THE ROLE OF HUMAN CAPITAL AND OPPORTUNITY COSTS IN GRADUATES' SELF-EMPLOYMENT DECISIONS

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THE ROLE OF HUMAN CAPITAL AND OPPORTUNITY COSTS IN GRADUATES’ SELF-EMPLOYMENT DECISIONS

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ABSTRACT

The study analyzes graduates' human capital (HC) endowments and their decision to opt for self-employment. We argue that graduates with high levels of HC are offered various options (outside) besides becoming an entrepreneur. Prior research has suggested that the relationships between human capital and entrepreneurial outcomes as well as HC and the probability to engage in entrepreneurial activity are more or less linear. We argue that graduates with high levels of human capital are offered various options (outside) on the labor market besides becoming an entrepreneur. In this sense we account for the effects of education and experience on graduates’ labor market options (increasing graduates’ entrepreneurial opportunity costs) and propose a curvilinear (inverted u-shape) relationship between HC investments and the probability to engage in entrepreneurship.

INTRODUCTION

A large body of entrepreneurship literature embraces human capital theory to explain the differences between people and their entrepreneurial behaviors. Indeed, prior research has indicated that human capital (HC) constitutes an essential factor influencing individuals’ entrepreneurial ability and entrepreneurial performance (Gimeno et al., 1997; Sexton & Bowman, 1985; Unger, Rauch, Frese, & Rosenbusch, 2009). Nevertheless, scholars have reported that the relevance of human and social capital is underutilized when studying the process of new venture creation (Schenkel, Hechavarria, & Matthews, 2009). Busenitz and Barney (1997) stated that “individuals who start their own organization are somehow different from those that work in large organizations” (p. 10). Are these differences also reflected in entrepreneurs’ human capital endowments? Given the avowed importance of entrepreneurship for innovation and economic growth (Reynolds et al., 1994; Schumpeter, 1911; Shane, 2001), fostering entrepreneurial activities ranks high on the political agenda. Herein, individuals with higher education take on a particularly important role, as the literature provides evidence that new venture formation by university graduates and faculty is particularly promising in terms of job creation (Dietrich, 1999) and venture performance (Shane, 2004). Despite an increasing body of research on academic entrepreneurship education, which mainly focuses on entrepreneurial intentions (Fayolle, Gailly, & Lassas-Clerc, 2006; Kolvereid, 1996; Kolvereid & Moen, 1997; Souitaris et al., 2007; Tkachev & Kolvereid, 1999; von Graevenitz et al., 2010), little is known about which graduates actually opt for self-employment after having finished their studies. A few exceptions are the works of Lazear (2004) who studied the entrepreneurial activities of Stanford University alumni, and McQueen and Wallmark (1982), who analyzed spin-off activities of Chalmers University graduates.
This study's objective is to address this research gap by analyzing the relationship between graduates' HC endowments and the decision to enter self-employment. In addition to filling this research gap, studying the entrepreneurial activities of graduates has an important advantage: HC endowments are strongly influenced by graduates' formal education and the formal education system is, in turn, receptive to innovations in teaching and to policy (Gradstein & Justman, 2000). Although HC theory generally assumes that more HC is always better, social systems, such as the higher education system, may induce individuals to either under or overinvest in HC. According to Davidsson and Honig (2003), investments in HC influence life career choices and overinvestments leading to high levels of certification may discourage risk taking, for example, in the form of entrepreneurial activity, while underinvesting may encourage it. Furthermore, high levels of HC may create promising career options on the labor market, thereby raising graduates' opportunity costs of entrepreneurial activity. Building on these introductory contemplations, this study's objective is to analyze the various effects of different HC dimensions on the decision to enter self-employment and its effect on opportunity costs. This study therefore addresses the following two main research questions:

\[ \text{RQ 1. What is the influence of human capital on graduates' decision to become self-employed?} \]
\[ \text{RQ 2. What is the effect of opportunity costs on graduates' decision to become self-employed?} \]

**Human Capital and Self-Employment**

The literature indicates that the decision to become self-employed is also linked to HC. According to Shane (2003), the most prominent non-psychological factors influencing the probability of exploiting an entrepreneurial opportunity are related to HC. Individuals with higher levels of HC are considered to be more effective in developing and executing a plan to exploit an opportunity and are thus more likely to engage in entrepreneurial activities (Shane, 2003).

