative studies. Another reason can be that the concept of social capital is best to be considered in context with other theories. With respect to this problem Brüderl and Preisendörfer (1998, p. 216) formulate the network compensation hypothesis. This hypothesis states that social networks are used by those entrepreneurs who have comparatively less human capital and limited access to financial capital, thus their social capital compensates for the lack of human capital. Results are diverse, though (Egbert, 2004, pp. 302-304).

Despite inconclusive results on the effect of social capital, we assume that an influence on entrepreneurial activity cannot be excluded. As social capital we conceptualize individual networks, in our context networks of friends. In our analysis we distinguish between individuals with friends who are self-employed and those without such friends. We test whether a relation between having self-employed friends and personality traits exist. However, the causality is far from being clear because those who have similar personality traits form networks but it may also be the case that networks include only those who have specific personality traits.

Lee and Tsang's paper (2001) is closest to our research and also addresses this gap. For two personality traits (internal locus of control and need for achievement) Lee and Tsang identify a positive impact on networking activities among 168 Chinese entrepreneurs.

We argue that if human capital, social capital and observational learning are relevant factors that influence an individual's ability to set up and run successfully (Note 3) an enterprise, then this influencing relation may also to be found out by conducting a psychometric test which measures an individual's entrepreneurial potential by identifying personality traits pertinent to entrepreneurs. The psychometric test we use is the F-DUP<sup>N</sup> (Müller, 2010a). With respect to different groups in our sample we test for differences between psychometric test scores and university degrees as well as for differences between F-DUP<sup>N</sup> scores and the criteria: (1) self-employment experience, (2) self-employed parents, and (3) self-employed friends. In relation to these aspects four hypotheses are formulated.

Our first hypothesis relates to formal human capital and assumes that a positive correlation between an individual's entrepreneurial potential and an individual's university degrees exists.

*H1 states that: Participants with higher university degrees achieve higher scores in the F-DUP<sup>N</sup> test.*

The second hypothesis relates to human capital theory, particularly to an individual's self-employment experience and an individual's entrepreneurial potential measured by the F-DUP<sup>N</sup> test.

*H2 states that: Participants with self-employment experience achieve higher scores in the F-DUP<sup>N</sup> test.*

The third hypothesis relates to observational learning approaches to entrepreneurship and assumes that a positive correlation between entrepreneurial potential and having self-employed parents exists.

*H3 states that: Participants with self-employed parents achieve higher scores in the F-DUP<sup>N</sup> test.*

The fourth hypothesis relates to social capital theory and assumes that a positive correlation between an individual's entrepreneurial potential and having self-employed friends exists.

*H4 states that: Participants with self-employed friends achieve higher scores in the F-DUP<sup>N</sup> test.*

A description of the data set follows next.

### **3. The Data Set and Description of the Screening Process**

#### *3.1 Sample Description*

In accordance with the aim of the project we initiated a multi-level screening process. During this process different types of data related to the individual respondent were collected. In order to identify eligible participants, we first contacted Ph.D. students and research associates (Group 1) enrolled in various technology-oriented fields of studies across German universities directly via email. We consider this group to be of comparatively high educational background and possessing an affinity towards technology.

We extend our sample by collecting data from a group of individuals who are either enrolled in a university

degree program or have already obtained a university degree (Group 2) but who are neither Ph.D. students nor research associates. These individuals were contacted also by email or by using various university networks. Collecting data from individuals enrolled in various university degree programs (Group 1 and Group 2) allows us to control for the influence of the educational background.

In the emails and on the project webpage, the potential participants received information about the project and about the option of becoming part of a founding team to set up a technology-oriented business. To do so, recipients were offered to participate in a three-stage screening process. In the first stage, participants were asked to fill in an online questionnaire. The questions were related to an individual's social and educational background, self-employment experience and entrepreneurial intent. In the second stage, an online-based psychometric test was used to collect data on personality traits. As mentioned above, the test we used is the F-DUP<sup>N</sup> (Müller, 2010a). In the third stage of the screening process, short-listed respondents were offered to participate in a workshop. The workshop consisted of three elements: a role play, an interview, and a presentation task (Note 4).

Table 1. Sample description

<b>Complete sample</b>		
Sample size:		$n=166$
Female (male):		$n=79$ ( $n=87$ )
Average age in years:		29.70
Median age in years		28
Minimum age in years		20
Maximum age in years		59
Participants with migration background:		$n=24$
<b>Group 1 – Ph.D. student and research associates</b>		
Group size:		$n_1=63$
Female (male):		$n=23$ ( $n=40$ )
Average age in years:		31.63
Median age in years		31
Minimum age in years		25
Maximum age in years		50
Participants with migration background:		$n=13$
<b>Group 2 – participants enrolled at least in a bachelor's program</b>		
Group size:		$n_2=101$
Female (male):		$n=55$ ( $n=46$ )
Average age in years:		28.40
Median age in years		27
Minimum age in years		20
Maximum age in years		59
Participants with migration background:		$n=11$

In total, we collected data from  $n=238$  participants on the first level (by May 2014). Due to particular reasons (Note 5) on the second level we received data from  $n=166$  participants. Of these 166,  $n_1=63$  are in the group of Ph.D. students and research associates (Group 1) and  $n_2=101$  are participants who are enrolled at least in a bachelor's degree program (Group 2). That is, this group consists of participants who are either enrolled in a bachelor's program and/or hold a bachelor's degree and/or are enrolled in a master's program and/or hold a master's degree. The remaining  $n_3=2$  participants hold a secondary education degree only (A-Level). Table 1 provides details of the sample.

### 3.2 Screening Process

At the first stage of the screening process participants were asked, among other things, to self-report their educational background and their prior entrepreneurial exposure. The questions refer to self-employment experience and also to the experience in their immediate social surrounding, referred to as entrepreneurial role model exposure. The criteria used here are (1) their own self-employment experience, (2) self-employed parents, (3) self-employed friends and (4) lacking any self-employment experience. For each criterion we divide our sample into two sub-groups. Participants in group "Yes" show the specific criterion and participants in group "No" do not. In order to test our hypotheses, we compare the participants' entrepreneurial potential (measured by

the F-DUP<sup>N</sup> test) for significant differences between the “Yes” and “No” groups. Table 2 shows the number of participants in the “Yes” and “No” groups (Note 6).

Table 2. Self-employment experience

Criteria	Group “Yes”	Group “No”
(1) self-employment experience	<i>n</i> =42 (25.30%)	<i>n</i> =124 (74.70%)
(2) self-employed parents	<i>n</i> =60 (36.15%)	<i>n</i> =106 (63.85%)
(3) self-employed friends	<i>n</i> =127 (76.51%)	<i>n</i> =39 (23.49%)
(4) lacking any self-employment experience	<i>n</i> =28 (16.87%)	<i>n</i> =138 (83.13%)

To relate the findings from the first stage of the screening process to the personality traits of the participants we had to measure dispositive factors.

For this purpose, we used the psychometric test F-DUP<sup>N</sup> (Müller, 2010a) in the second stage. The F-DUP<sup>N</sup> is based on the Entrepreneurial Potential Questionnaire (King, 1985) and measures ten dispositive factors using nine items each in a forced-choice format. (Note 7) For each item, two possible answers are presented and the participants had to select one of these. For each factor, a person can achieve nine points (one point per item), and a maximum of 90 points in total.

