



 **Universität Trier**

# **Skill Variety as a Driver of Entrepreneurship**

## **DISSERTATION**

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## List of abbreviations

### *Countries and states*

GA	Georgia
MA	Massachusetts
NJ	New Jersey
NY	New York
OK	Oklahoma
TX	Texas
UK	United Kingdom
US(A)	United States (of America)

### *Abbreviations*

BAuA	Federal Institute for Occupational Safety and Health (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin)
BIBB	Federal Institute for Vocational Training (Bundesinstitut für Berufsbildung)
BLK	Federal and State Commission for Educational Planning (Bund-Länder-Kommission für Bildungsplanung und Forschungsförderung)
BMBF	Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung)
CESIS	Centre of Excellence for Science and Innovation Studies, Royal Institute of Technology
cf.	Compare
CFI	Comparative Fit Index
CI	Confidence interval
CPS	Current Population Survey (USA)
EBSCO	Research Database ( <a href="https://www.ebsco.com/">https://www.ebsco.com/</a> )

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EconLit	Research Database ( <a href="https://www.aeaweb.org/journals/">https://www.aeaweb.org/journals/</a> )
EEA	Employee Entrepreneurial Activity
Entr.	Entrepreneurial
EPS	Entrepreneurial Personality System
ERIC	Research Database ( <a href="https://eric.ed.gov/">https://eric.ed.gov/</a> )
FEA	Federal Employment Agency
FLEED	Finnish Longitudinal Employer-Employee Data
GATE	Gifted and Talented Education
GEM	Global Entrepreneurship Monitor
GERA	Global Entrepreneurship Research Association
HWWI	Hamburg Institute of International Economics
IAB	Institute for Employment Research (Institut für Arbeitsmarkt- und Berufsforschung)
ICSB	International Council for Small Business
IEEE	Institute of Electrical and Electronics Engineers
IFM	Mannheim Institute for SME Reseach (Insitut für Mittelstandsforschung)
IFN	Research Institute of Industrial Economics (Insitutet för Näringslivsforskning)
ILFI	Italian Longitudinal Household Survey (Indagine Longitudinale sulle Famiglie Italiane)
ILR	Industrial and Labor Relations Review
Int.	Interest
IQ	Intelligence quotient
IZA	Institute of Labor Economics (Forschungsinstitut zur Zukunft der Arbeit)
JAT	Jack-of-all-Trades
JEF	Journal of Entrepreneurial Finance
M	Mean
m/f	Male/female
n.a.	Not available
NEO	Neuroticism-Extraversion-Openness



OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary least squares
OSF	Official Statistics of Finland
OSS	Open source software
Pers.	Personality
R&D	Research and development
REM	Regional Entrepreneurship Monitor
RIETI	Research Institute of Economy, Trade and Industry
RMSEA	Root Mean Square Error of Approximation
SD	Standard deviation
SE	Standard error
SEM	Structural Equation Modeling
SES	Socioeconomic status
SESTAT	Scientists and Engineers Statistical Data System
SSCI	Social Sciences Citation Index
TEA	Total early-stage Entrepreneurial Activity
VIF	Variance inflation factor

### *Symbols*

$\bar{\phantom{x}}$	Average
N	Sample Size
p	Probability
r	Coefficient correlation
$R^2$	Coefficient of determination
$\alpha$	Cronbach's alpha
$\beta$	Beta. Regression coefficient
$\chi^2$	Chi-square test

## Zusammenfassung

Die staatliche Förderung von Entrepreneurship wird allgemein als Maßnahme zur Schaffung von Arbeitsplätzen und zur Förderung von Wirtschaftswachstum angesehen. Um effektive politische Maßnahmen entwickeln zu können, liegt es im öffentlichen Interesse, diejenigen Faktoren zu bestimmen, welche die Entscheidung, ein Unternehmen zu gründen, beeinflussen. Kanäle politischer Einflussnahme auf den Gründungsprozess können beispielsweise unternehmerische Elemente in den Medien, (schulische) Bildungspläne oder spezielle Ausbildungsprogramme für potentielle Unternehmer sein.

Diese Dissertation behandelt die Frage nach den Determinanten des Eintritts in Entrepreneurship auf einer Mikroebene: im Fokus steht die individuelle Entscheidung für Entrepreneurship. Neben psychologischen Faktoren wie Risikotoleranz, Konkurrenzdenken und dem gesamten Persönlichkeitsprofil spielt auch Sozialkapital (z.B. geschäftliche Netzwerke und Vorbilder) eine wichtige Rolle. Darüber hinaus ist Humankapital entscheidend. Humankapital wird, neben den oben genannten Faktoren, hauptsächlich in der vorliegenden Dissertation untersucht. Nach dem Konzept von Lazear (2005) sind es vor allem die Fähigkeits- und Wissensvielfalt (Skill Variety) des Individuums, die das Gründen und erfolgreiche Führen eines Unternehmens positiv beeinflussen. Zunächst verschafft diese Dissertation dem Leser einen Überblick über bisherige relevante Forschungsergebnisse zum Thema Skill Variety in Bezug auf Unternehmertum. Ein Großteil der besprochenen Studien konzentriert sich auf die Wirkung von Skill Variety. Die meisten Studien kommen zu dem Ergebnis, dass Skill Variety vor allem die Entscheidung, sich selbständig zu machen, beeinflusst. Auch die Intention, sich selbständig zu machen, wird durch Skill Variety begünstigt. Weniger einstimmig sind die Ergebnisse im Hinblick auf den Einfluss von Skill Variety auf den unternehmerischen Erfolg. Gemessen anhand von Einkommen und Fortbestehen des Unternehmens, zeigt sich zum Teil eine negative bzw. U-förmige Korrelation.

Da bisherige Studien sich kaum auf die Determinanten von Skill Variety konzentrieren, widmet sich diese Dissertation in Kapitel 3 dieser Forschungslücke. Auf der Grundlage von Daten aus einer finnischen Panelbefragung Jugendlicher bzw. junger Erwachsener, wird untersucht, ob es bereits in der Jugend Vorboten für Skill Variety gibt und welche Faktoren hierzu und zu Skill Variety führen. Die Ergebnisse der Untersuchung weisen darauf hin, dass eine Vielfalt an frühen Interessen und Aktivitäten in der Jugend zu Skill Variety

führen, welche wiederum zur Absicht führen, sich selbständig zu machen. Weiterhin zeigt die Untersuchung, dass eine frühe Vielfalt durch Offenheit und ein unternehmerisches Persönlichkeitsprofil vorausgesagt werden. Auch Skill Variety wird durch ein unternehmerisches Persönlichkeitsprofil begünstigt.

Letztlich beschäftigt sich diese Dissertation in Kapitel 4 mit der Geschlechterkluft im Bereich Entrepreneurship im Hinblick auf Skill Variety. Frauen zeigen weniger oft das Vorhaben sich selbständig zu machen und arbeiten seltener als Unternehmer als Männer. Es wird untersucht, ob geschlechterabhängige Unterschiede in Skill Variety die Kluff zwischen Männern und Frauen erklären können und ob es Unterschiede in verschiedenen Messgrößen von Skill Variety gibt, die diese Kluff direkt beeinflussen. Im Ergebnis zeigt sich eine Kluff im Hinblick auf das Vorhaben sich selbständig zu machen. Während ein positiver Zusammenhang zwischen der frühen Vielfalt an Schulfächern und dem weiblichen Geschlecht gefunden wurde, bestehen negative Korrelationen zwischen den beiden anderen Messgrößen, bildungsbezogene und arbeitsbezogene Skill Variety, und Frauen, wobei der negative Effekt von arbeitsbezogener Skill Variety am stärksten ist.

Die Ergebnisse dieser Dissertation sind relevant für die Forschung, Politik, Bildungseinrichtungen sowie spezielle unternehmerische Bildungsprogramme. Auch für unternehmerische Eltern sind die Ergebnisse im Rahmen der Nachfolgeplanung von Familienunternehmen relevant. Durch die Literaturübersicht in Kapitel 2 wird deutlich, dass Skill Variety ein vielversprechendes Konzept für die Forschung im Bereich Entrepreneurship ist und die Absicht und Entscheidung, sich selbständig zu machen, besser erklären kann als allgemeines Humankapital. Außerdem zeigt der Literaturüberblick zwei Forschungslücken auf, denen sich diese Dissertation im Anschluss widmet: die Rolle von möglichen Determinanten von Skill Variety und die Geschlechterkluff im Hinblick auf Skill Variety.

Bildungsprogramme zur Förderung von Entrepreneurship können auf der Grundlage der vorliegenden Ergebnisse optimiert werden, indem die Übermittlung einer Vielfalt an Fähigkeiten zu einem zentralen Ziel gemacht wird. Auch könnte ein erhöhter Fokus auf Jugendliche den Erfolg steigern, sowie eine Vorauswahl anhand des Persönlichkeitsprofils der Teilnehmer. Im Hinblick auf die Geschlechterkluff sollten staatliche Maßnahmen darauf abzielen, Frauen mehr Anreize zu bieten, sich Skill Variety anzueignen. Hierzu können Bildungsprogramme speziell auf Frauen zugeschnitten werden und die Selbständigkeit als attraktive Alternative zum Angestelltenverhältnis präsentiert werden.

# 1 Introduction

## 1.1 Motivation and research goals

Entrepreneurship has emerged as one of the main foci of public policy, especially in regard to economic growth and job creation (Audretsch et al, 2007). This is not only true at the broad national level of the United States or the European Union, but also at a country, regional and local level (Carree et al., 2002). Even though entrepreneurship is a multidimensional concept with different definitions used in research (Wennekers et al., 2002), scholars widely agree that there is systematic variation of entrepreneurial activities over different countries (e.g. Blanchflower, 2000; Wennekers et al., 2002). Policy makers need an understanding of why there is this variation in entrepreneurship to develop appropriate policy instruments (Audretsch et al, 2007). Or turning it the other way around: what are the reasons for the individual entry into entrepreneurship? To answer this question, methods and findings from different scholarly fields, such as finance, management, economics, psychology or geography are appropriate.

Entrepreneurship is also a phenomenon that comprises multiple units of observation, including individuals, enterprises, cultures, industries or countries. Thus, the determinants of entrepreneurship can be investigated from a micro (individual entrepreneur), meso (region, industry) or a macro perspective (national economies). Please note that this dissertation will focus on the micro level of analysis.<sup>1</sup> The individual entrepreneur is the central unit of investigation. The entrepreneurial career decision is influenced by different factors. First, psychological factors, such as risk tolerance (e.g. Cramer et al, 2002), competitiveness (e.g. Boente and Piegeler, 2012) or the personality profile in general (e.g. Obschonka et al., 2014) play a major role. These psychological factors are relatively stable (Costa and McCrae, 1992; Roberts et al., 2006) and are thus rather difficult to modify by governmental policies. Yet, for example, by introducing entrepreneurial elements into media or education, governments could shape entrepreneurial values and attitudes, with the aim of an entrepreneurial culture in society (Audretsch et al., 2007).

Second, social capital, such as business networks (e.g. Klyver, 2011) or entrepreneurial role models (e.g. Chlosta et al., 2012), affects the entry into entrepreneurship. Access to social capital can also be addressed by governmental policies, for example by promoting

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<sup>1</sup> For a macro perspective e.g. Verheul et al. (2006) can be considered.

entrepreneurial role models in media or establishing start-up centers or business incubators. These institutions allow (nascent) entrepreneurs to exchange ideas and provide them with professional advice as well as fertile environments (Aerts et al., 2007; Mian, 1996).

A great deal of research has focused on human capital and entrepreneurship as occupational choice. Human capital is composed of knowledge and skills, acquired through schooling, on-the-job training and other kinds of experiences (Becker, 1964). For an overview over the different approaches in entrepreneurial human capital research, see Table 1-1.