HC components, including education, experience, knowledge, and skills are the initial individual-level resources nascent entrepreneurs have at hand and have therefore long been argued to be essential for new venture performance (Sexton & Bowman, 1985; Unger et al., 2009). A founder’s HC comprises his or her new venture’s initial stock of capital that is used to acquire further resources and to achieve growth. Beckman and Burton (2008) provided empirical evidence that a firm’s ability to acquire resources is path-dependent on the founder’s initial stock of HC. A large body of literature has analyzed the role of education in various aspects of entrepreneurship. Strong evidence has been found for the positive relationship between educational attainment and the likelihood of entering self-employment (Bates, 1995; Delmar & Davidsson, 2000; Reynolds, 1997). Furthermore, higher levels of education were reported to be positively associated with new venture size (Cooper, Woo, & Dunkelberg, 1989), venture survival (Bates, 1990; Brüderl & Preisendörfer, 1998), venture growth (Cooper et al., 1994), and performance (Gimeno et al., 1997). Similarly, Dolton and Makepeace (1990) suggested that entrepreneurs’ earnings increase in accordance with their degree performance. Overall, these findings point in the same direction: an entrepreneur’s level of education plays an important role in the venture creation process. Higher levels of education increase the likelihood of entering self-employment and have a positive effect on expected venture outcomes. In general, HC is argued to increase entrepreneurs’ capability to perform the generic tasks of identifying and exploiting entrepreneurial opportunities (Shane & Venkataraman, 2000; Unger et al., 2009). Davidsson and Honig (2003) empirically confirmed the positive relationship between HC and opportunity recognition and reported that individuals
with higher HC endowments have an increased probability to engage in entrepreneurial activity. Similarly, Ucbasaran, Westhead, and Wright (2008) found support for their proposition that entrepreneurship-specific HC has a positive effect on opportunity recognition behavior. Relevant knowledge and useful skills provide a routine in settling challenging tasks along the entrepreneurial process, help to reduce uncertainty in the course of new venture creation, and increase entrepreneurial self-efficacy. In sum, higher HC endowments increase the expected venture outcomes and consequently the probability of entering self-employment.

Self-Employment and Entrepreneurial Opportunity Costs

The decision to enter self-employment can be regarded as one alternative among several employment choices (outside options). Indeed, compared to dependent employment options, self-employment is characterized by high levels of uncertainty (Baron, 1998). Expected utility theory is the most common approach in economics for analyzing decisions under uncertainty (Schotter, 2008; Starmer, 2000). According to this theory, individuals who are given a choice of alternatives select that alternative from which they expect the maximum utility. Depending on their initial situation and own preferences, individuals attribute different expected utilities to each alternative. These preferences may not only include monetary but also non-monetary aspects, such as risk attitude or preferences for a certain life-work balance.