The ten factors are classified as:

- Three motivational factors (internal locus of control, need for achievement, need for autonomy),
- Two affective factors (stress resistance, intrinsic motivation),
- Three cognitive factors (problem-solving orientation, tolerance for ambiguity, risk-taking propensity),
- Two social factors (assertiveness, interpersonal reactivity). (Note 8)

Based on the total F-DUP<sup>N</sup> score obtained, which reflects the entrepreneurial potential, participants can be classified as: (L) 00 to 52 points: having only a low entrepreneurial potential, (M) 53 to 65 points: having a medium one, or (H) 66 to 90 points: having a high one. This classification is taken from Müller (2010a, p. 25).

#### 4. Results and Interpretation

The paper focuses on investigating the relation between personality traits and aspects of human capital, observational learning and social capital occurred through education and/ or prior entrepreneurial exposure. Next, we use our sample in order to test for such relations. We hypothesized that persons with higher educational background, with experience as self-employed, with self-employed parents, and with self-employed friends have higher scores in the F-DUP<sup>N</sup> test.

##### 4.1 The Influence of University Education

We first compare the achieved F-DUP<sup>N</sup> scores of participants grouped according to their educational background to demonstrate the influence of university degrees on entrepreneurial potential. Table 3 shows the average F-DUP<sup>N</sup> scores, reflecting the entrepreneurial potential of our participants, using the classification described in Section 3. Given the selection process and a minimum formal human capital requirement, the test scores are comparatively high.

Table 3. Classification of participants according to psychometric test scores (F-DUP<sup>N</sup>)

Classification	Σ obs.	Average F-DUP <sup>N</sup> score
(L) 00 to 52 points (low entrepreneurial potential)	<i>n</i> <sub>L</sub> =44	45.45
(M) 53 to 65 points (medium entrepreneurial potential)	<i>n</i> <sub>M</sub> =72	59.99
(H) 66 to 90 points (high entrepreneurial potential)	<i>n</i> <sub>H</sub> =50	70.00
Sample size: <i>n</i> =166, average score 59.15		

The average F-DUP<sup>N</sup> score of the *n*<sub>1</sub>= 63 participants in group (1) (Ph.D. student and research associates) is 61.27 and of the *n*<sub>2</sub>=101 participants in group (2) (participants enrolled at least in a bachelor’s program) is 57.86. Regarding the influence of university degrees on an individual’s entrepreneurial potential we hypothesized:

*H1: Participants with higher university degrees achieve higher scores in the F-DUP<sup>N</sup> test.*

A comparison using a Wilcoxon-Mann-Whitney-Test (WMW-Test) shows that the achieved F-DUP<sup>N</sup> scores of group (1) are statistically significantly different from those of group (2) (WMW-Test  $Z = -2.025$ ,  $p=0.043$ ). Therefore, we confirm our first hypothesis and conclude:

*Result 1: Participants with higher university degree have a higher entrepreneurial potential shown by a higher achieved F-DUP<sup>N</sup> score.*

#### 4.2 The Influence of Having Self-Employment Experiences

In order to test our hypotheses H2, H3, and H4 and thereby to better understand the influence of prior entrepreneurial exposure on the F-DUP<sup>N</sup> scores, we show these relations in accordance with the three criteria (1) participants with self-employment experience, (2) self-employed parents, and (3) self-employed friends. Additionally, we relate the F-DUP<sup>N</sup> scores to the age of the participants. This relation addresses the stability of the influence –if existing – over lifetime.

To test our hypotheses, we divide our sample into sub-groups. While participants in one sub-group (group “Yes”) show a specific factor (such as self-employment experience), the participants in the other sub-group (group “No”) do not. Thus one sub-group functions as a comparison group.

We first juxtapose the classified F-DUP<sup>N</sup> scores of participants with self-employment experience and those without it (Table 4) to test for the influence of different types of prior entrepreneurial exposure on the F-DUP<sup>N</sup> test scores.

Table 4. F-DUP<sup>N</sup> scores with respect to self-employment experience

		Self-employment experience					
		Yes			No		
		$\Sigma$ obs.	%	Average	$\Sigma$ obs.	%	Average
(L)	00 to 52 points	3	7.14	51.00	41	33.07	45.05
(M)	53 to 65 points	19	45.24	60.11	53	42.74	59.94
(H)	66 to 90 points	20	47.62	70.30	30	24.19	69.80
		42		64.31	124		57.40

42 participants in our sample have self-employment experience. While we observe only slight differences in the average F-DUP<sup>N</sup> scores of participants classified in groups M or H, we do observe a difference in the average F-DUP<sup>N</sup> scores in group L. We use ANOVA to analyze the data. Based on the results from the ANOVA we conclude that there are no statistically significant differences (Appendix 1: ANOVA – F-DUP<sup>N</sup> Scores with Respect to Self-employment Experience).

To demonstrate the relationship of F-DUP<sup>N</sup> score and age with respect to (1) self-employment experience, we present Figures 1 and 2. The figures show a histogram of the distribution of F-DUP<sup>N</sup> scores over age, Figure 1 for participants with self-employment experience and Figure 2 for those without such experience.



Figure 1. F-DUP<sup>N</sup> scores of individuals *with* self-employment experience



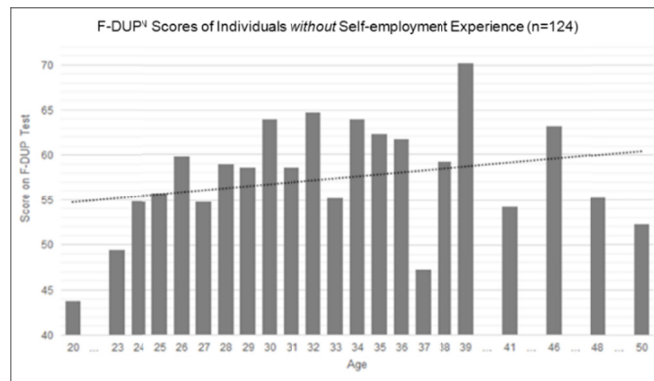


Figure 2. F-DUP<sup>N</sup> scores of individuals *without* self-employment experience

Figures 1 and 2 show that for both sub-groups the average F-DUP<sup>N</sup> score increases with participants' age (additionally illustrated by the trendlines). Irrespective of having self-employment experience or not, the older a person is, the higher her entrepreneurial potential is. Figure 3 shows only the trendlines of the F-DUP<sup>N</sup> score with respect to participants' age.