**Table 1-1: Human capital in entrepreneurship research**

Concept of human capital	Exemplary measurement
General human capital	-years of schooling -highest degree -years of employment
Task-related human capital	-managerial experience -prior start-up experience -work experience in small firm
Skill variety approach	-varied university curriculum -number of prior job roles -direct assessment of number of entrepreneurial skills

Traditional human capital research (see Davidsson and Gordon, 2012; Unger et al., 2011) focused on general human capital (e.g. years of schooling or work experience). Arguably, this approach does not differentiate between entrepreneurship and paid-employment. There is no reason why more years of work experience should influence the choice between paid-employment and entrepreneurship. For this reason, studies also included variables that are more related to the entrepreneurial task (e.g. management experience or prior self-employment). This is referred to as task-related or entrepreneurial human capital (Davidsson, 2006). Recently, Lazear (2005) came up with the concept of skill variety, which takes the concept of task-relatedness but develops it further so that it can be treated as a unique concept. In a nutshell, there is not one single entrepreneurial task. Entrepreneurs have to conduct a wide variety of tasks, such as the discovery of business opportunities, selling products, negotiating with suppliers or leading personnel. Empirical results indicate that skill variety is important for the entrepreneurial intention, entrepreneurial choice and success (Lazear, 2005; Wagner, 2006; Hsieh et al., 2017). Policy makers aim to educate new generations of entrepreneurs.

Policies could again concentrate on business incubators and public advice centers to provide (nascent) entrepreneurs with start-up-relevant knowledge. Another possibility to exert influence on the individual development of human capital is the educational system or are specific educational programs (Audretsch et al., 2007; Kuratko, 2005). Overall, the programs do not achieve the targeted success (Åstebro and Hoos, 2016; Fairlie et al., 2015; Oosterbeck et al., 2008). One reason for this might be that these programs do not foster skill variety, they rather concentrate on isolated (entrepreneurial) skills and knowledge. If skill variety proves to be an important predictor of entrepreneurial entry and success, it might be reasonable to adjust entrepreneurial education (programs) into that direction.

Please note that this dissertation mainly focuses on skill variety as a concept of human capital (economic approach), but also takes insights from psychology (e.g. personality) into account. There is a growing trend in entrepreneurship research to combine economic and psychological approaches. This interdisciplinary approach gained momentum in entrepreneurship research in the domain of management and business administration. Most notably, Dean Shepherd initiated the research on the psychological effects of entrepreneurial failure, such as grief and its consequences for learning or in other words the acquisition of new knowledge for entrepreneurship (Shepherd, 2003). Other interdisciplinary research focusses on passion which can drive entrepreneurial behavior (Cardon et al., 2009). Interdisciplinary entrepreneurship papers mainly use personality variables as proxies for economic constructs, such as culture as informal institution (e.g. Stuetzer et al, 2016; Stuetzer et al., 2017). Beyond the mere use of variables, there are also papers, which have a clear theorizing on how psychological and economic approaches interact (Obschonka et al., 2015; Wyrwich et al., 2016). The combination of economic and psychological approaches can also be used when studying skill variety. A variety in skills is the result of many learning experiences and decisions on how to invest in human capital. From this point of view, economic rationales and psychology of individuals can both be considered.

The first research goal of this dissertation is to depict the state of the art in skill variety research in entrepreneurship. Chapter 2 of this dissertation provides a literature review on the concept of skill variety in entrepreneurship research. The literature review focuses on the effects of skill variety (entrepreneurial intentions, choice and success), the origins of skill variety (investment- or endowment-based) and the relation between gender and skill variety. In subchapter 2.4, further research directions (concerning chapter 3 and 4) are derived and introduced in more detail. To give a short summary at this point, the second research goal will

be to provide more clarity on the determinants of skill variety and early precursors of skill variety (chapter 3). Utilizing a longitudinal dataset (FinEdu), covering the early formative years, education, the transition into working life and early adulthood, this dissertation makes the next step in entrepreneurial skill variety research. The third research goal aims at the relation between gender and skill variety. There is a substantial gender gap in entrepreneurship (e.g. Kelley et al., 2015), and skill variety is investigated as a potential mediator of this relation. A further research goal is to improve the understanding of the results from different measurement alternatives of skill variety (educationally and work-related), in regard to the effects of skill variety and the relation to gender. The dissertation will thus both contribute to theory development in human capital research as well as inform (school) policy makers and entrepreneurship educators. Self-employed parents in particular can influence their offspring's skill variety by encouraging them to work within the family's business (early on) or to study broad educational curricula. Thus, children can be equipped for family business succession.

## 1.2 Structure of the dissertation

This dissertation comprises five chapters. Figure 1-1 illustrates the structure of this thesis. **Chapter 2** focuses on skill variety as a recent concept in entrepreneurship research. Because skill variety is a relatively new research area, there is up to now no systematic literature review on this topic. Chapter 2 aims to close this research gap by providing an in-depth literature review on skill variety in scientific entrepreneurship research and derives further open research questions. The comprehensive literature review is structured by outcomes of skill variety, determinants of skill variety as well as gender and skill variety. In a further analysis measurement alternatives of skill variety are depicted.

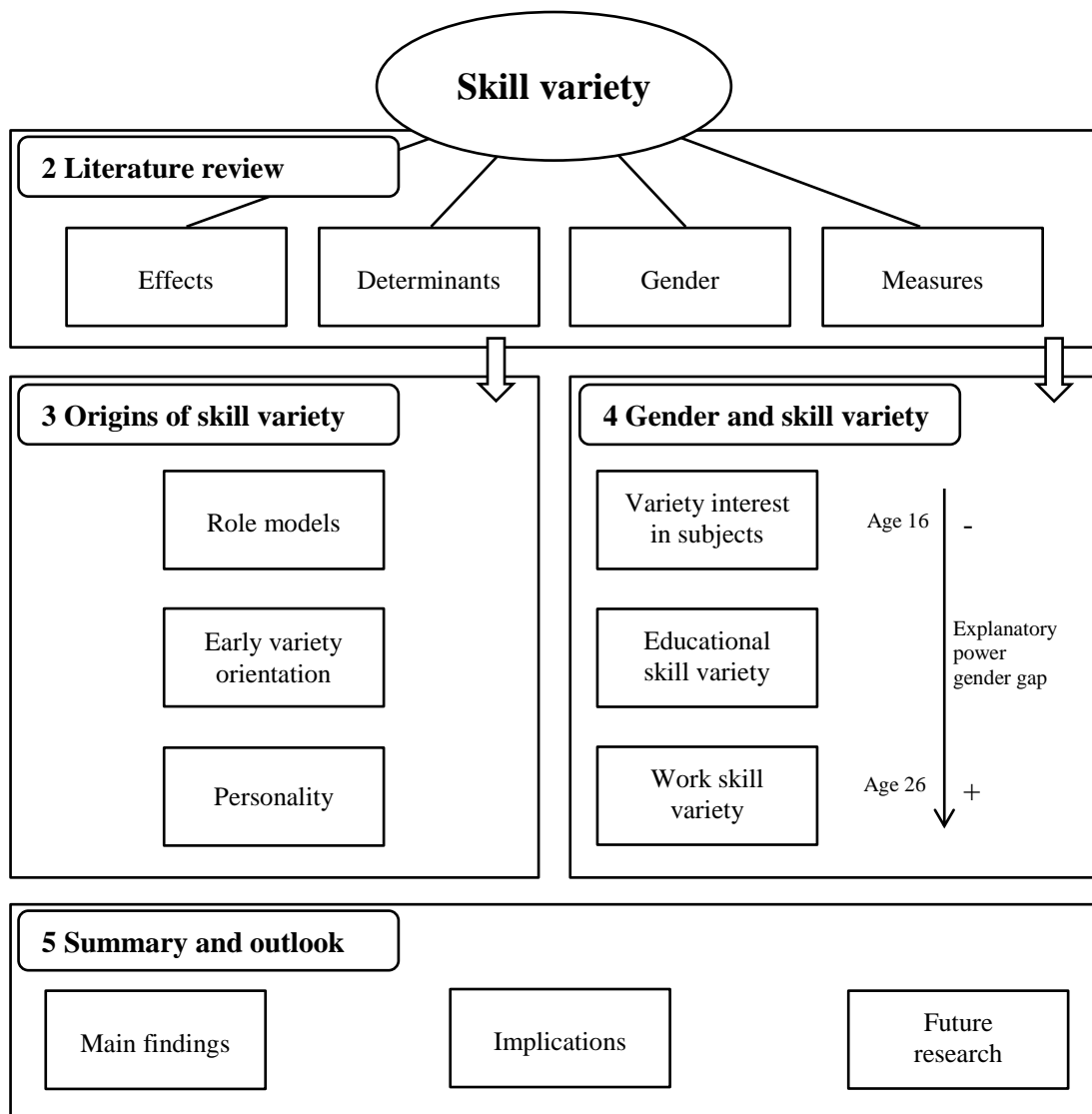
**Chapter 3** investigates the origins and development of skill variety, using longitudinal data from Finland (FinEdu dataset). The existing literature on the development of skill variety is still in its infancy. To contribute to this research stream, I theorize and develop hypotheses using human capital theory and approaches from developmental psychology as theoretical lenses. The investigation takes an early variety orientation, entrepreneurial role models as well as individual personality into account. Several structural equation models are set up to explore direct and indirect effects in the development of skill variety.

**Chapter 4** explores the gender gap in entrepreneurship from a skill variety perspective, again using the longitudinal FinEdu data from Finland. The existing literature on the gender gap in entrepreneurship shows no clear evidence on explanatory factors.

However, there are indications that skill variety might mediate the gender gap in entrepreneurship. This chapter investigates different measurement alternatives of skill variety as potential mediators through structural equation modeling. The measurement alternatives are a variety index over the interest in different school subjects and functional skill variety acquired through education or work. Subsequently, the results are compared by the method of seemingly unrelated regression.

**Chapter 5** summarizes the main findings and discusses theoretical and practical implications. Recommendations for entrepreneurs, policy makers, educators and self-employed parents are derived from the results. The dissertation concludes with an outlook on promising avenues for future research.

**Figure 1-1: Structure of the dissertation**





## 2 Skill variety in entrepreneurship: A literature review and research directions

### 2.1 Introduction and Motivation

Human capital is an evergreen in entrepreneurship research (Block et al., 2013; Marvel et al., 2016). Human capital measures have been employed to explain entrepreneurial choice (e.g. Obschonka et al., 2016), endurance (e.g. Bruce, 2002) and success (e.g. Stuetzer et al., 2013). Following Becker (1964) human capital is defined by knowledge and skills that are acquired through educational and work experiences. This definition implies that education and work are investments into human capital and knowledge as well as skills are the outcomes of these investments. Most existing studies use measures based on education or work experience as proxies for entrepreneurial human capital (Reuber and Fischer, 1994). Arguably, there is a relation between human capital investment (educational or work experience) and outcomes of human capital investments (knowledge, skills), but the concepts cannot be equated. Experience, acquired through human capital investments in a specific field, does not always lead to an increase in knowledge or skills (Sonnetag, 1998). For example, scholars often use years of schooling as a proxy for human capital. But what has been learned obviously depends both on the type of school (content orientation, instructional quality) as well as individual characteristics, such as motivation or cognitive abilities (Unger et al., 2011). Nevertheless, Marvel et al. (2016) find that 80% of the conducted studies in entrepreneurship use investment factors rather than outcomes.

The magnitude of the relation between human capital and entrepreneurship varies considerably across different studies (Unger et al, 2011). For example, looking at the relation of human capital and entrepreneurial success, some report a strong relation (e.g. Duchesneau and Gartner, 1990;  $r = .4$ .) while others report rather weak relations (Davidsson and Honig, 2003;  $r = .06$ ). One reason for these mixed results might be the use of different investment- and outcome-based human capital measures. Besides the differentiation of outcome-based and investment-based human capital measures, one should also look at the transferability of human capital to specific situations. The transferability of human capital is also referred to as task-relatedness (of human capital). To tackle the issue of task-relatedness, it is necessary to take a closer look at knowledge and skills as the constituting elements of human capital. First, knowledge, defined as “the possession and understanding of principles, facts, processes”

(Marvel et al., 2016, p. 616) is of higher value for entrepreneurship, if it is related to specific entrepreneurial activities. An entrepreneur should have knowledge of the market, of relevant technologies or of how to run a firm. Knowledge is usually clustered in domains (such as accounting, marketing, manufacturing and production, human resources or general management). Few studies (e.g. Dimov, 2007; Shane, 2000) investigated the effects of task-related knowledge on entrepreneurship. Second, skills “refer to observable applications or know-how” (Marvel et al., 2016, p. 617) and are thus related to specific tasks. One distinguishes between general skills, such as mathematics or public speaking and cross-functional skills, such as social skills or problem-solving skills. Human capital that is related to relevant entrepreneurial tasks is clearly more important for entrepreneurship than general human capital (e.g. Bosma et al., 2004; Lerner and Almor, 2002). Entrepreneurial tasks are, among others, the discovery of business opportunities, selling products or negotiating with suppliers. For example, to negotiate with a supplier, an entrepreneur must have relevant knowledge about the product and its specifications, the supply chain as well as different skills, such as social skills, language skills and business skills to be able to assess an offer.