Van Praag and Cramer (2001) revealed an increased likelihood to become an entrepreneur if the expected rewards surpass the wages of employment and argued that the expected rewards depend on the individual’s assessment of ability and on risk attitude. Gimeno et al. (1997) stated that entrepreneurs derive personal satisfaction from being self-employed, depending on the degree to which they are attached to values like independence or the realization of own ideas. In this sense, the major incentive to start a new venture may be the drive to be independent and to achieve something rather than the mere desire to become rich (McQueen & Wallmark, 1982). As is generally known, entrepreneurs often work longer hours than employees (Shane & Venkataraman, 2000). While some may have the desire to work independently, others may shy away from long working hours or be afraid to take responsibility for uncertain outcomes. All in all, individuals are likely to engage in self-employment when the expected overall utility exceeds those of alternative employment choices (Shane, 2003). The alternative that has not been chosen can be regarded as a missed opportunity and its utility cannot be realized. These foregone benefits of the second best choice constitute the opportunity costs (Buchanan, 1987). In this study, opportunity costs represent the forgone benefits derived from paid employment as a consequence of the self-employment decision, referred to as entrepreneurial opportunity costs. It has been argued that higher levels of HC are positively associated with the decision to enter self-employment, since the expected returns from being an entrepreneur increase. However, high levels of HC are, in turn, highly valued by the labor market, for example, in the form of more lucrative wages, more responsibility, or better working conditions (Weiss, 1995). The literature suggests that HC is a strong predictor of employment choice decisions, as HC characteristics result in employment opportunities and thus serve as a reference point for each individuals’ employment choice (Busenitz et al., 2003). Cassar (2006) argued that HC is highly valued by the labor market because it positively impacts employees’ productivity. As a result, individuals with high HC endowments are offered more (outside) options to earn a high income. Hence, HC exerts also a strong positive effect on professional incomes (Becker, 1993) and since individuals attempt to receive adequate compensation for their HC investments, they try to maximize the economic benefits given their level of HC (Unger et al., 2009).
However, investments in HC are costly. High investments may therefore discourage risk-taking (i.e. becoming self-employed) as taking risks is rather unpleasant and threatens individuals’ welfare (Davidsson & Honig, 2003), compared to a situation of safe returns from paid employment. As a consequence, highly educated people may not choose to become an entrepreneur. In line with this argumentation, Evans and Leighton (1989) reported that people moving from paid employment to self-employment were generally those with lower opportunity costs, i.e. they generally received lower wages or experienced relatively longer periods of unemployment. Similarly, Amit et al. (1995) found that people entering self-employment earned an average of 12% less in their former dependent employment, compared to those who chose to remain in their paid job positions. Hence, high opportunity costs seem to counteract the willingness to become self-employed. Put differently, the income derived from employment acts as a threshold that has to be overcome by the prospects of entrepreneurial activity. Evidently, the higher the opportunity costs, the less likely the expected utility from self-employment to exceed the opportunity costs.

Figure 1 depicts this theorized relationship. The proposed effects are twofold: HC positively affects the decision to become self-employed, as HC raises the expected utility of being self-employed. At the same time, HC has a strong impact on the entrepreneurial opportunity costs in the form of the increased utility derived from paid employment, as HC is highly valued by the labor market. Hence, high HC endowments lead to higher entrepreneurial opportunity costs, which, in turn, negatively affect the likelihood of becoming an entrepreneur. The effects of HC on self-employment and entrepreneurial opportunity costs do not necessarily have equal strength. There are different types of HC that have different degrees of applicability for either paid or self-employment. A distinction can be made between general HC, which is universally applicable, and specific HC, which is task-related and therefore only useful for certain tasks, for example, starting a new venture (Becker, 1993). Entrepreneurship-specific HC, like business ownership experience, has a positive impact on self-employment prospects (Gimeno et al., 1997), whereas it is obviously less applicable for paid employment and thus has little or no impact on the respective opportunity costs. The distinction of different HC dimensions and their effects on the decision to engage in entrepreneurial activity will be assessed in greater detail in the next section of this paper.

As outlined above, the decision to enter self-employment involves personal investments and highly uncertain outcomes. Paid employment provides safe returns whereas entrepreneurship involves risk and potentially extreme outcomes. Hence, entrepreneurial activity can be compared to a lottery, where extremely high and extremely low returns can occur (Iyigun & Owen, 1998). In this sense, the safe return can be regarded as the guaranteed price for a lottery ticket, which has to be given up in order to enter the self-employment lottery. The safe return then mainly determines the entrepreneurial opportunity costs, which serve as a strong reference point for the self-employment decision. According to prospect theory, in comparison to a certain reference point, individuals evaluate losses stronger than a return of the same amount (Kahneman & Tversky, 1979; Tversky & Kahneman, 1991). Due to loss aversion, a lottery ticket with a high loss potential is therefore likely to be avoided even if the lottery offers a high expected utility (Kahneman & Tversky, 1979). HC raises both the expected utility from the self-employment lottery and the reference point represented by the entrepreneurial opportunity costs. Following the presented arguments and the insights from prospect theory, this study proposes a curvilinear relationship between HC and the likelihood to enter self-employment (Figure 2). The “negative effect” of HC on the self-employment decision, i.e. the increased entrepreneurial opportunity costs, is assumed to outweigh the “positive effect” after a certain threshold level of HC is exceeded. Testing the curvilinear relationship provides the
potential to define the maximum point, i.e. the optimal level of HC for favoring the decision to become self-employed. Further insights can be gained by differentiating between HC dimensions. A promising approach provides the distinction between HC investments and the outcomes of HC investments (Becker, 1962; Unger et al., 2009).