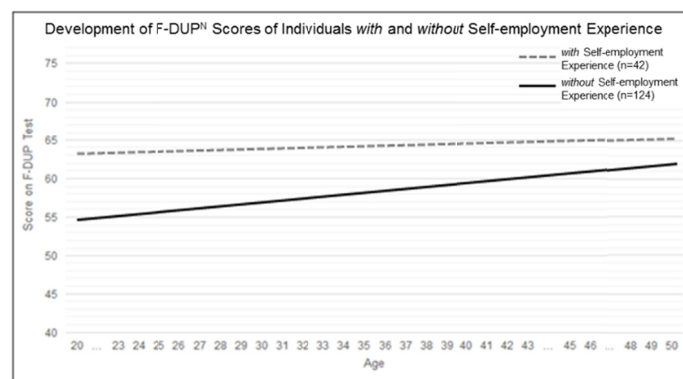


Figure 3. Development of F-DUP<sup>N</sup> Scores of Individuals *with* and *without* Self-employment Experience

Participants with self-employment experience achieve higher F-DUP<sup>N</sup> scores than participants without such experience. This holds true independently of the age of the participants. Regarding the influence of self-employment experience we hypothesized:

*H2: Participants with self-employment experience achieve higher scores in the F-DUP<sup>N</sup> test.*

We compare the achieved F-DUP<sup>N</sup> scores of the participants with self-employment experience with those without such an experience in order to test this hypothesis. We find that F-DUP<sup>N</sup> scores of participants with self-employment experience are significantly higher (WMW-test,  $Z = -3.762$ ,  $p = 0.000$ ). Therefore, we confirm our second hypothesis and conclude:

*Result 2: Participants with self-employment experience show a significantly higher entrepreneurial potential than participants without such experience.*

An additional observation is that, in terms of the development of personality traits, age positively influences participants' entrepreneurial potential. This influence is stronger for participants without self-employment experience.

#### 4.3 The Influence of Having Self-Employed Parents

Next we focus on the second criterion, i.e. self-employed parents. Table 5 shows the average F-DUP<sup>N</sup> scores of participants with self-employed parents and those without. It indicates that 60 out of 166 participants have self-employed parents. When comparing the average F-DUP<sup>N</sup> scores of the classified participants with respect to

the criteria “self-employed parents”, we observe only slight differences. Here we again use ANOVA to analyze the data. We find that the differences between the F-DUP<sup>N</sup> score of participants classified in group (L) and group (H) are not significant. However, the difference between the F-DUP<sup>N</sup> scores of participants classified in group (M) is statistically significant (Appendix 2: ANOVA-F-DUP<sup>N</sup> Scores with Respect to Self-employed Parents).

Table 5. F-DUP<sup>N</sup> scores with respect to self-employed parents

		Self-employed parents					
		Yes			No		
		$\Sigma$ obs.	%	Average	$\Sigma$ obs.	%	Average
(L)	00 to 52 points	16	26.67	46.56	28	26.41	44.82
(M)	53 to 65 points	23	38.33	61.35	49	46.23	59.35
(H)	66 to 90 points	21	35.00	69.81	29	27.36	70.14
		60		60.37	106		58.46

We present a histogram of the distribution of the F-DUP<sup>N</sup> scores over age for participants with self-employed parents, respectively for participants without self-employed parents, in Figures 4 and 5.

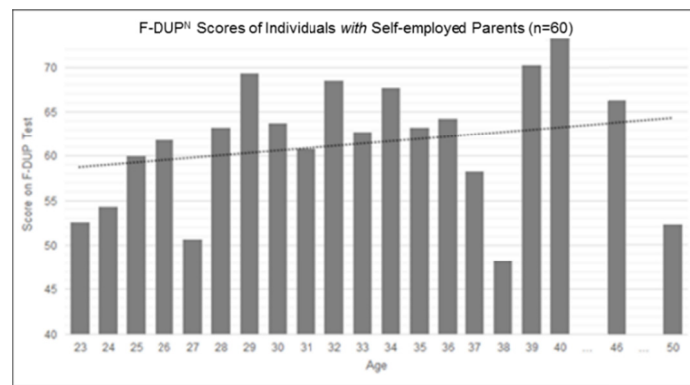


Figure 4. F-DUP<sup>N</sup> scores of individuals *with* self-employed parents

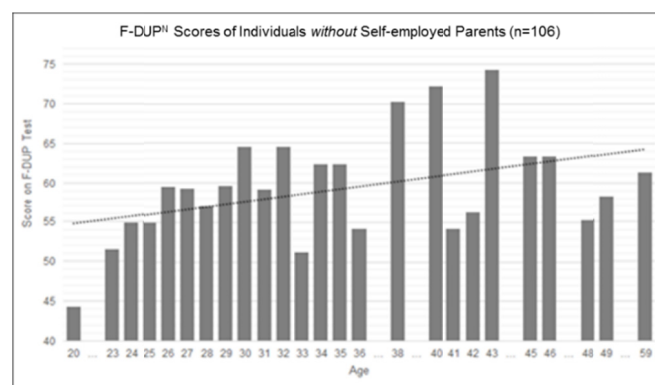


Figure 5. F-DUP<sup>N</sup> scores of individuals *without* self-employed parents

The achieved F-DUP<sup>N</sup> scores increase with higher age of the participants in both sub-groups. This is supportive of our interpretation that the older a person is, the higher her entrepreneurial potential is. Figure 6 presents only the trendlines.

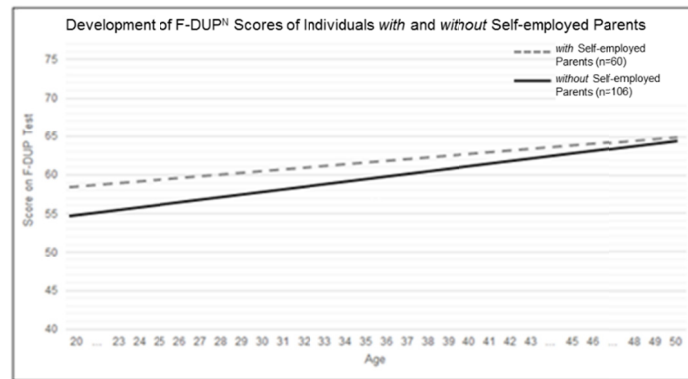


Figure 6. Development of F-DUP<sup>N</sup> scores of individuals *with* and *without* self-employed parents

Younger participants with self-employed parents achieve higher F-DUP<sup>N</sup> scores than those without self-employed parents. The differences between the F-DUP<sup>N</sup> scores of the two sub-groups become smaller with an increasing age. Regarding the influence on the entrepreneurial potential that self-employed parents might have, we hypothesized:

*H3: Participants with self-employed parents achieve higher scores in the F-DUP<sup>N</sup> test.*

We find that F-DUP<sup>N</sup> scores of participants with self-employed parents are significantly higher than the F-DUP<sup>N</sup> scores of those without (WMW-test,  $Z = -1.355$ ,  $p = 0.088$ ). Therefore, we confirm our third hypothesis. We conclude that observational learning from self-employed parents positively influences entrepreneurial potential.

*Result 3: Participants with self-employed parents show a significantly higher entrepreneurial potential than participants without self-employed parents*

Additionally, we observe that also with respect to the criterion self-employed parents, age positively influences the participants' entrepreneurial potential. This *lifetime effect* seems to be stronger than the influence of self-employed parents. Moreover, life experience seems to be able to compensate for the effects of observational learning from self-employed parents.

#### 4.4 The Influence of Having Self-employed Friends

Our next point analyzes an aspect of social capital, namely the criterion self-employed friends. The average F-DUP<sup>N</sup> scores of classified participants according to the criteria "self-employed friends" are shown in Table 6. As in the case of self-employed parents, we observe only slight differences in the average F-DUP<sup>N</sup> scores. Once again we use ANOVA to analyze the data and have to conclude that there are no statistically significant differences (Appendix 3: ANOVA-F-DUP<sup>N</sup> Scores with Respect to Self-employed Friends).