As argued above, there is not one single entrepreneurial task. There are rather a variety of tasks an entrepreneur has to conduct in order to set up a venture and keep it running (Davidsson, 2006; Lazear, 2005). Consequently, Lazear (2005) came up with the concept of skill variety (also called concept of balanced skills) to cover the nature of entrepreneurship and to provide human capital measures that are at the core of task-relatedness. Lazear (2005) argues that skill variety increases both the probability of becoming an entrepreneur as well the entrepreneurial performance. Empirical results indicate that the concept of skill variety is an enrichment to the field of entrepreneurship, reflected in high correlations with entrepreneurial outcome variables (e.g. Chen and Thompson, 2016; Stuetzer et al., 2013).

The purpose of this chapter is to provide an overview of the research on skill variety in entrepreneurship. This literature review is structured according to the main foci of the articles under investigation: Effects of skill variety (e.g. entrepreneurial choice or success), determinants of skill variety (e.g. an entrepreneurial personality or entrepreneurial parents) and female skill variety (are there gender differences in skill variety?). Furthermore, the existing research is analyzed with regard to the operationalizations of skill variety. As discussed above, coming from a human capital perspective, skill variety might be operationalized from a knowledge or a task perspective. In addition, skill variety can be measured directly (outcomes

of human capital investments) or indirectly (investments in human capital). Subsequently, the results of previous research and open research questions are discussed.

## **2.2 The concept of skill variety in entrepreneurship**

In the following, an overview of Lazear's skill variety approach is given, including possible routes on which skill variety can be acquired.

An entrepreneur is somebody who is "usually responsible for the conception of the basic product, hiring the initial team and obtaining at least some early financing" (Lazear, 2003, p. 3). Thereby, an entrepreneur brings together a number of different resources. This requires knowledge of a large number of business areas (Lazear, 2005). Lazear (2003) further argues that individuals can choose between two commercial activities - paid employment and entrepreneurship. Through these commercial activities individuals earn their livings. Thus, individuals that opt for paid employment try to maximize their income by investing in one skill in particular (other skills are irrelevant for paid employment). In turn, individuals that opt for entrepreneurship try to achieve balance in skills, as they are limited by their weakest skills. In sum, the skill variety approach can be seen as a model of vocational choice and success. How can individuals acquire skill variety? In the following, an overview of possible routes on which individuals might theoretically acquire skill variety is given. Please note that studies that investigate determinants of skill variety empirically are discussed in subchapter 3.4.

First, one mechanism to acquire skill variety can be seen in prior entrepreneurial experience. Starting a new venture requires constant learning. Learning theories suggest that prior experience facilitates the understanding of current challenges. Experiential learning requires the transformation of experience into knowledge or skills (Kolb, 1984). Previous self-employment can thus be seen as "the best training to gain specific knowledge and skills in various fields, which are then most productively applied in later entrepreneurship" (Stuetzer et al., 2013, p. 98). This is both reflected in a high proportion of prior self-employed individuals among nascent entrepreneurs (Evans and Leighton, 1989; Davidsson and Honig, 2003) as well as higher success rates for individuals with entrepreneurial experience.

Second, managerial experience is a path to acquire skill variety. Management roles provide entrepreneurs with relevant skills in making decisions, solving problems, planning or negotiating (Romanelli and Schoonhoven, 2001; Shane, 2003). Overall, managers are exposed to diverse tasks (Parker, 2009). These tasks allow individuals to build up experience that can

be transformed into skill variety. Research shows mixed evidence on the relevance of managerial experience for entrepreneurship. While Gimeno et al. (1997) report a positive relation between prior managerial experience and entrepreneurial performance, Davidson and Honig (2003) found no effect on entrepreneurial opportunity discovery and exploitation.

Third, work experience in small and young companies might lead to the accumulation of skill variety. In small and young companies there are usually no complex hierarchical structures. Work places and conditions are laid out to be rather generalist than specialized, demanding each employee to fulfill a variety of tasks (Elfenbein et al. 2010; Parker 2009). Empirical evidence is provided by Wagner (2004), who reports a higher probability to enter entrepreneurship for individuals with prior experience in small and young companies.

Fourth, formal education can also be a route to acquire skill variety. Studying a varied university curriculum, students acquire knowledge in different domains. A specialist in paid employment might rather choose a more specialized university curriculum as well. Beyond that, a broader theoretical curriculum enables students to work in different jobs and industries after finishing their studies (Lazear, 2005). Lazear (2005) and Backes-Gellner et al. (2010) provide empirical evidence for the relevance of variety in educational backgrounds for the entrepreneurial choice.

### **2.3 Review of the scientific literature on skill variety**

There are three recent literature reviews on human capital in entrepreneurship. First, Unger et al. (2011) bring together the results of 70 independent samples in their meta-analytical study about human capital and entrepreneurial success. Overall, human capital measures are correlated to entrepreneurial success by  $r = .098$ . Furthermore, higher correlations to entrepreneurial success are reported for more task-related measures of human capital. Second, Marvel et al. (2016) discuss the results of 109 articles on human capital and entrepreneurship. They stress the importance of human capital throughout the venturing process and also highlight task-related human capital measures. Third, Martin et al. (2013) review literature on the relation between entrepreneurship education and human capital assets, behaviors and performance. They report a significant relationship between entrepreneurship education and human capital assets, especially for academic programs.

All three provide compelling evidence that especially task-related human capital is an important driver of entrepreneurship. This provides further arguments to develop a

comprehensive review on skill variety, which is strongly connected to the entrepreneurial task. Nevertheless, skill variety, as a human capital concept and measure, has been neglected in previous reviews, probably due to the small body of literature on skill variety. The following review closes this research gap.

### **2.3.1 Literature research and selection criteria**

The scholarly articles on skill variety in entrepreneurship were identified in a Google Scholar title and keyword search for the term ‘Entrepreneurship’ and one of the terms ‘skill variety’, ‘balanced skills’, ‘skill balance’, ‘balanced skill set’, ‘Jack-of-all-trades’. Studies that cover the concept of skill variety and empirically investigate skill variety, its antecedents and outcomes are subject of this review. Few studies without a direct connection to Lazear’s concept of skill variety are considered, because the conceptualizations and variables used are similar to Lazear’s approach (example search terms are ‘labor diversity’, ‘functional experience’, ‘functional expertise’, ‘generalists’, ‘experience diversity’). In a next step, the search was expanded based on the references cited in these articles. To confirm the results, further searches were conducted in EBSCO, SSCI, EconLit and ERIC, among others. Finally, experienced research scholars in the field of human capital and entrepreneurship were asked to suggest further important studies. As of 18 April 2017, the search returned 255 hits.

Despite the high theoretical relevance of skill variety for entrepreneurship, there are only few studies published on the subject. Hence, (unpublished) working papers are included in this review. Working papers were only included if no published article (from the same author, on the same topic) is available. An exception to this rule is made for Lazear’s (2003) working paper that was published later on in the *Journal of Labor Economics* (Lazear, 2005), because Lazear (2003) is the first source on the concept of skill variety. The working papers and articles were selected based on the following criteria:

- Scholarly articles and working papers are included. Reports and notes for practitioners as well as bachelor and master theses were excluded.
- Only papers that were relevant for the field of entrepreneurship were taken into account.
- Articles must be written in English or German to be included.

Using these criteria, 66 articles and working papers are selected for the literature review.

### 2.3.2 Development of scientific research in skill variety

The concept of skill variety has experienced a notable rise in entrepreneurship research since the first theory development and empirical evidence by Lazear (2003, 2005). At this point it should be noted that Lazear's theory has quite some similarity with the O-ring theory of production, which was championed by Kremer (1993). He argues that different tasks of production should be executed competently together. If one task is poorly executed the whole production will suffer. Looking at entrepreneurship, which demands several tasks that need to be performed in parallel, the concept of skill variety can be viewed as a specific example of the O-ring theory of production (Bublitz et al., 2015). In this specific example the single founder's skills and the requirements resulting from his enterprise are the object of investigation. For this reason, studies with a focus on team skill variety are excluded. Another argument why studies investigating team skill variety are excluded is that it is difficult to decide whether there are solely positive effects of team skill variety or if these positive effects interfere with negative effects such as communication problems, conflicts or disagreement within the entrepreneurial team (Harrison and Klein, 2007). Please also note that there is another strand of literature looking at the related concept of task variety. In general, it is found that task variety is a relevant factor for work satisfaction, which is especially true for entrepreneurs that conduct a wider variety of tasks than employees (e.g. Hundley, 2001; Schjoedt, 2009). Although work satisfaction could be considered an outcome of skill or task variety, it is not accounted for in this review. The body of literature is constrained to entrepreneurship outcome variables only (e.g. entrepreneurial choice or success).

This chapter analyzes the content of the identified articles. The structure was chosen according to the emergence of the literature following Lazear's (2003) idea of skill variety in entrepreneurship. First, the effects of skill variety are investigated (entrepreneurial intentions, entrepreneurial choice and entrepreneurial success). Second, different determinants of skill variety are shown. Third, an overview of the relationship between gender and skill variety is given. This includes several studies that have a main focus on gender issues and skill variety as well as information (on gender and skill variety) from the articles of the other two categories (if available). Last, the articles under investigation are analyzed in regard to the operationalization of skill variety. For an overview on the different categories and articles within these categories see Table 2-1.

**Table 2-1: Categories and empirical studies within each category**

Category of <u>main</u> focus	Description	Final sample
2.3.3 Effects of skill variety	Investigates the entrepreneurial outcomes of skill variety at an individual level.	55
2.3.4 Determinants of skill variety	Investigates the sources and areas entrepreneurial skill variety in entrepreneurship comes from.	5
2.3.5 Gender and skill variety	Investigates the topic of skill variety differences between the sexes and its relation to different entrepreneurial outcome variables.	6

### 2.3.3 Literature with a focus on effects of skill variety

Literature focusing on the effects of skill variety is predominantly concerned with entrepreneurial intentions, entrepreneurial choice and entrepreneurial success (see Table 2-2). Please note that most studies focusing on the determinants of skill variety or gender and skill variety also investigate effects of skill variety. Therefore, the studies are assigned to the three different tables/subchapters according to their main foci. This means, studies with a main focus on determinants of skill variety or gender and skill variety are not shown in Table 2-2. In the following, the contents of Table 2-2 are discussed. Here, the most prominent studies and a general tendency of other studies are presented. For more details see Table 2-2, which contains a summary of the contents, methods, source and further information on the measurement of skill variety as well as gender and skill variety. This information will also be referred to in sections 2.3.5 and 2.3.6.

#### *Entrepreneurial choice and intentions*

Lazear (2003, 2005) started the discussion on skill variety in entrepreneurship by developing a theoretical model (as described in subsection 2.2). Beyond that, with a dataset of 5,000 Stanford alumni, he also presented first empirical evidence on the importance of skill variety for entrepreneurial choice in the US. Lazear (2003, 2004 and 2005) used both an educational (varied university curriculum) as well as a work perspective of skill variety (number of prior jobs and employers). Interestingly, the central premise of Lazear's arguments, that entrepreneurs perform more tasks compared to paid employees, was only investigated in the study of Lechmann and Schnabel (2014). They showed that entrepreneurs indeed perform more different tasks than employees.

**Table 2-2: Literature on effects of skill variety**

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Aldén et al. (2014)</b>	Respondents with more skill variety are more likely to be self-employed.	Quantitative (OLS)	Swedish Military general ability test	Sweden	-low variance of scores attained in different areas of ability tests, e.g. logical thinking, verbal skills, emotional stability	not reported
<b>Åstebro et al. (2011)</b>	Individuals with a history of changing occupations and employers are more likely to enter self-employment. This history is associated with higher earnings for entrepreneurs, but not for employees.	Quantitative (different regression techniques)	Korean Labor and Income Panel Study	Korea	-number of prior job roles held -number of prior employers	not reported
<b>Åstebro and Yong (2016)</b>	Both occupational and industry variety have positive relationships with invention quality. Further, industry variety has a negative relationship with entrepreneurial earnings while occupational variety has no relationship.	Quantitative (OLS)	Canadian Innovation Centre	Canada	-number of different occupational fields of experience -number of different distinct industries worked in	not reported
<b>Backes-Gellner and Lazear (2003)</b>	Confirms Lazear's results. Was not available from the authors on request.					



Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Backes-Gellner and Moog (2013)</b>	Skill variety and variety in social capital foster entrepreneurial intentions among students.	Quantitative (different regression techniques)	Cologne Founder Study	Germany	-academic skill variety (analytical, practical, financial and marketing skills) -work skill variety (worked as a freelancer, intern, full-time or part-time employee, apprentice or as self-employed)	not reported
<b>Backes-Gellner, et al. (2010)</b>	Individuals that have not had a straight educational path, but switch between different educational possibilities, have a higher probability to end up in entrepreneurship.	Quantitative (different regression techniques)	Swiss Labor Force Survey	Switzerland	-educational skill variety (apprenticeship, vocational training, academic education)	not reported
<b>Boehm and Hogan (2012)</b>	Principle investigators in research collaboration projects have skill variety.	Qualitative	Case study in research collaboration projects	Germany, Ireland	-different roles (project manager, negotiator, resource acquirer, ...)	not reported
<b>Brixy and Hessels (2010)</b>	Nascent entrepreneurs are less likely to succeed (firm survival), if they have skill variety.	Quantitative (multinomial probit regression)	Survey of the Global Entrepreneurship Monitor (GEM)	Germany, Netherlands	-number of fields of experience (i.e. R&D/design/engineering, production, marketing, finance/accounting, law, human resources, general management, consulting)	not reported

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Bublitz and Noseleit (2014)</b>	Skill variety is significantly larger for entrepreneurs than it is for employees. Further, skill variety of employees is negatively related to firm size. Skill variety at higher levels is correlated with income, especially for entrepreneurs but also for employees in small businesses.	Quantitative (different regression techniques)	BIBB/BAuA Employment Survey of the Working Population 2006	Germany	-count over different general skills (e.g. law, math, handcraft, ...) and self-assessment to judge the balance in skills	women have less skill variety
<b>Bublitz et al. (2015)</b>	Entrepreneurs with more skill variety need less time to finish projects. Further, entrepreneurs with less skill variety benefit more from the positive relationship between agglomeration economies and completion time.	Quantitative (negative binomial regression)	Establishment History Panel	Germany	-number of different occupational fields of experience	not reported
<b>Chen and Thompson (2016)</b>	Both employer and job variety are positively associated with entrepreneurship. The number of functional job experiences is more important. Specific types of experience (“business administration experience” and “senior management experience”) eliminate the positive effects of both employer and functional experience counts.	Quantitative (logistic regression)	Data from largest professional social network websites	USA, Canada	-functional job experience: accounting and finance, business administration, marketing and sales, R&D and engineering, personnel, production -number of prior employers	no differences

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Cho and Orazem (2014)</b>	Skill variety (number of job roles and industries) is both important for nonprofit as well as profit entrepreneurial choice.	Quantitative (probit regression)	Iowa State University Bachelor's degree alumni survey data	USA	-number of prior job roles held -number of prior industries -academic skill variety (courses taken in the major and the average number of courses taken in other departments)	not reported
<b>Colombatto and Melnik (2007)</b>	Prior work experience as an employee positively correlates with expected entrepreneurial success, measured in income and firm size of startups.	Quantitative (different regression techniques)	Sample of newly founded firms, 2005	Italy	-years of working in paid employment prior to becoming entrepreneur (proxy for number of roles worked in)	not reported
<b>Cumming et al. (2016)</b>	Having skill variety is more important for serial entrepreneurship than the experience in venture capital.	Quantitative (probit regression)	Venture-backed startups in the CrunchBase online database	USA	-management education as proxy for skill variety	no differences
<b>Daghbashyan and Hårsman (2012)</b>	Arts graduates having switched industries (proxy for skill variety) are more likely to become entrepreneurs.	Quantitative (multinomial probit regression)	Individual time series data on all Swedish employees, firms and establishments	Sweden	-number of different industries worked in during the last four years	women have more skill variety
<b>Dencker et al. (2015)</b>	Skill variety is negatively associated with job creation in firms. But skill variety makes it possible to operate firms with less employees. Firm failure is not predicted by skill variety.	Quantitative (different regression techniques)	German FEA	Germany	-self-assessment in breadth of knowledge (market and industry, marketing and sales and computer/hardware/software)	women have less skill variety

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Douhan (2009)</b>	Lazear's JAT theory holds, students with skill variety tend to become entrepreneurs.	Quantitative (different regression techniques)	Educational survey 1961/1966	Sweden	-narrow set: IQ dimensions (inductive, linguistic, spatial) -additional broad set: interest in sociability, general knowledge, mechanical activities -variance across all score values is skill variety	not reported
<b>Dutta et al. (2011).</b>	Individuals that have an education highly specialized on entrepreneurship are more likely to become entrepreneurs and are more successful (income and personal wealth). This relation is stronger for individuals with educational skill variety (moderation).	Quantitative (OLS regression)	Alumni of University of Arizona's Berger Entrepreneurship Program 1985-1999	USA	-count variable over different educational experiences (such as language courses or studying abroad)	women are more specialized and have less educational skill variety
<b>Elfenbein et al. (2010)</b>	Individuals with science and engineering degrees are more likely to enter entrepreneurship if they work in small firms. This is in part because they perform a broader range of commercial tasks in small firms.	Quantitative (different regression techniques)	National Survey of recent college graduates	USA	-count of commercial activities -count of research activities	not reported
<b>Failla (2015)</b>	Different measures of skill variety are set into relationship to firm failure. Both the number of previous employers and industries positively predict firm failure. But both measures positively predict entry into entrepreneurship.	Quantitative (different regression techniques)	Integrated Database for Labor Market Research	Denmark	-number of previous employers -number of previous industries	women have less skill variety

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Fleming et al. (2007)</b>	Inventors demonstrate more generative creativity in patents when they have more skill variety.	Quantitative (different regression techniques)	U.S. utility patents	USA	-number of different occupational fields of experience	not reported
<b>Fritsch et al. (2012)</b>	Business specialists and engineers have the highest levels of skill variety. Entrepreneurs have more skill variety than employees. Employees in small businesses have higher levels of skill variety than those in larger businesses.	Quantitative (multinomial probit regression)	BIBB/BAuA Erwerbstätigenbefragung 2006	Germany	-count over different general skills (e.g. law, math, handcraft, ...) and self-assessment to judge the balance in skills	not reported
<b>Giuri et al. (2008)</b>	In OSS projects, managers tend to have balanced skills, in contrast to other team members.	Quantitative (ordered logit estimations)	SourceForge.net 1999-2003	Worldwide	-self-assessment of skills in programming, application-specific skills and spoken languages -experience: average level of time invested in each skill - number of skills named	not reported
<b>Hartog et al. (2010)</b>	Skill variety generates higher incomes, but only for entrepreneurs. Skill variety has no influence on the entry decision in entrepreneurship.	Quantitative (different regression techniques)	National Longitudinal Survey of Youth	USA	-coefficient of variation of abilities (verbal, math, technical, clerical, social)	not reported

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Hessels et al. (2014)</b>	Nascent entrepreneurs with more skill variety are more likely to succeed (innovation is a mediator from variety to success). Skill balance has no comparable effect.	Quantitative (multinomial logit model)	GEM 06/07	Germany, Netherlands	-years of experience in different fields (e.g. design/engineering, production, marketing/sales) -self-assessment to judge the balance in skills	not reported
<b>Hsieh (2016)</b>	Learning multiple skills together is more important for entrepreneurial choice than skill variety itself.	Quantitative (different regression techniques)	SESTAT panel database	USA	-count of parallel domains of work experience (accounting, applied research, basic research, computer applications, design, development, employee relations, management and administration)	women have less (in parallel acquired) skill variety
<b>Huber et al. (2014)</b>	Teams (of students participating in entrepreneurship education) consisting of members with high skill variety show higher performance than teams with specialized members, even if a variety of specialized skills is combined.	Quantitative (different regression techniques)	Field experiment with 179 teams	Netherlands	-equal mathematical and verbal abilities as indication of skill variety	not reported
<b>Hyytinen and Ilmakunnas (2007a)</b>	Employees that have skill variety are more likely to do job switching as well as entrepreneurial aspirations.	Quantitative (probit regression)	Quality of Work Life Survey	Finland	-number of different fields of occupation (1, if number is greater than 3; 0 otherwise)	not reported

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Hyytinen and Ilmakunnas (2007b)</b>	Paid employees with varied work experience as well as those having worked as an entrepreneur in the past are more likely to have entrepreneurial aspirations.	Quantitative (probit regression)	Quality of Work Life Survey	Finland	- dummy: 1, if worked in more than three clearly different occupations	not reported
<b>Kucel and Vilalta-Bufi (2016)</b>	Skill variety does not significantly influence the probability to become an entrepreneur.	Quantitative (Heckman selection model)	Survey of tertiary graduates	Spain	-number of skills in which individual excels, e.g. analytical thinking, ability to perform well under pressure	not reported
<b>Lazear (2003)</b>	First theory development on skill balance. Number of job roles are decisive for being an entrepreneur, the number of prior employers plays no role. Prior job roles reflect skill variety and the willingness to acquire skill variety. Results also hold true for intrapreneurs (upper management).	Quantitative (logistic regression)	Stanford alumni data	USA	-number of prior job roles held -number of prior employers	not reported
<b>Lazear (2004)</b>	It is found that those who end up being entrepreneurs study a more varied curriculum than do those who end up working for others. CPS data show that entrepreneurs are rather generalists and do not have technical backgrounds on average.	Quantitative (logistic regression)	2002 CPS data and Stanford alumni data	USA, Germany	-difference between the number of courses taken in the student's field of specialty and the average number of courses taken in other fields. "Field of specialty" is defined simply as the field in which the student took the largest number of courses.	not reported

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Lazear (2005)</b>	As in Lazear (2003).	Quantitative (logistic regression)	Stanford alumni data	USA	-number of prior job roles held -number of prior employers	not reported
<b>Lazear (2012)</b>	Skill variety (wide range of job experiences) is associated with later leadership roles, not necessarily higher income.	Quantitative (logistic regression)	Stanford alumni data	USA	-number of prior job roles held	not reported
<b>Lechmann and Schnabel (2014)</b>	First, entrepreneurs really have more tasks to fulfill (test of Lazear's premises). Second, entrepreneurs only partially have more skill variety. Besides broad skill variety, expert skills are important, too.	Quantitative (different regression techniques)	BIBB/BAuA Employment Survey of the Working Population	Germany	-changes of profession -number of different kinds of professional training	not reported
<b>Li and Zhang (2007)</b>	China's high technology ventures that have managers with skill variety are more successful.	Quantitative (OLS)	Randomly selected 300 new technology venture	China	-functional job experience five functional areas: marketing, sales and promotion, accounting, controlling and finance, R&D and engineering, production, personnel	not reported
<b>Mahé (2016)</b>	Return migrants are likely to opt for self-employment. This is due to skill variety (occupation and jobs). Variety in sectors is not helpful, here, industry specialization is more important.	Quantitative (SEM)	Egyptian Labour Market Panel Survey	Egypt	-number of jobs held -number of sectors worked in -number of occupations worked in	not reported



Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Marino et al. (2012)</b>	Workforce educational skill variety (over a company) promotes entrepreneurial behavior of employees as well as the formation of new firms.	Quantitative (OLS)	Integrated Database for Labor Market Research	Denmark	-index on the highest degrees of employees (on a company level)	not reported
<b>Moog et al. (2015)</b>	Skill variety positively affects the intention to become an entrepreneur, in cases where organizational peers have entrepreneurial ideas and where the working time is balanced between different academic activities.	Quantitative (ordered probit regression)	Data from 480 Swiss and German life sciences researchers	Switzerland	-number of job roles held (e.g. patenting, publication, teaching, ...) -working time balance (e.g. teaching, academic administration, research, ...)	women have more skill variety
<b>Oberschachtsiek (2012)</b>	Having skill variety is an important factor for the longevity of self-employment.	Quantitative (different regression techniques)	Bridging allowances Lueneburg	Germany	-number of different fields of occupation (purchase, services, production, trade/installation, marketing/sales and administration)	no differences
<b>Oberschachtsiek (2013)</b>	Skill variety increases the probability of becoming a nascent entrepreneur.	Quantitative (different regression techniques)	Telephone-based survey, representative of overall population	Germany	-number of tasks performed in different professional fields	not reported