**HC Investments and the Outcomes of HC Investments**

Becker (1993) defined HC as the skills and knowledge acquired by individuals through investments in education, training, and experience. The definition implies two distinct conceptualizations of the above mentioned HC components (Becker, 1962; Unger et al., 2009): HC investments (education and experience) and the outcomes of HC investments (knowledge and skills). HC investments include education and training, work experience, and other types of experiences that may or may not lead to knowledge and skills. The outcomes of HC investments are individuals’ acquired knowledge and skills (Unger et al., 2009). However, the same investment does not necessarily lead to the same outcome in terms of knowledge or skills. Two individuals with the same amount of educational attainment may differ substantially in their acquired levels of knowledge and skills. Thus, this differentiation is helpful, as it theoretically distinguishes the causes and effects of HC attributes and accentuates the dynamic processes of acquiring knowledge and skills. For example, in their meta-analysis of 70 independent samples, Unger et al. (2009) found a stronger relationship between outcomes of HC investments and entrepreneurial success than between HC investments and entrepreneurial success.

This study’s objective is to analyze graduates’ HC endowments and how such endowments affect their self-employment decision. University graduates received an academic degree recently, which serves as a signal or screening label on the labor market (Riley, 1979; Stiglitz, 1975; Wolpin, 1977). Potential employers often lack information about the true quality of job candidates. Agency theory (Fama, 1980; Jensen & Meckling, 1976) suggests that problems resulting from asymmetric information, for example information about the true abilities and skills of a candidate (agent), can be reduced by signaling activities by the agent (Akerlof, 1970; Spence, 1973). Credible signals may include degrees, grades, certificates, and references from former employers. Evidently, graduates have fewer signals compared to experienced employees with a track record of their career steps and former accomplishments. Employees’ references serve as (more) credible signals of their actual knowledge and skills. In the case of a graduate, a potential employer can only observe his or her investment in HC, i.e. level of education (type of degree, grades) and some professional experience (internships, professional trainings etc.), but has little insight into the outcomes of these HC investments, i.e. actual knowledge and skills. Due to the mentioned insights from HC theory, inferring the quality of graduates’ knowledge and skills from their education and experience remains a difficult task. Put differently, graduates’ investments in HC are highly observable and comparable, whereas the outcomes of these investments are uncertain. For this reason, investments in HC are assumed to have a strong impact on graduates’ labor market opportunities and thus on their entrepreneurial opportunity costs. In turn, the outcomes of HC investments (knowledge and skills) are not observable and are therefore assumed to have little or no effect on the entrepreneurial opportunity costs. However, higher levels of knowledge and skills may affect graduates’ psychological characteristics, such as self-confidence and entrepreneurial self-efficacy and thus have a positive effect on the self-employment decision. In fact, self-employment comprises an outstanding opportunity to capitalize on one’s knowledge and skills. Individuals who have the capability to successfully complete challenging tasks may profit best from their...
success by being self-employed. Drawing on HC theory and the signaling model, the following hypotheses are proposed:

**H1:** Human capital investments are observable and affect entrepreneurial opportunity costs. There is an inverted u-shaped relationship between human capital investments and the probability to enter self-employment.

**H2:** While the outcomes of human capital investments are unobservable and thus do not affect entrepreneurial opportunity costs, they have a positive influence on graduates’ self-assessments of their entrepreneurial ability. The outcomes of human capital investments positively influence the probability to enter self-employment.

**Methods**

**Data**

The sample comprised data from the “Bayerisches Absolventenpanel” (German for “Bavarian Graduate Panel”; abbr. “BAP”). The data set contains responses from 11,217 university graduates from all of Bavaria’s 26 public universities (10 universities and 16 universities of applied sciences) whose graduations took place between one and two years prior to the survey. Respondents were asked about the competences they had acquired during their studies and their early career paths. Respondents answered more than 50 questions on six subject areas — studies, activities during studies, work entry, career path, features of first employment, and background information — including a number of variables reflecting various dimensions of HC.