Table 6. F-DUP<sup>N</sup> scores with respect to self-employed friends

		Self-employed friends					
		Yes			No		
		$\sum$ obs.	%	Average	$\sum$ obs.	%	Average
(L)	00 to 52 points	26	20.47	46.58	18	46.15	43.83
(M)	53 to 65 points	56	44.09	60.34	16	41.03	58.75
(H)	66 to 90 points	45	35.43	69.96	5	12.82	70.60
		127		60.92	39		53.38

Here again, we first show a histogram of the distribution of the F-DUP<sup>N</sup> scores over age for participants with self-employed friends, respectively for participants without self-employed friends, in Figures 7 and 8.

In line with our findings regarding the criteria (1) self-employment experience and (2) self-employed parents, the average F-DUP<sup>N</sup> scores increase with the increasing age of the participants in both sub-groups. As mentioned above, this supports our interpretation that the older a participant is, the higher her entrepreneurial potential is. Figure 9 presents the trendline for both sub-groups, indicating the influence self-employed friends have on F-DUP<sup>N</sup> scores.

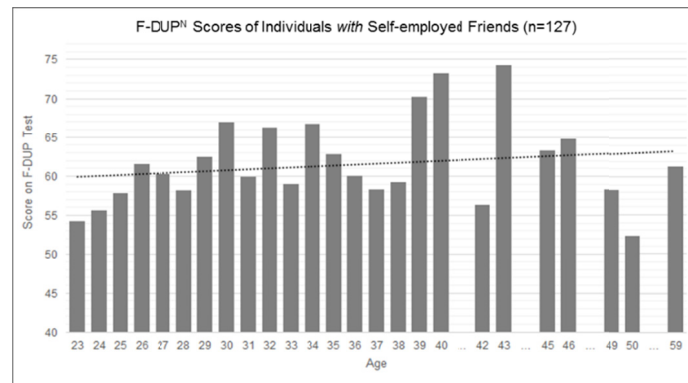


Figure 7. F-DUP<sup>N</sup> Scores of Individuals *with* self-employed friends

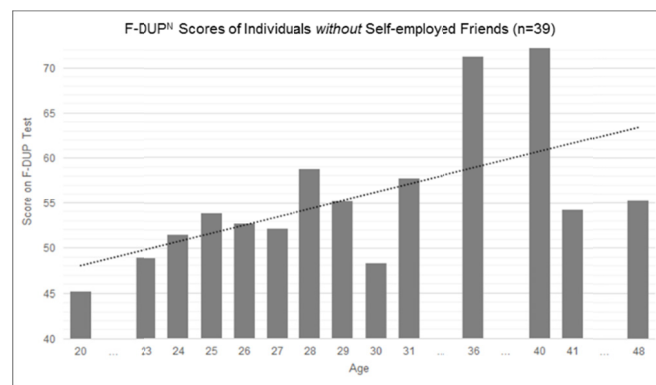


Figure 8. F-DUP<sup>N</sup> Scores of Individuals *without* self-employed friends

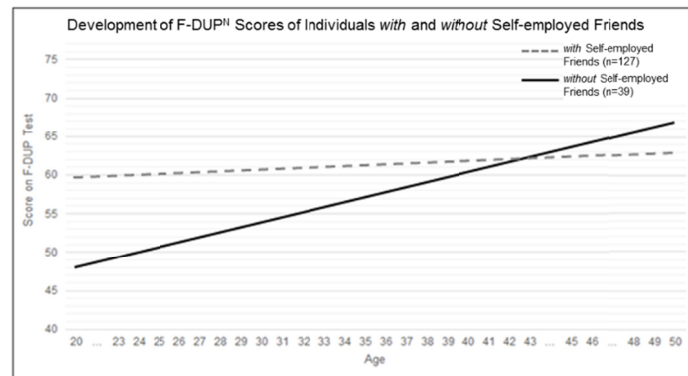


Figure 9. Development of F-DUP<sup>N</sup> scores of individuals *with* and *without* self-employed friends

It can be seen that younger participants with self-employed friends achieve higher F-DUP<sup>N</sup> scores than those without self-employed friends. This ratio becomes smaller with increasing age, which means that age tends to compensate for the effect self-employed friends have. Our corresponding hypothesis was:

*H4: Participants with self-employed friends achieve higher scores in the F-DUP<sup>N</sup> test.*

We find that the achieved F-DUP<sup>N</sup> scores of participants with self-employed friends are significantly higher than the F-DUP<sup>N</sup> scores of participants without self-employed friends (WMW-test,  $Z = -3.943$ ;  $p = 0.000$ ). Therefore, our fourth hypothesis is confirmed.

*Result 4: Participants with self-employed friends show a significantly higher entrepreneurial potential than*

*participants without self-employed friends.*

In line with our findings above, we observe that age positively influences participants' entrepreneurial potential.

#### 4.5 Regression Analysis

Next, we apply a regression analysis with the achieved F-DUP<sup>N</sup> scores as dependent variables (see Table 7) to evaluate the factors that influence an individual's entrepreneurial potential. As explanatory variables, we use (1) participants' age (Note 9), (2) sex (Note 10), (3) education (Note 11), (4) self-employment experience (Note 12), (5) self-employed parents (Note 13), and (6) self-employed friends. (Note 14).

Table 7. Prediction of F-DUP<sup>N</sup> scores using linear regression

Linear Regression – Dependent variable: F-DUP <sup>N</sup> scores		
Explanatory Variables	Coefficients	Significance
Age	0.15497	0.2246
Sex	-3.61606	0.0129
Education	0.51750	0.3013
Self-employment Experience	4.46219	0.0135
Self-employed Parents	0.00799	0.9958
Self-employed Friends	5.64853	0.0014
(Intercept)	48.87741	0.0001
Observations: n=166, R <sup>2</sup> = 0.2111 (adjusted R <sup>2</sup> = 0.1813)		

From the results of the regression we can infer that parts of a participant's entrepreneurial potential (reflected by the F-DUP<sup>N</sup> score) is statistically explained by self-employment experience as specific human capital and self-employed friends representing social capital. From the regression results we additionally conclude that sex has a statistically significant impact on the achieved F-DUP<sup>N</sup> scores, with men showing higher entrepreneurial potential. The other explanatory variables have a positive impact on the participants' entrepreneurial potential. None of the variables, however, is statistically significant.

The positive impact of formal human capital as well as specific human capital is in line with the findings of a considerable number of studies (Walter & Walter, 2009). With respect to prior self-employment experience, we provide evidence for a positive impact of this specific human capital.

Drawing on behavioral approaches on entrepreneurship which stress the importance of the possibility to learn from parents, we expected self-employed parents to have a positive impact. Our results show only a weak but insignificant impact. One possible interpretation is that the impact of self-employed parents only exists in younger age and will be compensated by lifetime experiences.