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Obschonka et al. (2016)</b>	Age appropriate skill variety (competencies) mediate the relation between an entrepreneurial personality and intentions as well as alertness. The variety approach yields significant results, but not better results than the single indicators together.	Quantitative (SEM)	Mind the gap (data from schools)	Finland	-count index over early entrepreneurial competencies (leadership, self-esteem, creativity, proactive motivation)	women have less skill variety
<b>Orazem et al. (2010)</b>	Students with more diverse academic programs are more likely to enter entrepreneurship. Along the individual career, the importance of academic diversity declines, while the diversity of work experiences become more important.	Quantitative (different regression techniques)	Iowa State University Graduates Survey	USA	-difference between the number of courses taken in the student's major and the average number of courses taken in other fields -number of different occupational experiences since graduation -number of different industries since graduation	women have less educational and work skill variety
<b>Peltonen and Arenius (2016)</b>	Skill variety in terms of work experience diversity is important for the first entry into entrepreneurship. High cognitive ability is negatively associated with the entry in entrepreneurship, not so for people with skill variety.	Quantitative (different regression techniques)	FLEED	Finland	-employer diversity -industry diversity	not reported
<b>Ryota and Kazuyuki (2013)</b>	Broad job categories (within few companies) are important for entrepreneurial success.	Quantitative (multinomial probit regression)	RIETI 2012	Japan	-number of companies -number of job categories	not reported

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Spanjer and van Witteloostuijn (2017)</b>	Skill and knowledge variety is found to be positively associated with performance up to a certain threshold. After this threshold, an increase in an entrepreneur's experiential diversity lowers performance (inverted U-shape).	Quantitative (different regression techniques)	US National Labor Survey Youth 1979 and O-net	USA	-number of skills linked to an entrepreneur's past jobs -number of knowledge fields associated with the entrepreneur's past jobs	women have less skill variety
<b>Spiegel et al. (2013)</b>	Single founders do not have more skill variety than co-founders, but co-founders have complimentary skills within their teams.	Quantitative (Chi-2)	CrunchBase and LinkedIn	USA	-number of prior jobs held	not reported
<b>Stenard and Sauermann (2016)</b>	People, who are voluntarily mismatched (from an education perspective) in their jobs, have a higher probability to become entrepreneurs. This effect is partially mediated by skill variety.	Quantitative (logistic regression)	SESTAT	USA	-diversity of work activities (e.g. accounting and finance, employee relations, management, production and operations, ...)	women have less skill variety
<b>Stuetzer et al. (2012)</b>	Entrepreneurs who exhibit skill variety undertake more gestation activities towards a new venture.	Quantitative (different regression techniques)	Thuringian Founder Study	Germany	-functional job experience five functional areas: marketing, sales and promotion, accounting, controlling and finance, R&D and engineering, production, personnel	not reported

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Stuetzer et al. (2013a)</b>	Active founders are investigated. Work skill variety is shown to be more important for entrepreneurial skills than traditional human capital variables.	Quantitative (OLS)	Thuringian Founder Study	Germany	-functional job experience five functional areas: marketing, sales and promotion, accounting, controlling and finance, R&D and engineering, production, personnel	not reported
<b>Taylor and Greve (2006)</b>	Skill variety of creators has positive influence on collector value of comic books, especially for single creators.	Quantitative (OLS)	Comic books published from 1972 through 1999	Worldwide	-number of genres a creator has worked in	not reported
<b>Wagner (2003)</b>	Both number of changes in profession and number of different professional trainings predict being self-employed. The number of different trainings is more important though.	Quantitative (probit regression)	BIBB/IAB, Strukturhebung 1998/1999	Germany	-number of changes in profession -number of different kinds of professional training (after completing school)	not reported
<b>Wagner (2005a)</b>	For nascent entrepreneurs, both the number of professional fields as well as the number of professional degrees have a significant positive effect. For infant entrepreneurs, only the number of professional degrees matter.	Quantitative (rare event logistic regression)	Regional Entrepreneurship Monitor Germany	Germany	-number of professional fields of experience -number of professional degrees	not reported
<b>Wagner (2005b)</b>	Both necessity and opportunity entrepreneurs differ from employees with respect to the number of professional fields of experience as well as number of professional degrees.	Quantitative (rare event logistic regression)	Regional Entrepreneurship Monitor Germany	Germany	-number of professional fields of experience -number of professional degrees	not reported

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Wagner (2006)</b>	The probability of being a nascent entrepreneur is dependent on the number of fields of experience and the number of professional degrees.	Quantitative (rare event logistic regression)	Regional Entrepreneurship Monitor Germany	Germany	-number of professional fields of experience -number of professional degrees	not reported

Lazear's (2005) results also hold true for intrapreneurship. On average, the upper management shows more skill variety than employees. This also applies to principle investigators of research collaborations (Boehm et al., 2012) and managers in open source projects (Giuri et al., 2008). The relation between intrapreneurship and skill variety was expanded by Li and Zhang (2007), who showed that Chinese high technology companies lead by managers with more skill variety are more successful.

Overall, 41 studies were found that followed Lazear's initial approach and studied skill variety and entrepreneurial choice in different country and measurement settings. For Germany, Wagner (2003) brought up first evidence that work-related skill variety predicts self-employment entry. Later, Wagner expanded his analysis on nascent and infant entrepreneurs as well as necessity- and opportunity-driven entrepreneurship (Wagner 2005a, Wagner 2006). He confirmed the high relevance of skill variety for entrepreneurial choice in all cases. Lechmann and Schnabel (2014) could only find partial support for Lazear's concept. They find that expert skills also play a major role for the entry in self-employment.

Most studies following Lazear have been carried out in the US (11). Most prominently, Chen and Thompson (2016), who analyzed data from the largest professional social networking websites, confirmed the importance of skill variety, but also acknowledged the importance of single factors, such as management experience. Hartog et al. (2010) found no relation between skill variety and entrepreneurial choice. Lazear's concept has been originally developed for single founders, rather than teams. Even so, Spiegel et al. (2013) revealed that there are no major differences between single and co-founders with regard to skill variety. Furthermore, it has been shown that skill variety is important for profit and non-profit entrepreneurs (Cho et al., 2014) as well as for inventors with science and engineering degrees (Elfenbein et al., 2010). Skill variety has also been shown to be a mediator between educational mismatch and the propensity to become an entrepreneur (Stenard and Sauermann, 2016). Here, an educational mismatch is a person that does not work in a job according to his or her formal qualification. Skill variety also mediated the relation between risk aversion and entrepreneurial choice, surprisingly turning the negative effect of risk aversion around (Hsieh et al., 2017). Besides the US and Germany, the relation between skill variety and entrepreneurial choice has also been investigated in Scandinavia (e.g. Marino et al., 2012) and other European countries, such as Italy (Silva, 2007) and the Netherlands (Hsieh et al., 2017). Overall, studies report a high importance of skill variety for the entrepreneurial choice. Only in a few studies this importance

could not be confirmed. This is at least in part due to the different operationalizations of skill variety and will be discussed in subsection 2.3.6.

Skill variety has also been studied in regard to entrepreneurial intentions or aspirations, as a precursor of entrepreneurial behavior. It depends on the sample, if it is appropriate to study entrepreneurial intentions. Studying a sample of employees or a sample of students that have not completed the transition to working life leaves no other choices than using an intention based outcome variable. There are two studies examining the relationship between skill variety and entrepreneurial intentions of students. First, Obschonka et al. (2016) show that a variety of age-appropriate competencies mediates the relationship between an entrepreneurial personality and entrepreneurial intentions/alertness. Second, Backes-Gellner and Moog (2013) emphasize that variety in academic and work-related skills foster entrepreneurial intentions. Studies analyzing employee samples also report the high relevance of skill variety for entrepreneurial intentions (Hyytinen and Ilmakunna 2007a, 2007b). Moog et al. (2015) only find skill variety to be relevant for entrepreneurial intentions of scientists, if their peers have entrepreneurial ideas and their working time is balanced.

### *Entrepreneurial success*

The concept of skill variety was not only investigated with regard to entrepreneurial choice, but also to entrepreneurial success (as intended by the original model of Lazear). Entrepreneurial success can be accounted for in various ways (e.g. income, firm survival). In the following, the main results of the 24 identified articles will be presented, ordered by the measurement of entrepreneurial success.

First, there are studies looking at the relationship between skill variety and income as a proxy for entrepreneurial success. The results are somewhat mixed. There are studies that report a positive effect of skill variety on income. With German data, Bublitz and Noseleit (2014) show that skill variety has a positive effect on income both for entrepreneurs as well as employees in small businesses. Åstebro et al. (2011) with Korean data and Hartog et al. (2010) with US data report higher incomes for entrepreneurs with skill variety, not so for employees with skill variety. Spanjer and van Witteloostuijn (2017) find a U-shaped relation between skill variety and income for US entrepreneurs. Upon a certain threshold, skill variety has a positive impact on income, before it begins to lower the performance of entrepreneurs. Åstebro and Thompson (2011) as well as Åstebro and Yong (2016) find that skill variety has a negative impact on income for both entrepreneurs (800 Canadian inventors) and employees.

Lechmann and Schnabel (2012) report the same negative correlation with data from the German BIBB 2006. Dencker et al. (2015) use job creation as a success indicator. They find negative implications of skill variety on job creation. At the same time, entrepreneurs with skill variety are able to operate their firms with less employees (probably due to their own capabilities).

Second, there are studies looking at the relationship between skill variety and firm survival. Again, the results are mixed. For example, Oberschachtsiek (2012) shows (with German regional data) that skill variety is positively associated with firm survival. Hessels et al. (2014) also find entrepreneurs with more skill variety to persist longer in the market. Interestingly, this relation is mediated by innovations within the firms. On the other side, both Brixy et al. (2012) and Faila (2015) report a negative impact of skill variety on firm survival.

Third, there are studies analyzing the relation between skill variety and the progress of a (nascent) venture. Building on data from the Thuringian Founder Study, Stuetzer et al. (2012, 2013b) find skill variety to be important for the process of venture creation. The process of venture creation is measured by the number of gestation activities (such as talking to customers or product development) undertaken by the founders. Furthermore, entrepreneurs with more skill variety tend to need less time to complete innovative projects (Bublitz et al., 2015). On the other hand, having less skill variety can be compensated for by locating a business in an agglomeration, probably because it is easier to find employees that complement the skill set of the founder.

Fourth, there are studies associating skill variety with different entrepreneurial competencies. Stuetzer et al. (2013a) find skill variety to be a predictor of entrepreneurial competencies, such as the discovery of business opportunities or resource allocation. Interestingly, Lazear (2012) expands his model of skill variety on leadership both theoretically and with the Stanford alumni data. Skill variety indeed predicts subsequent leadership roles in working life. Further, Åstebro and Yong (2016) report a positive relationship between skill variety of founders and invention quality. Fleming et al. (2007) highlight the importance of skill variety of inventors for generative creativity.

### **2.3.4 Literature with a focus on determinants of skill variety**

Literature focusing on the determinants of skill variety is summarized in Table 2-3. Table 2-3 also contains methods, sources and further information on the measurement of skill variety as well as gender and skill variety. This information will be referred to in sections 2.3.5 and 2.3.6.