**Dependent Variables**

The BAP data permit to split the self-employment status up into entrepreneurs and freelancers. This distinction represents a valuable opportunity to gain additional insights. The BAP survey asked respondents: “What was the first occupational position under the conditions of regular employment you held after having finished your studies?” The respondents could choose between different employment options, including “self-employed as an entrepreneur” and “self-employed as a freelancer.” To test the proposed hypotheses, two binary dependent variables were formed from the information on graduates’ employment status: entrepreneur and freelancer.

**Independent Variables**

The obtained independent variables included both the measures of HC investments (education and experience) and the outcomes of HC investments (knowledge and skills). HC investments comprised the variables education and experience. The education-variable was formed using three components from the BAP survey: (1) Type of university degree, (2) final university degree grade, and (3) final school diploma grade. The information on educational attainment was classified into five categories in accordance with a five-point Likert scale where “1” denotes “very low education” and “5” denotes “very high education.” Subsequently, an overall education-index was formed by averaging the values of the three components.

For the formation of the experience-variable, three types of professional experience were taken into account: (1) Vocational training before or during the course of studies, (2) employment
during the course of studies, and (3) internships during the course of studies. To classify each type of graduates’ professional experience into five categories, the following criteria were applied: (1) Duration, (2) relevance for the studies, and (3) the benefits for the improvement of knowledge and skills derived from the respective type of experience. The overall experience-variable was obtained by building an index, in which the three types of experiences (vocational training, employment, and internships) are equally weighted.

To obtain the outcomes of HC investment variables, graduates’ self-assessments of knowledge and skills from the BAP data were utilized. Respondents had to rate their knowledge and skills at the time of graduation on a five-point Likert scale from “1” denoting “I possess the respective knowledge or skill to a small degree” and “5” denoting “I possess the respective knowledge or skill to a large degree.” The BAP questionnaire enquired about 19 different types of knowledge and skills that graduates may possess. Exploratory factor analysis was used to obtain five interpretable and largely uncorrelated factors: Technical knowledge includes graduates’ self-assessments for the categories: “expert knowledge,” “specific theoretical knowledge,” and “knowledge of scientific methods.” The three items were averaged to obtain the overall variable “technical knowledge” ($\alpha = 0.729$). Business knowledge consists of the two items: “business knowledge” and “legal knowledge” ($\alpha = 0.651$). Communication skills reflects graduates’ self-assessments for the following three items: “ability to communicate,” “written communication skills,” and “oral communication skills.” The overall averaged variable “communication skills” showed good reliability ($\alpha = 0.736$). Cognitive skills includes the following four items: “ability to solve problems,” “ability to apply existing knowledge to new problems,” “multidisciplinary thinking,” and “analytical skills.” The four items were averaged to obtain an overall measure, which showed good reliability ($\alpha = 0.768$). Management skills. The measure was obtained by averaging the following for items: “ability to work independently,” “ability to organize,” “ability to cooperate,” and “ability to assume responsibility.” The overall measure showed good reliability $\alpha = 0.724$). As the sample comprises data from graduates of a similar age and who received a similar duration of education, “year of graduation” is the only variable that was controlled for. Therefore, a dummy variable was formed for the year of graduation (“0” for 2003/2004; “1” for 2005/2006).

**Results**

In the total sample ($N=11,217$), 177 graduates (1.58%) indicated that they became entrepreneurs and 401 graduates (3.57%) indicated that they became freelancers immediately after having finished their studies. Thus, the total percentage of graduates who opted for self-employment was 5.15% ($N=578$). To test the proposed hypotheses generalized additive logistic regression model analysis (GAM) was used. The year of graduation (2003/2004) was controlled for in the regression analysis. It is notable that the graduation year 2003/2004 had a significantly positive influence on the decision to become an entrepreneur, but no significant influence on the decision to become a freelancer.