The literature on the effect of social capital on entrepreneurial potential provides diverse results. In particular, the impact of self-employed friends on an individual's entrepreneurial potential is discussed controversially in the literature. Our results show a positive impact of self-employed friends, meaning that participants who have self-employed friends show a higher entrepreneurial potential than those without.

## 5. Conclusion

The initial argument of the paper is economic in nature: in order to use public resources effectively it is reasonable to support individuals with a comparatively high entrepreneurial potential. Following this argument, we conclude that it is necessary to measure an individual's entrepreneurial potential in order to identify those individuals who should benefit from public funds. One instrument to examine entrepreneurial potential is psychometric tests which are used to measure personality traits considered to be important for an entrepreneurial potential.

While the literature on personality traits is to some extent polarized, with one group of researchers emphasizing the stability of personality traits and the other group emphasizing changes (Roberts, 2009), we follow the idea of personality traits development. More precisely, we assume that a relation between personality traits (important for successful entrepreneurs) and selected aspects of human and social capital exists. Consequently, we test whether entrepreneurial potential (measured by personality traits) shows systematic differences between sub-groups of potential entrepreneurs in accordance to different variables. These variables are university degrees (formal human capital), self-employment experience (specific human capital), self-employed friends (social capital) and self-employed parents (observational learning), the latter three are referred to as different types of

prior entrepreneurial exposure.

We hypothesize that individuals with higher university degrees and with prior entrepreneurial exposure show significantly higher scores in a psychometric test, when measuring an individual's entrepreneurial potential, than individuals without such experiences.

We report the results from 166 participants. All participants are university students and graduates from different fields of study. We use the F-DUP<sup>N</sup> test as a psychometric test to measure the entrepreneurial potential of the participants. All participants indicate a specific interest in entrepreneurial activity. We test whether F-DUP<sup>N</sup> scores for personality traits show systematic differences between sub-groups of potential entrepreneurs.

As a major result we found that all variables we tested have a positive impact on participants' entrepreneurial potential. With respect to the participants' age, we find for all tested groups that scores increased with age. These findings allow the following conclusions:

- (1) Formal human capital (measured by university degrees) and prior entrepreneurial exposure matters with respect to F-DUP<sup>N</sup> scores. These results can be related to theories on entrepreneurship.
- (2) Age matters with respect to F-DUP<sup>N</sup> scores. We can call this a *lifetime effect*. This implies that tested personality traits are not necessarily stable over a person's lifetime but change in a way which generates higher test scores, reflecting in this way higher entrepreneurial potential.
- (3) The data indicates that differences in F-DUP<sup>N</sup> scores with respect to prior entrepreneurial exposure become less salient as regards age. Particularly with respect to the criterion self-employed parents, i.e. the arguments of entrepreneurial role model exposure and of observational learning, life experience seems to compensate for the initially lower test scores of those who do not have an entrepreneurial family background.

From these results we can also derive implications for the practice of supporting business ventures with public resources. Firstly, we found that with moderate effort it is possible to select among a larger group of potential entrepreneurs those who show a higher potential. A consequence is that it is feasible to use psychometric tests for screening processes *ex ante* spending public funds for fostering entrepreneurship. This was demonstrated by using a specific test. Yet, other psychometric tests may be also used. Secondly, we found that a combination of different complementary selection tools (tests, questionnaires) for identifying entrepreneurial potential is applicable. Thirdly, besides identifying high potential, test results can also be used to identify an individual's strengths and weaknesses. Consequently, courses that focus on entrepreneurial education and training can address an individual's shortcomings more precisely thus enhancing the effectiveness of such measures. Fourthly, we demonstrated that an individual's entrepreneurial potential can be, to a certain degree, explained by her prior entrepreneurial exposure. Our results support the finding of Zapkau et al. (2015, p. 650), for instance. They conclude that "prior entrepreneurial exposure may serve as a signal to identify promising entrepreneurs". Consequently, the importance of gathering entrepreneurial exposure should be addressed at an early stage of entrepreneurial education, for instance by providing opportunities to young individuals to collect such experiences.

Finally, we address the limitations of our study. This paper is based on the concept and data of a project meant to form entrepreneurial teams for setting up businesses. Since all participants indicated a specific interest in entrepreneurial activities we have a bias in the direction *pro entrepreneurship* among our participants. This is clearly shown by on average high test scores. While this is in line with the project's concept to identify and support those individuals who have an interest in starting a business *plus* having the potential to run this business successfully an external control group is not taken account of. Certainly we cannot exclude the possibility that more efficient ways to identify high potentials exist. Our current approach can be improved by applying more sophisticated techniques when deciding who will and who will not be supported by public funds.

Furthermore, we were rather selective with the variables we tested. We decided for a small set of variables only and considered them as proxies for more general concepts, for instance own self-employment experience as a proxy for specific human capital. We do not deny the employability of other theories and related variables. However, the aspects we used are comparatively easy to identify and also to verify, in interviews for instance. Our approach thus suited well our purposes. Another limitation is that the link between a person's entrepreneurial potential (in our case reflected by the total F-DUP<sup>N</sup> score) and the (real) success or failure in running a business needs to be observed in a longitudinal study, including a repetition of the test. Our data is, in this respect, non-dynamic and we are aware of the criticism that the distinction cause and effect remains rather blurred. The insights gained in our study as well as its shortcomings render the questions to be addressed by future research.

## Acknowledgements

This paper is based on data from the project ‘Gründungstandem’. The project (2012-2014) was organized and managed by Anhalt University of Applied Sciences and financed by the European Social Fund and the Ministry of Sciences and Economic Affairs Saxony-Anhalt. The objective of the project (25-32327/12-04/ego.-Konzept.068) was to promote the formation of teams capable of setting up new technology-oriented businesses in Saxony-Anhalt, Germany. In order to prepare the team formation process, data about potential candidates was collected. This paper uses the data and documents selected results. For all results presented in the text the authors are solely responsible and not the funding organizations. We would like to thank Desislava Yordanova and participants of the FEBA conference 2014, Sofia University who helped us improve the paper considerably.