**Table 2-3: Literature on determinants of skill variety**

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Åstebro and Thompson (2011)</b>	Skill variety is associated with being an entrepreneur in a sample of 800 Canadian Inventors and 300 employees. But skill variety has a negative effect on income for both entrepreneurs and employees. Further examinations show that skill variety might result from a taste for variety rather than a human capital investment strategy.	Quantitative (different regression techniques)	Canadian Innovation Centre	Canada	-different occupational fields of experience (e.g. accounting, farming, marketing and plumbing)	not reported
<b>Hsieh et al. (2017)</b>	Risk aversion might lead individuals to acquire skill variety. There is a positive indirect effect of risk aversion on entrepreneurship. This indirect effect turns the negative direct effect of risk aversion on entrepreneurship into a positive effect overall.	Quantitative (OLS and probit regression)	Dutch research institute SEO	Netherlands	-variety of industries that a given degree major is observed to be used in -spread of grades that individuals achieve across three different secondary school courses	women have less skill variety
<b>Oberschachtsiek (2009)</b>	Taste for variety (desire for entrepreneurial career) and investments in abilities are important for skill variety.	Quantitative (different regression techniques)	Regional Entrepreneurship Monitor Germany	Germany	-number of prior job roles held	women have less skill variety

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Silva (2007)</b>	Skill variety matters for becoming an entrepreneur. Using fixed effect panel techniques, to control for individual unobserved characteristics, reveals that skill variety might be important for the entrepreneurial choice, but more as an innate ability.	Quantitative (Fixed effect panel techniques in logistic regression)	ILFI Survey (Longitudinal Survey of Italian Families)	Italy	-number of prior job roles held	not reported
<b>Stuetzer et al. (2013b).</b>	The performance of nascent entrepreneurs is associated with skill variety (even controlling for other human capital measures). Determinants of skill variety come both from endowments as well as investments. Early career interests, prior work engagement, as well as an entrepreneurial personality are decisive for skill variety.	Quantitative (different regression techniques)	Thuringian Founder Study	Germany	-functional job experience five functional areas: marketing, sales and promotion, accounting, controlling and finance, R&D and engineering, production, personnel	women have less skill variety

Human capital theory (Becker, 1964) argues that individuals purposely invest in their knowledge and skills to obtain financial rewards in terms of wages and salaries. Lazear (2005) adopts these arguments to entrepreneurship, stating that investments in entrepreneurial skill variety should pay off in terms of firm profitability and survival. The purposeful and intentional investment in skill variety to run and succeed as an entrepreneur has been termed investment hypothesis (Stuetzer et al., 2013b). First of all, Silva (2007) questioned this intentionality of skill accumulation. In a fixed effects panel analysis, using longitudinal data on Italian households, he finds that skill variety “only matters as an innate attribute” (Silva, 2007, p. 122). In a sample of Canadian inventors and employees, Åstebro and Thompson (2011) find that both skill variety and entrepreneurship are the expression of a taste for variety. Taste for variety is a label for several personality traits, such as preference for risk and adversity resilience. The acquisition of skill variety driven by innate attributes has been termed as endowment hypothesis (Stuetzer et al., 2013b).

Stuetzer et al. (2013b) investigate different determinants of skill variety from both the investment and the endowment view. First, they find evidence that the age of an early entrepreneurial career interest (as an indicator for purposeful investment strategies) is negatively associated with skill variety. Second, they find entrepreneurial and management experience to be particularly important for skill variety. Moreover, they employ a holistic approach from personality research in associating an entrepreneurial personality profile, based on a Big Five measure, with the development of skill variety. In their view, an entrepreneurial personality profile can be regarded as entrepreneurial talent. They find that an entrepreneurial personality profile is an important factor for the development of skill variety. Hsieh et al. (2017) expand the endowment view by using the personality factor of risk aversion. Interestingly, risk aversion leads to more skill variety (probably as a protection against labor market insecurities).

Overall, it can be argued that individuals with a taste for variety or an entrepreneurial talent choose broad educational curriculums or choose professions that allow the accumulation of skill variety, such as work in small and young companies, management or self-employment. As Lazear (2003) states, “Going into any job, individuals with a broader range of skills, acquired either through investment or through endowments, are more likely to be entrepreneurs”. It will remain an ongoing challenge to include more potential endowment factors in models explaining the development of skill variety.

### 2.3.5 Literature with a focus on gender and skill variety

Tables 2-2 and 2-3 and 2-5 contain information on gender (0 = male, 1 = female) and skill variety (besides their main foci). First, an overview over the main tendency in regard to gender and skill variety is given (see Table 2-4). The information on the relation between gender and skill variety is drawn from correlation tables or regressions with skill variety as dependent variable. Note that many studies reported these results without having a clear focus on gender but used gender only as a control variable in their analysis. Most studies that included the relevant information report a negative relation (17) between gender and skill variety.

**Table 2-4: Overview of relation between gender and skill variety**

<b>Relation between gender (0 = male, 1 = female) and skill variety</b>	<b>Number of studies</b>
Negative relation	17
Positive relation	2
Neutral relation	3
No information available	44

Literature with a clear focus on gender and skill variety is summarized in Table 2-5. Table 2-5 also contains methods, sources and further information on the measurement of skill variety. This information will be referred to in subsection 2.3.6.

**Table 2-5: Literature on gender and skill variety**

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Lechmann and Schnabel (2012)</b>	Skill variety has a negative impact on self-employment earnings, which is insignificant for women. Female employees have less skill variety, this is not true for entrepreneurs.	Quantitative (different regression techniques)	BIBB/IAB, Struktur-erhebung 2006	Germany	-number of changes of profession	women have less skill variety
<b>Lin (2016)</b>	Skill variety does not predict entry in entrepreneurship and does thus not explain the gender gap in entrepreneurship.	Quantitative (different regression techniques)	Wharton School of Business Alumni	USA	-number of previous employers	women have less skill variety
<b>Strohmeier et al. (2014)</b>	Ventures headed by men tend to exhibit a greater scope of innovation. This is partially due to less female skill variety.	Quantitative (hierarchical poisson regression)	Data from 300 male and 600 female highly-educated entrepreneurs	Germany	-number of professional degrees completed after school -number of occupational and job changes -number of professional trainings	women have less skill variety

Reference	Main Content/Results	Method	Data source	Country	Measure of skill variety	Female
<b>Tegtmeier et al. (2016)</b>	Theoretical adjustment of Lazear's theory (other motives than income maximization). Skill variety is important for women's entry decisions, only the number of occupational fields is not significantly related to entrepreneurial choice.	Quantitative (logit regression)	Sample of 1384 women graduates	Germany	-additional professional trainings -confidence in 19 distinct entrepreneurial tasks (e.g. identifying the need for a new product) -number of industries worked in -number of different occupational fields of experience (e.g. accounting, marketing)	only female in database
<b>Tonoyan et al. (2009)</b>	Women have less skill variety over all four operationalizations. Interaction effects show that skill variety is more important for men than for women concerning the transition into entrepreneurship. Overall, skill variety explains substantial part of the gender gap in entrepreneurship.	Quantitative (rare event logistic regression)	BIBB/IAB data (1998-1999)	Germany	-number of professional degrees completed -number of occupational and job changes -number of professional trainings	women have less skill variety
<b>Wagner (2007)</b>	Fields of experience are important for the entrepreneurial choice of both sexes. For men, especially the number of professional degrees is more important than for women. Overall, women score lower on both skill variety measures.	Quantitative (rare event logistic regression)	Regional Entrepreneurship Monitor Germany	Germany	-number of professional degrees -number of different occupational fields of experience	women have less skill variety

The relation between gender and skill variety can be approached from two points of view. First, it is an interesting question, whether skill variety is also important for women entrepreneurship (moderation analysis). As shown above, skill variety is important for both the entrepreneurial choice as well success. However, most studies investigating skill variety use datasets that mainly consist of male entrepreneurs which reflects the general distribution of the gender of entrepreneurs. Less is known whether skill variety matters for female entrepreneurs too. Wagner (2007) was the first to address this particular research question. He found that skill variety is important for the entrepreneurial choice of both sexes (even though female have less skill variety). Tegtmeier et al. (2016) use a sample of female entrepreneurs and employees to show that skill variety is important for the female entrepreneurial choice. They also make some theoretical adjustments of Lazear's (2005) theory. Lazear's main argument for the occupational choice is lifetime income maximization. For women other factors (that are associated with entrepreneurship), e.g. self-fulfillment, family flexibility or social impact, are theorized to lead to skill variety.

The second question is, whether women have less skill variety than men and if this fact can explain entrepreneurial choice, success or other outcomes, such as innovativeness (skill variety as mediator). Here, most studies focus on the gender gap in entrepreneurship, which is the observed tendency that men are more likely to become an entrepreneur, to persist as an entrepreneur and to earn more in entrepreneurship than women. As explained above, Wagner (2007) found women to have less skill variety than men, but skill variety is a rather small part of the explanation of the gender gap in entrepreneurship. He finds fear of failure to be a stronger mediator. With a sample of Warton business school alumni, Lin (2016) also reports no significant mediation of the gender gap over skill variety. In contrast, Tonoyan et al. (2009) find skill variety to be a strong explanation of the gender gap in entrepreneurship. Round about 30% of the gender gap is explained by different skill variety measures (German BIBB data are employed). Lechmann and Schnabel (2012) address the question if skill variety might be an explanation of the gender earnings gap in entrepreneurship. Findings from German BIBB data suggest that skill variety has a negative impact on self-employment earnings (this result is against Lazear's (2005) theoretical model but in line with the findings from Åstebro and Thompson (2011)). This effect is insignificant for women, though, which means that there seem to be other more decisive factors for women self-employment earnings. Here, working time differences between the sexes are found to explain about 25% of the gender earnings gap in

entrepreneurship. In contrast, Stromeier et al. (2014) report skill variety to explain substantial part of the gender innovativeness gap in entrepreneurship.

### 2.3.6 Overview of measures of skill variety and methodological challenges

In the following, the studies under review are analyzed with regard to the operationalization of skill variety. Please note that several studies of the 66 studies under investigation use different measures of skill variety at the same time (see Table 2-6 for an overview). Overall, 92 different measures are employed.

#### *Measures of skill variety*

**Table 2-6: Measurement of skill variety**

Different measures of skill variety	Number of studies using measure
Number of prior job roles/professions	27
Count over specific skills/knowledge	14
Functional job experience	11
Number of prior industries	9
Number of prior employers	8
Number of professional degrees	6
Number of professional trainings	5
Difference between college major and other courses	3
Number of different work statuses	2
Spread of college grades	1
Number of industries a degree can be used in	1
Number of commercial activities	1
Number of research activities	1
Number of different parallel work experiences	1
Years in paid employment	1
Management education	1



Human capital (also skill variety as a special form of human capital) consists of knowledge and skills that might be acquired through education or on the job. As argued in the introduction, a direct measure of human capital (outcome-based) is preferable over an investment-based measure that can only serve as a proxy for human capital, here skill variety. In this review, 14 out of 67 studies were identified that used direct measures of skill variety. There are a number of studies that use count variables on different general skills or abilities (e.g. law, math or handcraft) as measures for skill variety (e.g. Bublitz and Noseleit, 2014; Huber et al., 2014). Other studies use count variables on skills more specific to entrepreneurship. Tegtmeier et al. (2016) use a confidence measure in 19 entrepreneurship specific tasks (e.g. identifying the need for a new product). Further, Obschonka et al. (2016) employ a count index on different early entrepreneurial competencies (e.g. leadership, self-esteem or creativity). Even though a direct (outcome-related) measure of skill and knowledge is preferable, it is not easy to decide which skills are relevant for entrepreneurship. Not all forms of variety might be conducive to entrepreneurial behavior or success.

Most studies (58) under investigation use investment-related skill variety measures. Lazear (2003, 2004 and 2005), who brought up the concept of skill variety in entrepreneurship, uses the number of different job roles as a proxy for skill variety. A related measure is functional job experience, which is for example used by Stuetzer et al. (2013b). Here, different functional areas (e.g. marketing, production, accounting and personnel) are set and the respondents have to decide in which they have work experiences. One major difference to the number of job roles is that one can have different functional experiences within one job role. For example, a tax manager (one specific job role) has experiences in leadership (personnel) and at least in accounting. Other frequently used skill variety proxies are the number of employers or industries as well as professional degrees and trainings.

The majority of skill variety measures is work-related. There are only three studies that employ an academic skill variety measure (Cho and Orazem, 2014; Lazear, 2004; Orazem and Jolly, 2010). Here, the differences between the courses taken in a college major and courses taken in other fields is used. Hsieh et al. (2017) use the spread of grades and the number of industries a degree can be used in. Overall, skill variety is in most cases inconsistently measured with different proxy variables. The results of the present studies are thus difficult to compare. It is convincing that the number of job roles predicts entrepreneurial choice, because it reflects conducting diverse tasks in different positions, as needed in entrepreneurship. The number of employers might thus not only reflect different tasks and experiences but also personal

differences between the employers and the specific employee. Nevertheless, proxy measures have the common problem that the measures might capture part of the concept under investigation but also other aspects of variables not under investigation.