Hypothesis 1 proposed a curvilinear relationship between investments in HC (education and experience) and the decision to enter self-employment. Table 2 depicts the results of a generalized additive regression model (GAM), in which the HC investment variables education and experience are included as 2nd degree polynomial functions. Both polynomial terms are significant for the group of entrepreneurs and freelancers, indicating an inverted u-shaped relationship. Figure 3 shows the respective GAM plots for the variables education and experience for the total group (i.e.
entrepreneurs and freelancers). The proposed curvilinear relationship is found for both variables. However, the effect is much stronger for experience. The probability to enter self-employment increases with an increasing level of education and experience until a certain threshold level is met. After the threshold level is reached (at approximately 2.3 for education and 3.2 for experience) the probability strongly decreases. However, the initial positive effect is stronger for the experience variable. It is noticeable that the maximum point for the education index is already reached at a very low level of 2.3 (on a scale between “1” low education level and “5” high education level). Hypothesis 1 is thus accepted.

Whereas Hypothesis 1 predicted a curvilinear relationship for HC investments, Hypothesis 2 proposes that the outcomes of HC investments (knowledge and skills) are less observable by the labor market and therefore do not raise opportunity costs, but positively influence the graduates’ self-assessments of their entrepreneurial ability (and therefore the decision to enter self-employment). Table 2 shows the expected relationship for business knowledge and cognitive skills in the group of entrepreneurs and for communication and management skills for the group of freelancers. However, for the group of freelancers, technical and business knowledge has a negative influence. Therefore, Hypothesis 2 is only partly accepted.

**Discussion**

This study set out to analyze the effects of HC on graduates’ decision to engage in entrepreneurial activities. By building on HC theory and the concept of opportunity costs, hypotheses regarding the differential effects of HC investments and the outcomes of HC investments were developed and tested. Investments in HC were argued to be highly observable and thus have a strong effect on entrepreneurial opportunity costs. The literature has positively associated education and experience – the most commonly used measures of HC – with new venture success, size, survival, growth and, most importantly, with the probability to enter self-employment. In contrast, the presented results in this study reveal a curvilinear relationship (inverted u-shape) between HC investments and graduates’ probability to engage in entrepreneurial activity. Increasing levels of education and experience initially raise the probability to become self-employed until a certain threshold level is reached. After this tipping point, the probability decreases due to higher entrepreneurial opportunity costs. Hence, graduates with either (very) good or (very) poor education and experience levels have a lower probability to opt for entrepreneurship. It is striking that the optimal level of education (2.3) is below the mean value (2.94). This implies that the negative effect of HC on the self-employment decision caused by increasing entrepreneurial opportunity costs sets in at a relatively low level, i.e. below the average value of education.

According to prospect theory, as pointed out above, a lottery with higher loss potential is more likely to be avoided, even if the lottery offers a higher expected utility (Kahneman & Tversky, 1979; Tversky & Kahneman, 1991). Loss aversion in the sense of Kahneman & Tversky could explain why the opportunity costs effect is much stronger for entrepreneurs than for freelancers. Nevertheless, these results imply that graduates with below-average levels of education and experience are more likely to become entrepreneurs than graduates with above-average levels of education and experience. However, prior research has found entrepreneurs with higher levels of HC to perform better and be more innovative (Bosma, Van Praag, Thurik, & De Wit, 2004). Subsequently, these insights suggest lower prospects of success and innovativeness for those graduates who have the highest probability to engage in entrepreneurial activity, i.e. those with below-average levels of
education and experience. Admittedly, all graduates from universities have relatively high levels of education compared to other groups in the society. Moreover, graduates have invested more or less the same amount of time in their education and have gathered a similar amount of professional experience. This homogeneity in the sample might relativize these unfavorable results to a certain extent. Other studies with more heterogeneous samples report stronger and more positive effects of education and experience (e.g., Davidsson & Honig, 2003).

The outcomes of HC investments, knowledge and skills, were argued to be hard to observe and thus have little or no impact on entrepreneurial opportunity costs. In turn, knowledge and skills were assumed to raise graduates’ self-assessments of their entrepreneurial ability and therefore favor the decision to become self-employed. The study differentiated between five types of knowledge and skills: technical knowledge, business knowledge, communication skills, cognitive skills, and management skills. Contrary to the proposed relationship, technical knowledge was found to be negatively associated with the decision to become a freelancer and had no significant influence on the decision to become an entrepreneur. The variable technical knowledge comprised graduates’ self-assessments of their expert knowledge, specific theoretical knowledge, and knowledge of scientific methods. Expert knowledge in a certain domain appears to be more favorable for dependent employment. Similarly, knowledge of scientific methods may be best applicable as an employee. The finding that technical knowledge had no significant effect on the probability to become an entrepreneur could also be explained by the fact that entrepreneurs can hire experts and do not necessarily have to possess all of the technical knowledge.