## References

- Aldrich, H., & Waldinger, R. (1990). Ethnicity and Entrepreneurship. *Annual Review of Sociology*, 16, 111-135. <http://dx.doi.org/10.1146/annurev.soc.16.1.111>
- Aldrich, H., & Zimmer, C. (1986). Entrepreneurship through Social Networks. In H. Aldrich (Ed.), *Population Perspectives on Organizations* (pp. 13-28). Uppsala: Acta Universitatis Upsaliensis.
- Allport, G. W. (1937). *Personality: A Psychological Interpretation*. New York: Holt, Rinehart, & Winston.
- Bandura, A. (1971). *Social-learning Theory*. New York: General Learning Press.
- Bates, T. (1990). Entrepreneur Human Capital Inputs and Small Business Longevity. *Review of Economics and Statistics*, 72(4), 551-559. <http://dx.doi.org/10.2307/2109594>
- Baum, J. R., & Locke, E. A. (2004). The Relationship of Entrepreneurial Traits, Skill, and Motivation to Subsequent Venture Growth. *Journal of Applied Psychology*, 89(4), 587-598. <http://dx.doi.org/10.1037/0021-9010.89.4.587>
- Baumol, W. J. (1990). Entrepreneurship: Productive, Unproductive, and Destructive. *Journal of Political Economy*, 98(5), 893-921. <http://dx.doi.org/10.1086/261712>
- Becker, G. S. (1962). Investment in Human Capital: A Theoretical Analysis. *Journal of Political Economy*, 70(5), 9-49. <http://dx.doi.org/10.1086/258724>
- Becker, G. S. (1993). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education* (3rd ed.). New York: National Bureau of Economic Research.
- Bosma, N., Van Praag, M., Thurik, R., & De Wit, G. (2004). The Value of Human and Social Capital Investments for the Business Performance of Startups. *Small Business Economics*, 23(3), 227-236. <http://dx.doi.org/10.1023/b:sbej.0000032032.21192.72>
- Brüderl, J., & Preisendörfer, P. (1998). Network Support and the Success of Newly Founded Businesses. *Small Business Economics*, 10(3), 213-225. <http://dx.doi.org/10.1023/a:1007997102930>
- Caliendo, M., Fossen, F., & Kritikos, A. (2014). Personality Characteristics and the Decision to Become and Stay Self-employed. *Small Business Economics*, 42(4), 787-814. <http://dx.doi.org/10.1007/s11187-013-9514-8>
- Chlostra, S., Patzelt, H., Klein, S. B., & Dormann, C. (2012). Parental Role Models and the Decision to Become Self-employed: The Moderating Effect of Personality. *Small Business Economics*, 38(1), 121-138. <http://dx.doi.org/10.1007/s11187-010-9270-y>
- Colombo, M. G., & Grilli, L. (2005). Founders' Human Capital and the Growth of New Technology-Based Firms: A Competence-Based View. *Research Policy*, 34(6), 795-816. <http://dx.doi.org/10.1016/j.respol.2005.03.010>
- Cooper, A. C., Gimeno-Gascon, F. J., & Woo, C. Y. (1994). Initial Human and Financial Capital as Predictors of New Venture Performance. *Journal of Business Venturing*, 9(5), 371-395. [http://dx.doi.org/10.1016/0883-9026\(94\)90013-2](http://dx.doi.org/10.1016/0883-9026(94)90013-2)
- Costa, P. T., & McCrae, R. R. (1992). Four Ways Five Factors are Basic. *Personality and Individual Differences*, 13(6), 653-665. [http://dx.doi.org/10.1016/0191-8869\(92\)90236-i](http://dx.doi.org/10.1016/0191-8869(92)90236-i)
- Davidsson, P. (1995). *Determinants of entrepreneurial intentions*. RENT IX Conference. Piacenza, Italy.
- Davidsson, P., & Honig, B. (2003). The Role of Social and Human Capital among Nascent Entrepreneurs. *Journal of Business Venturing*, 18(3), 301-331. [http://dx.doi.org/10.1016/s0883-9026\(02\)00097-6](http://dx.doi.org/10.1016/s0883-9026(02)00097-6)

- Egbert, H. (1998). Entrepreneurial Advantages and Disadvantages of Belonging. *GeoJournal*, 46(2), 129-134. <http://dx.doi.org/10.1023/a:1006953321747>
- Egbert, H. (2004). Networking and Entrepreneurial Success: A Case Study from Tanga, Tanzania. In K. Wohlmuth et al. (Eds.), *African Development Perspectives Yearbook* (Vol. 9, pp. 291-309). Münster: LIT (2004).
- Egbert, H. (2009). Business Success through Social Networks? A Comment on Social Networks and Business Success. *American Journal of Economics and Sociology*, 68(3), 665-677. <http://dx.doi.org/10.1111/j.1536-7150.2009.00643.x>
- Egbert, H., Neumann, T., & Rasmus, A. (2014). Matchingtools und Matchingprozesse im Kontext von Junior und Senior Entrepreneurs. *Munich Personal RePEc Archive*, MPRA 54829 (2014). Retrieved from <https://mpra.ub.uni-muenchen.de/id/eprint/54829>
- Gerschenkron, A. (1962). *Economic Backwardness in Historical Perspective. A Book of Essays*. Cambridge: Belknap Press.
- Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the Fittest? Entrepreneurial Human Capital and the Persistence of Underperforming Firms. *Administrative Science Quarterly*, 42(4), 750-783. <http://dx.doi.org/10.2307/2393656>
- Glaeser, E., Laibson, D., & Sacerdote, B. (2002). The Economic Approach to Social Capital. *The Economic Journal*, 112(483), 437-458. <http://dx.doi.org/10.1111/1468-0297.00078>
- Granovetter, M. (1973). The Strength of Weak Ties. *American Journal of Sociology*, 78(6), 1360-1380. <http://dx.doi.org/10.1086/225469>
- Granovetter, M. (1985). Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology*, 91(3), 481-510. <http://dx.doi.org/10.1086/228311>
- Hartog, J., Van Praag, M., & Van der Sluis, J. (2010). If You Are so Smart, Why Aren't You an Entrepreneur? Returns to Cognitive and Social Ability: Entrepreneurs versus Employees. *Journal of Economics and Management Strategy*, 19(4), 947-989. <http://dx.doi.org/10.1111/j.1530-9134.2010.00274.x>
- Ireland, R. D., & Webb, J. W. (2007). A Cross-disciplinary Exploration of Entrepreneurship Research. *Journal of Management*, 33(6), 891-927. <http://dx.doi.org/10.1177/0149206307307643>
- Kilby, P. (1971). Hunting the Heffalump. In P. Kilby (Ed.), *Entrepreneurship and Economic Development* (pp. 1-42). London: The Free Press.
- King, A. S. (1985). Self Analysis and Assessment of Entrepreneurial Potential. *Simulation & Games*, 16(4), 399-416. <http://dx.doi.org/10.1177/104687818501600402>
- Kirzner, I. M. (1973). *Competition and Entrepreneurship*. Chicago: University of Chicago Press.
- Knight, F. H. (1921). *Risk, Uncertainty, and Profit*. New York: Houghton Mifflin.
- Krueger, N. F. (1993). The impact of prior entrepreneurial exposure on perceptions of new venture feasibility and desirability. *Entrepreneurship: Theory & Practice*, 18(1), 5-21.
- Krueger, N. F., & Brazeal, D. V. (1994). Entrepreneurial Potential and Potential Entrepreneurs. *Entrepreneurship: Theory & Practice*, 18(3), 91-104.
- Krueger, N. F., & Carsrud, A. L. (1993). Entrepreneurial intentions: Applying the theory of planned behaviour. *Entrepreneurship & Regional Development*, 5(4), 315-330. <http://dx.doi.org/10.1080/08985629300000020>
- Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15(5/6), 411-432. [http://dx.doi.org/10.1016/S0883-9026\(98\)00033-0](http://dx.doi.org/10.1016/S0883-9026(98)00033-0)
- Langowitz, N., & Minniti, M. (2007). The Entrepreneurial Propensity of Women. *Entrepreneurship Theory and Practice*, 31(3), 341-364. <http://dx.doi.org/10.1111/j.1540-6520.2007.00177.x>
- Lee, D. Y., & Tsang, E. W. K. (2001). The Effects of Entrepreneurial Personality, Background and Network Activities on Venture Growth. *Journal of Management Studies*, 38(4), 583-602. <http://dx.doi.org/10.1111/1467-6486.00250>
- Linton, R. (1936). *The Study of Man*. New York: D. Appleton-Century.
- McClelland, D. C. (1961). *The Achieving Society*. Princeton: Van Nostrand.
- McClelland, D. C. (1987). Characteristics of Successful Entrepreneurs. *Journal of Creative Behavior*, 21(3), 219-233. <http://dx.doi.org/10.1002/j.2162-6057.1987.tb00479.x>