### *Methodological challenges*

The determination of the influence of human capital measures (e.g. skill variety) on entrepreneurial outcome variables (e.g. entrepreneurial intentions or choice) is difficult. As argued above, there are problems related with an indirect measurement of human capital. Beyond that, scholars investigating the relation between human capital and entrepreneurial outcomes have to take the issue of endogeneity into account (Van der Sluis et al., 2008). Neglecting endogeneity can lead to unreliable estimation results (Block et al., 2012). Endogeneity means that an explanatory variable is related to the errors of the model. This relation can be caused, among other things, by omitted variables, measurement errors or reverse causality (Kennedy, 2008). Using instrumental variables regressions, it has been shown that education is endogenous to entrepreneurial choice (Block et al., 2013) and performance (Parker and Van Praag, 2006).

At this point, I summarize issues of endogeneity in the relation of skill variety and individual entrepreneurial intentions (as investigated in chapters 3 and 4). One trigger of endogeneity are omitted variables that impact the causal and dependent variables at the same time. The first group of omitted variables concerns the relation between skill variety and individual characteristics. Silva (2007) argues that both the accumulation of skill variety and subsequent engagement in entrepreneurship are influenced by individual unobservables. In a similar vein argue Åstebro and Thompson (2011), who find an individual taste for variety to be a driver of both skill variety and entrepreneurship. Of course, it is not possible to control for all individual characteristics, but I control for openness (as a proxy for a taste for variety), fear of failure and an entrepreneurial personality profile within the empirical chapters of this dissertation.

The second group of omitted variables concerns individual social capital related to the acquisition of skill variety and entrepreneurship. Entrepreneurial peers, such as parents, colleagues or friends, can be regarded as role models that influence entrepreneurial intentions, but also educational or work-related experiences (e.g. Bosma et al., 2012a; Obschonka et al., 2011). I control for entrepreneurial parents within the empirical chapters of this paper. As argued above, other role models might also exert substantial influence, which means the

estimate of skill variety in the entrepreneurial intention regression might be biased. Parents might also influence their children through other channels. For example, they might provide financial securities that enable the offspring to acquire skill variety and develop entrepreneurial intentions (Bosma et al., 2012a). Without financial securities children might rather choose a more specialized education and follow a straighter career leading to less skill variety and low entrepreneurial intentions.

The third group of omitted variables goes back to different motivations for having entrepreneurial intentions. The literature distinguishes to different motivations: necessity and opportunity entrepreneurship. Opportunity entrepreneurship pursues promising business ideas, whereas necessity entrepreneurship is driven by a lack of alternatives (Block and Sandner, 2008). Individuals with bad prospects in the labor market (necessity) might see entrepreneurship as the alternative for earning their living and thus develop entrepreneurial intentions. These individuals might also have low levels of skill variety due to low levels of schooling and work experience as unskilled workers. On the contrary, individuals with business opportunities in mind might also develop entrepreneurial intentions. These individuals rather have high levels of skill variety because skill variety is related to the detection and exploitation of business opportunities (e.g. Lazear, 2005).

Other triggers of endogeneity are measurement errors and reverse causality. Measurement errors in skill variety might lead to a misinterpretation of the effect on entrepreneurial intentions because they lead to variation in skill variety that has no effect on entrepreneurial intentions. As explained above, studies conducted so far use different proxy measures for skill variety. Arguably, this makes the results hard to compare, but it also weakens the validity of predictions on the relationship (of these skill variety measures) with entrepreneurial outcomes. Reverse causality means that the relation between the causal and dependent variables works the other way round as expected. In this dissertation, I hypothesize that skill variety (as a human capital factor) leads to entrepreneurial intentions. It could also be argued that individuals acquire skill variety because they have entrepreneurial intentions (as a preparation for the job). To account for this, I used different skill variety measures that were assessed at different points of career. First, an early measure of skill variety during school was employed (variety interest in subjects). Second, I used two variety indices over different educational and work experiences acquired in tertiary education or on the job. Furthermore, I took an early variety orientation into account that comprises having different hobbies and

interests at school. At this early point in life, it is not plausible that adolescents acquire skill variety because of their (early) entrepreneurial intention.

## 2.4 Summary and open research questions

This chapter provides an overview on the existing research on skill variety in entrepreneurship. The concept of skill variety has first been brought up by Lazear in 2003. The focus of most of the studies since Lazear's pivotal study lies on the outcomes of skill variety. It is comprehensible that studies seek to investigate the outcomes of a new concept first, followed by an analysis of the determinants afterwards. Academic research on skill variety is still in its infancy. Even though skill variety is a promising concept in entrepreneurship research, especially with regard to the entrepreneurial choice, few studies have focused on determinants of skill variety. In the following, the central results of this review are summarized and a number of open research questions are derived (based on the structure of this review: outcomes of skill variety, determinants of skill variety, gender and skill variety and measurement of skill variety).

This literature review has identified a number of research priorities in regard to outcomes of skill variety. Entrepreneurial choice was identified to be a central outcome of skill variety. Most studies under review find skill variety to be an important driver of the entrepreneurial choice over different countries. This is true for profit and non-profit entrepreneurs (Cho et al., 2014), single and co-founders (Spiegel et al., 2013). Further, skill variety is important for entrepreneurial intentions, often a precursor of the entrepreneurial choice. Entrepreneurial intentions of both students and employees are predicted by skill variety (e.g. Obschonka et al., 2016; Hyytinen and Ilmakunna, 2007a, 2007b). Entrepreneurial success has been identified as another outcome of skill variety. Here, entrepreneurial success can be accounted for in different ways (e.g. firm growth, income, firm survival or innovativeness). Results on the impact of skill variety on entrepreneurial success are somewhat mixed. Skill variety plays a negative role for success factors, such as income or firm survival (e.g. Åstebro and Thompson, 2011), or the relationship could be U-shaped (Spanjer and van Witteloostuijn, 2017). This means skill variety is only conducive to the entrepreneurial success upon a certain threshold. Other success measures, such as innovativeness (Åstebro and Yong, 2016), progress within a venture (Stuetzer et al., 2012) or entrepreneurial competencies (Stuetzer et al., 2013a) are strongly correlated with skill variety.

The results on skill variety and its relation to success measures should be considered with a look on potential determinants. As theorized by Lazear (2003), skill variety is acquired

intentionally for the purpose of income maximization. This obviously clashes with the results discussed above on skill variety and success measures. But research conducted by Silva (2007) or Åstebro and Thompson (2011) questions this intentionality and presents evidence that the acquisition of skill variety might be more depended on endowments, such as an entrepreneurial talent or a taste for variety. Given individuals acquiring skill variety for the sake of satisfying their taste for variety and subsequently choosing entrepreneurship as a profession for the same reason, it is quite comprehensible that such an individual is not a successful entrepreneur on average. This is especially true for financial success measures. In other terms, if someone pursues entrepreneurship or other jobs with high skill variety because of a taste for variety, this person might accept lower earnings in exchange for non-financial gains such as fulfillment of his or her life plan.

It thus seems to be of the highest priority to understand how and why individuals acquire skill variety. Equipped with knowledge on the determinants of skill variety and the underlying intentions to acquire skill variety, the research community can gain a better understanding of the appropriateness of using specific indicators of entrepreneurial success.

Related to the argument above, another important research area might be to explore at what point in time individuals start to acquire skill variety. Most studies measure skill variety at some point in adult life, which is reasonable because task-related human capital, especially skill variety, can be best acquired at work. However, a few studies showed that a varied university curriculum also predicts entrepreneurship (e.g. Lazear, 2005). Even fewer studies find that factors in adolescence (e.g. Obschonka et al., 2016 and Stuetzer et al., 2013) either are correlated with subsequent skill variety or entrepreneurial outcomes. Correlations with early factors in adolescence should however be expected, if one accepts that certain endowments, as argued for example Åstebro and Thompson (2011) and Silva (2007), are important drivers of the acquisitions of skill variety. Given these scant findings, there is a big research gap on when the skill accumulation process starts and which factors influence early precursors of later skill variety. This research gap is surprising because it is well-known that skill acquisition is a cumulative process, building on knowledge acquired in earlier stages of life (Cunha and Heckman, 2007). For this reason and for the reason of understanding how policy makers and entrepreneurship educators can foster skill variety, it is necessary to explore to role of endowments (e.g. personality factors or entrepreneurial peers) in the process of skill acquisition in adolescence.

A substantial gender gap in entrepreneurship can be observed both in regard to entrepreneurial choice (Kelley et al., 2015) and success (e.g. Wagner, 2007). Scholars have investigated different potential mediators for the gender gap in entrepreneurship. Disadvantages in raising financial capital (e.g. Verheul and Thurik, 2001), personality differences (e.g. Obschonka et al., 2014) and differences in social networks (e.g. Klyver, 2011) have been analyzed recently. So far, there is no clear evidence from a human capital perspective on the gender gap (Cowling and Taylor, 2001). Studies analyzing the outcomes and determinants of skill variety report negative correlations of being female with different skill variety measures. Still, the effect of skill variety on entrepreneurial outcomes seems to be robust for both sexes (e.g. Tegtmeier et al., 2016). Beyond that, there are a few studies investigating skill variety as a mediator for the gender gap in German entrepreneurship (e.g. Tonoyan, et al., 2009; Wagner, 2007). The studies conducted so far show mixed evidence. Thus, further studies should be carried out to explore the mediating role of skill variety in entrepreneurship in different country settings. A related research question should be raised on differences in skill variety measures over the educational trajectory. It is theoretically plausible that women have less work-related skill variety (e.g. due to discrimination in the labor market). But, as mentioned above, skill acquisition is a cumulative process, building on knowledge acquired early in life (Cunha and Heckman, 2007). Thus, it should be also explored, if there are gender differences in (early) educational skill variety measures.

Regarding the operationalization of skill variety, it can be summarized that the studies conducted so far use work-related proxies as a measurement for skill variety (e.g. number of job roles held, number of industries worked in and number of professional degrees). Some studies use variety measures over different (entrepreneurship-) specific skills (e.g. Tegtmeier et al., 2016). This makes it difficult to compare the results of the present literature. Further, human capital consists of skill and knowledge acquired through schooling or on the job training (Becker, 1964). It thus seems to be important to expand the current work focus of this literature stream to an education view. More education-related measures of skill variety should be combined with work-related measures. If studies use outcomes of human capital (direct measurement), there is no consensus on which skills should be taken into account. Some scholars use entrepreneurial competencies (e.g. Obschonka et al., 2016; Tegtmeier et al., 2016) and some use general abilities (e.g. Bublitz and Noseleit, 2014).

This literature review shows that skill variety is a promising concept in entrepreneurship research. Especially in regard to the entrepreneurial choice, skill variety seems

to be a better explanation than general human capital measures. In this review, two major research gaps were identified and it is the intention of this thesis to shed some light on the two issues. First, the role of potential determinants of skill variety with a focus on adolescence will be investigated in the next chapter. Further, an early variety orientation in adolescence is taken into account as a precursor of skill variety. Second, there will be an analysis of the role of gender in relation to skill variety. The measurement of skill variety will be carried out from a work and an education perspective.

### 3 Origins and development of skill variety<sup>2</sup>

#### 3.1 Introduction

Why do some people become entrepreneurs while others stay in paid employment? A great deal of research investigating this question has focused on human capital (Davidsson and Gordon, 2012; Unger et al., 2011). According to Becker (1964), human capital is composed of knowledge and skills that are acquired through schooling, on-the-job training and other kinds of experience. However, a recent meta-analytical study reported low correlations between traditional human capital variables (such as same industry experience, years of working experience or years of managerial experience) and entrepreneurial engagement and success (Unger et al., 2011). One reason for this disappointing finding might be the focus on human capital measures that do not capture the nature of the entrepreneurial task, which consists of a wide variety of tasks in order to set up and run a business (Davidsson, 2006; Lazear, 2005). Searching for a distinctive set of entrepreneurial skills and abilities that matches the profile of the entrepreneurial task, Lazear (2005) introduced a theoretical model featuring a varied skill set for entrepreneurs. He argues that because entrepreneurs perform many different tasks, they should be multi-skilled in various areas; for example, developing a business model, talking to customers and negotiating with suppliers. A wide range of papers have found empirical support for the hypothesis that individuals with a varied skill set are more likely to become entrepreneurs than those with a specialized skill set (Åstebro and Thompson, 2011; Chen and Thompson, 2016; Hsieh et al., 2017; Lazear, 2005; Silva, 2007; Wagner, 2006).