Business knowledge was found to exhibit the strongest influence on the decision to become self-employed. However, this influence took on different directions for entrepreneurs and freelancers. It positively influenced the decision to become an entrepreneur, but also had a strong negative effect on the decision to become a freelancer. Business knowledge was measured in terms of the items business knowledge and legal knowledge. The opposing effects of business knowledge can be ascribed to the fact that both knowledge components are important to entrepreneurs when building up and administering organizational structures and processes, whereas business knowledge is less important to freelancers who do not have to create and manage a new organization. In this case, business knowledge might be applied more beneficially by working as an employee in a larger organization than by working as a freelancer.

The skill measures – communication skills, cognitive skills, and management skills – were found to be positively associated with the decision to enter self-employment. However, not all of the effects were significant for both entrepreneurs and freelancers. Cognitive skills positively influenced the decision to become an entrepreneur. Communication skills and management skills positively influenced the probability to become a freelancer. Both groups showed above-average values for all of the skill measures in simple mean comparisons with the total sample. These results underline the importance of skills for entrepreneurial activities, although not all of the skill measures proved equally important and significant for entrepreneurs and freelancers in the regression analysis. Finally, the only variable that was controlled for in the model was the year of graduation. The findings show a significant positive effect of the graduation year 2003/2004 on the probability to become an entrepreneur. This result is in line with the findings of the KfW-Gründungsmonitor, which monitors entrepreneurial activity in Germany (KfW, 2011). According to the report, the fraction of people in Germany who became self-employed steadily decreased from 2003 (2.84%) to 2007 (1.66%).
The study provides several implications for entrepreneurship theory and HC theory in general. This study’s main contribution manifests in the detailed analysis of HC effects for different HC dimensions and, most importantly, different levels of HC. The distinction between HC investments and the outcomes of HC investment as suggested by Becker (1993) allows for a more differentiated analysis of HC and its effects on entrepreneurial opportunity costs. Prior research has suggested that the relationships between HC and entrepreneurial outcomes as well as HC and the probability to engage in entrepreneurial activity are more or less linear. In contrast, this study also accounts for the effects of education and experience on graduates’ entrepreneurial opportunity costs, thereby proposing a curvilinear relationship. The interaction between HC investment effects and opportunity cost effects was theoretically derived and the curvilinear relationship empirically confirmed. Integrating the concept of opportunity costs and its effects on graduates’ decision to enter self-employment extends HC theory in the domain of entrepreneurship. Second, this study contributes to entrepreneurship theory by analyzing the role of knowledge and skills. In line with prior results, this study confirms the importance of skills for entrepreneurship. Moreover, the presented results highlight the important role of skills in the decision to initially engage in entrepreneurial activity. The role of the knowledge proved equivocal for the probability to engage in self-employment and revealed striking discrepancies between entrepreneurs and freelancers. Technical knowledge showed a significantly negative influence on the probability to become a freelancer, whereas it had no influence on the probability to become an entrepreneur. Business knowledge was found to be favorable for entrepreneurs, but exhibited a strong negative effect on the probability to become a freelancer.

The presented findings have implications for education and policy. The HC endowments of graduates are highly influenced by formal education (Gradstein & Justman, 2000). The formal education system is, in turn, receptive to policy. Policy-makers could endorse the integration of courses that develop certain skills, such as presentation and communication seminars in the curriculum. In addition, entrepreneurship education can offer well-directed trainings to foster entrepreneurial activity. Moreover, educators could explicitly address the topic of the opportunity costs of entrepreneurial engagement in the classroom to sensitize students and initiate active discussions. The finding that high potential graduates, who have the highest levels of education and experience, have a lower probability to opt for self-employment is quite unfavorable for success prospects and the innovativeness of new ventures. Thereby, entrepreneurial opportunity costs could be reduced. Attractive start-up loans or state guarantees would have similar effects on graduates’ opportunity costs.