- McCrae, R. R., Costa, P. T., Pedrosa de Loma, M., Simões, A., Ostendorf, F., Angleitner, A., Marusić, I., Bratko, D., Caprara, G. V., Barbaranelli, C., Chae J. H., & Piedmont, R. L. (1999). Age Differences in Personality across the Adult Life Span: Parallels in Five Cultures. *Developmental Psychology*, 35(2), 466-477. <http://dx.doi.org/10.1037/0012-1649.35.2.466>
- Mead, G. H. (1934). *Mind, Self and Society*. Chicago: University of Chicago Press.
- Mueller, G., & Plug, E. J. S. (2006). Estimating the Effect of Personality on Male and Female Earnings. *Industrial and Labor Relations Review*, 60(1). <http://dx.doi.org/10.1177/001979390606000101>
- Müller, G. F. (1999a). Dispositionelle und familienbiografische Faktoren unselbständiger, teilselbständiger und vollselbständiger Erwerbsarbeit. In Rosenstiel, V. Lutz & T. Lang-von Wins (Eds.), *Existenzgründung und Unternehmertum* (pp. 157-180). Stuttgart: Schäffer-Poeschel.
- Müller, G. F. (1999b). Indikatoren unternehmerischen Verhaltens bei Psychologiestudierenden. *Report Psychologie*, 24(7), 462-473.
- Müller, G. F. (2000). Eigenschaftsmerkmale und unternehmerisches Handeln. In G. F. Müller (Ed.), *Existenzgründung und unternehmerisches Handeln: Forschung und Förderung* (pp. 105-121). Landau: Verlag Empirische Pädagogik.
- Müller, G. F. (2010a). *Fragebogen zur Diagnose unternehmerischer Potenziale* (F-DUP<sup>N</sup>). Universität Koblenz-Landau: Landau (2010).
- Müller, G. F. (2010b). Unternehmerische Eignung: Impuls- und Erfolgsfaktor für eine erfolgreiche berufliche Selbständigkeit. In Berufsverband Deutscher Psychologinnen & E. V. Psychologen (Eds.), *Psychologische Expertise für erfolgreiches Unternehmertum in Deutschland* (pp. 66-71). Berlin.
- Müller, G. F., & Gappisch, C. (2005). Personality Types of Entrepreneurs. *Psychological Reports*, 96, 737-746. <http://dx.doi.org/10.2466/pr0.96.3.737-746>
- Müller, G. F., & Stilz, K. (2009). Selbständigkeitsrelevante Eignungspotentiale im Vergleich: Unternehmer und Topmanager in den Branchen der, Old 'und, New Economy'. *Report Psychologie*, 34, 370-382.
- Nafziger, E. (1969). The Effect of the Nigerian Extended Family on Entrepreneurial Activity. *Economic Development and Cultural Change*, 18(1), 25-33. <http://dx.doi.org/10.1086/450400>
- Parsons, T. (1951). *The Social System*. London: Routledge & Kegan Paul.
- Portes, A. (1998). Social Capital: Its Origins and Applications in Modern Sociology. *Annual Review of Sociology*, 24, 1-24. <http://dx.doi.org/10.1146/annurev.soc.24.1.1>
- Preisendörfer, P., & Voss, T. (1990). Organizational Mortality of Small Firms: The Effects of Entrepreneurial Age and Human Capital. *Organization Studies*, 11(1), 107-129. <http://dx.doi.org/10.1177/017084069001100109>
- Putnam, R. D. (2000). *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon and Schuster.
- Rauch, A., & Frese, M. (2000). Psychological approaches to entrepreneurial success. A general model and an overview of findings. In C. L. Cooper & I. T. Robertson (Eds.), *International Review of Industrial and Organizational Psychology* (pp. 101-142). Chichester: Wiley.
- Roberts, B. W. (2009). Back to the Future: Personality and Assessment and Personality Development. *Journal of Research in Personality*, 43(2), 137-145. <http://dx.doi.org/10.1016/j.jrp.2008.12.015>
- Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of Mean-level Change in Personality Traits across the Life Course: A Meta-analysis of Longitudinal Studies. *Psychological Bulletin*, 132(1), 1-25. <http://dx.doi.org/10.1037/0033-2909.132.1.1>
- Rostow, W. W. (1960). *The Stages of Economic Growth*. Cambridge: Cambridge University Press.
- Rotter, J. B. (1954). *Social Learning and Clinical Psychology*. Englewood Cliffs: Prentice Hall.
- Schultz, T. W. (1961). Investment in Human Capital. *The American Economic Review*, 51(1), 1-17. Retrieved from <http://www.jstor.org/stable/1818907>
- Schultz, T. W. (1963). *The Economic Value of Education*. New York: John Wiley.
- Schumpeter, J. A. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle*. Cambridge: Harvard University Press.
- Strack, M., & Siegmund, I. (2010). Existenzgründungen aus der Arbeitslosigkeit: Erfolgsindikatoren aus einem

- Gründercenter. In Berufsverband Deutscher Psychologinnen & E. V. Psychologen (Eds.), *Psychologische Expertise für erfolgreiches Unternehmertum in Deutschland* (pp. 107-113).
- Walter, S. G., & Walter, A. (2009). Personenbezogene Determinanten von Unternehmensgründungen: Stand der Forschung und Perspektiven des Fortschritts. *Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung*, 61(2), 57-89. <http://dx.doi.org/10.1007/bf03371738>
- Watzka, K. (2006). JETT-M–Jenaer Entrepreneur Test & Training Modul: Ein Assessment-Center für Unternehmensgründer. Jenaer Beiträge zur Wirtschaftsforschung. No. 2006, 1. Jena: Fachhochschule Jena.
- Zapkau, F. B., Schwens, C., Steinmetz, H., & Kabst, R. (2015). Disentangling the effect of prior entrepreneurial exposure on entrepreneurial intention. *Journal of Business Research*, 68(3), 639-653. <http://dx.doi.org/10.1016/j.jbusres.2014.08.007>
- Zhao, H., & Seibert, S. E. (2006). The Big Five Personality Dimensions and Entrepreneurial Status: A Meta-analytical Review. *Journal of Applied Psychology*, 91(2), 259-271. <http://dx.doi.org/10.1037/0021-9010.91.2.259>

## Notes

Note 1. Prior entrepreneurial exposure covers all prior individual experiences in the domain of self-employment or entrepreneurship respectively (Krueger, 1993; Zapkau et al., 2015).

Note 2. We use the term ‘social capital’ as a heuristic for social networks in a broad sense (Putnam, 2000). Since most of our participants have been socialized within the same educational system and by similar institutions of a specific country, we do not account for the impact of habitus in this study.

Note 3. Note, that given by the design of the project “Gründungstandem” and of this study we do not control for real business success of the participants and therefore do not report any result with respect to success.