**LIMITATIONS AND CONCLUSION**

Inevitably, this study has several limitations. The sample is restricted to Bavarian graduates. Therefore, the external validity of the obtained results has to be questioned. The generalizability of the findings for other demographic groups can be doubted. Graduates comprise a homogenous group with a similar age, relatively high level of education, and a rather low amount of professional experience. Future research is needed to validate the empirical results and test the generalization of the study with different samples. Another limitation is that the analysis is restricted to graduates’ early career paths. The literature indicates that entrepreneurial intentions are often a result of previous work experience and are therefore not very strong immediately after graduation. Moreover, even if intentions are strong, they might not be acted upon until the graduates have gathered enough experience to provide the level of confidence necessary to anticipate new venture
success (Boyd & Vozikis, 1994; Connolly, O’Gorman, & Bogue, 2006; Elfving et al., 2009). In this sense, many graduates will opt for entrepreneurship only years after graduation. Finally, a potential overconfidence bias concerning the self-assessments of knowledge and skills may affect the quality of the data.

To sum up, this study advances entrepreneurship theory by providing empirical evidence of how different levels and dimensions of HC affect graduates’ probability to engage in entrepreneurial activity. The findings add to understanding graduates’ early career choice intentions. HC investments – education and experience – are found to exhibit a two-fold effect. At first, the probability of entrepreneurial activity increases with increasing levels of education and experience until a certain threshold level is met, after which the probability strongly decreases. This effect is argued to be triggered by increasing levels of entrepreneurial opportunity costs, as education and experience serve as strong signals on the labor market. The findings also indicate a mainly positive effect of knowledge and skills – the outcomes of HC investments – on graduates’ decision to become self-employed. However, the effects are not consistent for entrepreneurs and freelancers and reveal important differences between the two groups.

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REFERENCES


Figure 1: The effect of human capital on the decision to enter self-employment
Figure 2: The proposed relationship between human capital and the likelihood to enter self-employment (inverted u-shape)

Figure 3: GAM Plots

Table 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Pearson correlations</th>
<th>Human capital investments and outcomes for total sample (N=11,217)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>1 Education</td>
<td>3.17</td>
<td>0.78</td>
</tr>
<tr>
<td>2 Experience</td>
<td>2.94</td>
<td>0.75</td>
</tr>
<tr>
<td>3 Technical knowledge</td>
<td>3.63</td>
<td>0.22</td>
</tr>
<tr>
<td>4 Business knowledge</td>
<td>2.83</td>
<td>0.19</td>
</tr>
<tr>
<td>5 Communication skills</td>
<td>3.92</td>
<td>0.69</td>
</tr>
<tr>
<td>6 Cognitive skills</td>
<td>3.98</td>
<td>0.62</td>
</tr>
<tr>
<td>7 Management skills</td>
<td>4.10</td>
<td>0.60</td>
</tr>
</tbody>
</table>

*** p < 0.001

Table 2

Generalized additive logistic regression model (GAM) - Enter self-employment as entrepreneur, freelancer (N=11,217)

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Entrepreneurs</th>
<th>Freelancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-6.373 (0.668)***</td>
<td>-4.368 (0.456)***</td>
</tr>
<tr>
<td>Control variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year of graduation</td>
<td>0.387 (0.154)**</td>
<td>0.118 (0.105)</td>
</tr>
<tr>
<td>Predictor variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education (2nd degree polynomial)</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Experience (2nd degree polynomial)</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Technical knowledge</td>
<td>-0.177 (0.116)</td>
<td>-0.238 (0.072)***</td>
</tr>
<tr>
<td>Business knowledge</td>
<td>0.377 (0.084)***</td>
<td>0.455 (0.055)***</td>
</tr>
<tr>
<td>Communication skills</td>
<td>0.091 (0.146)</td>
<td>0.248 (0.098)**</td>
</tr>
<tr>
<td>Cognitive skills</td>
<td>0.311 (0.175)*</td>
<td>0.035 (0.111)</td>
</tr>
<tr>
<td>Management skills</td>
<td>-0.028 (0.190)</td>
<td>0.469 (0.128)***</td>
</tr>
</tbody>
</table>

Note: Standard errors in parentheses  *** p < 0.001, ** p < 0.01, * p < 0.1