Note 4. In this paper we focus only on the results of the first and second levels, and we do not deal with the workshops in detail. For an explanation of the workshop and the questionnaires employed compare Egbert et al. (2014).

Note 5. One possible reason can be that participants did not meet the requirements needed to enter the next level, e.g. they were not willing to set up a business in Saxony-Anhalt.

Note 6. Since we want to test for relations of these criteria to dispositive factors, here we only report the results of the 166 participants, who took part in the second stage of our screening process.

Note 7. Strack and Siegmund (2010) and Watzka (2006) also use the F-DUP<sup>N</sup> to measure personality traits.

Note 8. The employed terms are translated from German.

Note 9. Participants’ age is given in years.

Note 10. Dummy variable: Equals 1 for female and 0 for male respondents.

Note 11. Education is coded as: 0-Secondary Education, 1-Bachelor’s degree, 2-Diploma (University of Applied Sciences), 3-Diploma (University), 4-Master’s degree, 5-Ph.D.

Note 12. Dummy variable: Equals 1 if participants have self-employment experience and 0 if participants do not have self-employment experience.

Note 13. Dummy variable: Equals 1 if participants have self-employed parents and 0 if participants do not have self-employed parents.

Note 14. Dummy variable: Equals 1 if participants have self-employed friends and 0 if participants do not have self-employed friends.

## Appendix 1. ANOVA - F-DUP<sup>N</sup> Scores with Respect to Self-employment Experience

A1.1 Single Factor ANOVA on F-DUP<sup>N</sup> scores of participants with and without self-employment experience, classified in group L (having a low entrepreneurial potential)

SUMMARY								
Groups			Count	Sum	Average	Variance		
Participants	with	Self-employment Experience	3	153	51.000	1.000		
Participants	without	Self-employment Experience	41	1847	45.049	25.748		
ANOVA								
Source of Variation			SS	df	MS	F	p-value	F <sub>crit</sub>
Between Groups			99.007	1	99.007	4.0297	0.0512	4.0727
Within Groups			1031.902	42	24.569			
Total			1130.909	43				

A1.2 Single Factor ANOVA on F-DUP<sup>N</sup> scores of participants with and without self-employment experience, classified in group M (having a medium entrepreneurial potential)

SUMMARY								
Groups			Count	Sum	Average	Variance		
Participants	with	Self-employment						
Experience			19	1142	60.105	13.433		
Participants	without	Self-employment						
Experience			53	3177	59.943	10.593		
ANOVA								
Source of Variation			SS	df	MS	F	p-value	F <sub>crit</sub>
Between Groups			0.366	1	0.366	0.0324	0.8578	3.9778
Within Groups			792.620	70	11.323			
Total			792.986	71				

A1.3 Single Factor ANOVA on F-DUP<sup>N</sup> scores of participants with and without self-employment experience, classified in group H (having a high entrepreneurial potential)

SUMMARY								
Groups			Count	Sum	Average	Variance		
Participants	with	Self-employment						
Experience			20	1406	70.300	9.905		
Participants	without	Self-employment						
Experience			30	2094	69.800	8.028		
ANOVA								
Source of Variation			SS	df	MS	F	p-value	F <sub>crit</sub>
Between Groups			3.000	1	3.000	0.3420	0.5614	4.0427
Within Groups			421.000	48	8.771			
Total			424.000	49				

## Appendix 2. ANOVA-F-DUP<sup>N</sup> Scores with Respect to Self-employed Parents

A2.1 Single Factor ANOVA on F-DUP<sup>N</sup> scores of participants with and without self-employed parents, classified in group L (having a low entrepreneurial potential).

<b>SUMMARY</b>				
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Participants <i>with</i> Self-employed Parents	16	745	46.563	16.263
Participants <i>without</i> Self-employed Parents	28	1255	44.821	31.708
<b>ANOVA</b>				

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p-value</i>	<i>F<sub>crit</sub></i>
Between Groups	30.864	1	30.864	1.1784	0.2839	4.0727
Within Groups	1100.045	42	26.192			
Total	1130.909	43				

A2.2 Single Factor ANOVA on F-DUP<sup>N</sup> scores of participants with and without self- employed parents, classified in group M (having a medium entrepreneurial potential).

<b>SUMMARY</b>						
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>		
Participants <i>with</i> Self- employed Parents	23	1411	61.348	10.601		
Participants <i>without</i> Self-employed Parents	49	2908	59.347	10.356		
<b>ANOVA</b>						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p-value</i>	<i>F<sub>crit</sub></i>
Between Groups	62.667	1	62.667	6.0065	0.0168	3.9778
Within Groups	730.319	70	10.433			
Total	792.986	71				

A2.3 Single Factor ANOVA on F-DUP<sup>N</sup> scores of participants with and without self-employed parents, classified in group H (having a high entrepreneurial potential).

<b>SUMMARY</b>						
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>		
Participants <i>with</i> Self- employed Parents	21	1466	69.810	8.362		
Participants <i>without</i> Self-employed Parents	29	2034	70.138	9.123		
<b>ANOVA</b>						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p-value</i>	<i>F<sub>crit</sub></i>
Between Groups	1.314	1	1.314	0.1492	0.7010	4.0427
Within Groups	422.686	48	8.806			
Total	424.000	49				

### Appendix 3. ANOVA-F-DUP<sup>N</sup> Scores with Respect to Self-employed Friends

A3.1 Single Factor ANOVA on F-DUP<sup>N</sup> scores of participants with and without self- employed friends, classified in group L (having a low entrepreneurial potential).

<b>SUMMARY</b>						
<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>		
Participants <i>with</i> Self-employed Friends	26	1211	46.577	29.134		
Participants <i>without</i> Self- employed Friends	18	789	43.833	18.971		
<b>ANOVA</b>						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p-value</i>	<i>F<sub>crit</sub></i>
Between Groups	80.063	1	80.063	3.1999	0.0809	4.0727
Within Groups	1050.846	42	25.020			
Total	1130.909	43				

### A3.2 Single Factor ANOVA on F-DUP<sup>N</sup> scores of participants with and without self-employed friends, classified in group M (having a medium entrepreneurial potential)

#### SUMMARY

Groups	Count	Sum	Average	Variance		
Participants with Self-employed Friends	56	3379	60.339	9.974		
Participants without Self-employed Friends	16	940	58.750	14.200		
<b>ANOVA</b>						
Source of Variation	SS	df	MS	F	p-value	F <sub>crit</sub>
Between Groups	31.433	1	31.433	2.8892	0.0936	3.9778
Within Groups	761.554	70	10.879			
Total	792.986	71				

### A3.3 Single Factor ANOVA on F-DUP<sup>N</sup> scores of participants with and without self-employed friends, classified in group H (having a high entrepreneurial potential)

#### SUMMARY

Groups	Count	Sum	Average	Variance		
Participants with Self-employed Friends	45	3147	69.933	9.382		
Participants without Self-employed Friends	5	353	70.600	2.300		
<b>ANOVA</b>						
Source of Variation	SS	df	MS	F	p-value	F <sub>crit</sub>
Between Groups	2.000	1	2.000	0.2275	0.6356	4.0427
Within Groups	422.000	48	8.792			
Total	424.000	49				

#### Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).