While we now know a good deal about the effects of skill variety, we know astonishingly little about the determinants of skill variety. Two schools of thought have emerged to explain the process of the accumulation of skill variety that have been coined the investment and the endowment view. On the one hand, proponents of the investment view argue that individuals purposely invest in skill variety by, for example, switching jobs and working in different fields (Lazear, 2005). On the other hand, proponents of the endowment view question the intentionality of skills acquisition. In particular Åstebro and Thompson (2011) and Silva (2007) argue that the process of skill acquisition and ultimately the decision to become

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<sup>2</sup> Chapter 3 is based on a working paper written in conjunction with Michael Stuetzer, Martin Obschonka and Katariina Salmela-Aro. This working paper was presented at the G-Forum 2016 in Leipzig as well as at the Babson College Entrepreneurship Research Conference 2017 in Norman, OK and the Annual Meeting of the Academy of Management 2017 in Atlanta, GA.



an entrepreneur is driven by stable personal characteristics such as “taste for variety” or “entrepreneurial talent”. The few empirical papers provide evidence for both schools of thought. While Åstebro and Thompson (2011) as well as Silva (2007) find empirical evidence for the endowment view, Stuetzer et al. (2013b) finds empirical evidence for both the investment and the endowment view. One caveat of the papers investigating the origins of skill variety is their empirical focus on the time period after the respondents entered the labor market. To the best of my knowledge, there are only few papers investigating the sources of skill variety during adolescence (Obschonka et al., 2016) – a period which is, according to developmental psychologists, pivotal to the accumulation of skills and the formation of vocational interests (e.g. Hartung et al., 2005; Obschonka and Silbereisen, 2012). Given this scant empirical evidence, this chapter aims to make a contribution regarding the formation of skill variety. Here I focus on two research questions: 1) Do early precursors of skill variety exist in adolescence? 2) What are the determinants of these early precursors and subsequent skill variety?

Answering these research questions is also important because there is a controversy in the field of entrepreneurship education over whether entrepreneurship can be taught or whether entrepreneurs are born (Åstebro and Hoos, 2016; Kuratko, 2005). Numerous entrepreneurship education programs have been created in the past decades in schools and universities (Kuratko, 2005). However, few of them have been evaluated in terms of randomized controlled trial, and the empirical evidence of those which have been evaluated casts doubt on the effectiveness of those programs. For example, the Junior Achievement Company Program focuses on students aged 16 to 18 and has been evaluated several times with different results. Oosterbeck et al. (2008) found no treatment effect regarding entrepreneurial skills and even a negative treatment effect on entrepreneurial intentions. Peterman and Kennedy (2003) found a positive treatment effect of the program on the desirability and feasibility of becoming an entrepreneur. Elert et al. (2015) found a positive treatment effect on the probability to become an entrepreneur but not on survival of the business started. Other entrepreneurship programs at schools or in the field fare even worse (Åstebro and Hoos, 2016; Fairlie et al., 2015). My findings regarding the early precursors of skill variety and its determinants can shed some light on which skills could be targeted in entrepreneurship education programs. A better knowledge about how entrepreneurial human capital grows and cumulates is clearly needed.

To tackle both research questions, I use human capital theory (Lazear, 2005) and the competence growth approach from developmental psychology (Masten et al., 2010; Obschonka and Silbereisen, 2012; Schoon and Duckworth, 2012) as theoretical lenses. Following these

perspectives, I investigate whether a variety of early interests and activities in adolescence predicts subsequent variety in skills and knowledge. The variety of early interests and activities is a very broad concept encompassing different hobbies and interest in different school subjects. In that sense, a variety in early interests and activities can also be understood as a variety orientation of adolescents as early, age-appropriate entrepreneurial precursor, thereby representing one of the fundamentals of entrepreneurial human capital growth in adulthood. In contrast, subsequent variety in skills and knowledge is a rather narrow concept purely related to entrepreneurship. I also investigate determinants of skill variety and variety of early interests and activities. In particular, I focus on potential determinants which largely reflect the endowment and the investment view. Regarding the investment view, I study the influence of entrepreneurial parents on the skill accumulation process. It has been long argued that entrepreneurial parents transmit entrepreneurial skills to their children (Chlosta et al., 2012). Entrepreneurial parents might deliberately push their children to acquire a varied skill set because they are aware of the importance of skill variety for entrepreneurial success. The potential impact of entrepreneurial parents on skill accumulation stands in the tradition of Lazear's (2005) investment view.

Regarding the endowment view, I study the effect of personality traits. In particular openness – a Big Five trait – might lead adolescents to be interested in various activities and unintentionally drive the skill accumulation process. Using openness as a potential determinant resembles the “taste for variety” approach (Åstebro and Thompson, 2011). I test whether or not only such a taste for variety, as relatively stable trait, stimulate the growth of entrepreneurial skill variety from adolescence on, but also an entrepreneurial personality structure, reflecting the general *entrepreneurial* disposition of a person that may also drive the growth of entrepreneurial human capital from adolescence on. Using entrepreneurial personality indicators as potential determinant of human capital has been advocated in entrepreneurship research over the past decades (e.g. Schumpeter, 1934; Silva, 2007; Stuetzer et al., 2013b).

I develop a path model describing the serial mediation effect of early variety orientation in adolescence and entrepreneurial skill variety in adulthood between the effect of personality and entrepreneurial parents on the one side and entrepreneurial intentions on the other. I test this model with longitudinal data from the ongoing Finnish FinEdu study, which has collected data in 7 waves covering respondents over a time span of 10 years from ages 16 to 26. Since the study participants were only 26 in the last data collection wave, I focused on entrepreneurial intentions and not entrepreneurial behavior and success as final outcome

variable. The FinEdu study is a leading Finnish research project studying the development of school students and their work outcomes, including entrepreneurial development (Tuominen-Soini & Salmela-Aro, 2014). Structural equation modelling (SEM) was used to test the hypotheses. As expected and consistent with Lazear's skill variety approach, I find that skill variety predicts entrepreneurial intentions (both measured at age 26). Skill variety at age 26 was in turn predicted by an early variety orientation (variety of early interests and activities at age 16) and an entrepreneurial personality profile. It was however not predicted by openness and the presence of entrepreneurial parents. Early variety orientation was predicted by openness, entrepreneurial talent, but not by the presence of entrepreneurial parents. My results are thus more in line with the endowment view on entrepreneurial skills (that gives talent and personality a unique role) but also with the idea that there are early developmental precursors of skill variety (early variety orientation).

This chapter makes several contributions to the field of entrepreneurship in regard to a better understanding of the normative growth processes leading to the formation of skill variety in adulthood. To my knowledge, this chapter is the first to examine this issue by means of prospective longitudinal data (the FinEdu dataset spans from the early formative years to young adulthood). The results inform both human capital theory in entrepreneurship research and the field of entrepreneurship education from a developmental perspective that already figures prominently in general research on human capital (Cunha and Heckman, 2007; Heckman, 2006).

The remainder of the chapter is organized as follows. In subsection 3.2, I develop the hypotheses. In subsection 3.3, I describe the data and the methods used. In subsection 3.4, I present the empirical results which are discussed in subsection 3.5. Subsection 3.6 concludes.

## **3.2 Theory and hypothesis development**

### **3.2.1 Skill variety and entrepreneurial intentions**

Searching for the "essence" of entrepreneurial human capital, Lazear (2005) developed a widely acknowledged model of vocational choice. The author highlights the importance of skill variety for entrepreneurs. In that regard, I see skill variety as having a varied set of skills and knowledge due to working in different functions, having a varied curriculum at school or university and switching employers (Chen and Thompson, 2016). This skill variety pays off in entrepreneurship because entrepreneurs have to perform many different tasks (Lechmann and

Schnabel, 2014) such as developing a business model, hiring first employees, negotiating with customers and acquiring financial capital – to name a few. In contrast, skill variety does not pay off in most paid employment occupations because the tasks that have to be conducted in these occupations are more specialized (Lazear, 2005). Given the advantages of skill variety for the entrepreneurial task, people with a varied skill set are more likely to become entrepreneurs compared to people with no or less skill variety (Åstebro and Thompson, 2011; Chen and Thompson, 2016; Lazear, 2005; Silva, 2007; Wagner, 2006). Skill variety also positively affects the progress of nascent venture projects towards a fully-fledged firm (Stuetzer et al., 2013a) and longevity of the business among entrepreneurs (Oberschachtsiek, 2012).

Entrepreneurial behavior is often argued to be intentional because people invest a considerable amount of time and money in it. It is something people plan or choose to do (Obschonka et al., 2010). In this regard, entrepreneurial intentions are understood as “states of mind that direct attention, experience and action toward a business concept” (Bird, 1988, p. 442). In other words, there is a certain readiness to engage in entrepreneurship (Goethner et al., 2011). Empirical studies have shown that entrepreneurial intentions are a strong predictor of entrepreneurial action (Krueger, 2009; Lee et al., 2011). I argue that because skill variety is very advantageous for entrepreneurship, people with skill variety are aware of the fit between their skill-set and the entrepreneurial task. Accordingly, this readiness in skills should foster the development of entrepreneurial intentions. Empirical support for this reasoning comes from Backes-Gellner and Moog (2013), who show that a broad human capital portfolio positively predicts the disposition to become an entrepreneur. Hence, if skill variety in adulthood is indeed as conducive to entrepreneurship as proposed by Lazear (2005) and indicated by a growing number of studies (Stuetzer et al., 2013a; Wagner, 2006), such skill variety should also predict entrepreneurial intentions. Taken together, my baseline hypothesis H1 states:

*H1: Individuals with more skill variety have stronger entrepreneurial intentions.*

### **3.2.2 Variety orientation in adolescence as precursor of skill variety in adulthood**

If such skill variety is indeed conducive to entrepreneurship it is important to understand where it comes from. Both personal and vocational development clearly begin during childhood. Drawing from developmental psychology, which assumes that past interests and actions influence future choices (Holland and Nichols, 1964), prior studies have related adolescents' early interests with vocational choice (e.g. Hong et al., 1993; Munson and Savickas, 1998; Schmitt-Rodermund and Vondracek, 1999). For example, Hong et al. (1993)

studied vocational choice among Israeli adolescents. They found that for 35% of the participants, the domain of leisure time activities at the age of 17 matched occupation 18 years later. Adolescents can explore occupation-related, age-appropriate activities and thereby develop initial skills or competencies (Obschonka et al., 2012). Furthermore, they acquire career choice attitudes as a precondition for informed career decisions (Munson and Savickas, 1998; Super, 1984). Therefore, childhood and adolescence can be seen as “a period of active precursory engagement in the world-of-work” (Hartung et al., 2005, p. 411).

Connecting the insights from developmental psychology with the development of human capital, I follow the argumentation of Jayawarna et al. (2015), who highlight the importance of human capital accumulation in early stages of life for the formation of human capital in later stages. Human capital acquired in early stages is said to bolster the development of human capital in later stages in a synergistic way. Cunha and Heckmann (2007) describe human capital acquisition as a hierarchical process where “the skills produced at one stage augment the skills attained at later stages” (p. 35). In a similar vein, developmental psychologists argue that the growth in competencies is cumulative – starting in childhood and impacting skills across the life span (e.g. Jordan et al., 2009; Obschonka et al., 2011).

As I am interested in the development of skill variety conducive to entrepreneurship, I extend the models of skill acquisition from focusing on a single skill towards the variety in skills. I argue that adolescents with a variety of early interests and activities (henceforth: early variety orientation) are more likely to acquire more skill variety in later stages. This early variety includes but is not limited to interest in different school subjects, participating in a range of non-curricular activities at school and having different hobbies. While engaging in a variety of activities, adolescents acquire a variety of early skills. Applying the developmental psychology models of competence growth to skill variety, this variety of early skills lays the foundation of future skill variety. This claim is based on learning theories, which argue that acquiring knowledge and improving skills is greatly enhanced by interest and prior knowledge (Hartley, 1998; Tobias, 1994).

Surprisingly, not much research in developmental psychology and economics has been done on this topic. Munson and Savickas (1998) discovered a positive relationship between broad leisure activities and career exploitation behavior among US students. Further supporting arguments can be found in the literature of giftedness. Milgram and Hong (1999) examined highly gifted adolescents in Israel. They found that those with an undifferentiated skill set

(variety) had less differentiated vocational interests. Put differently, individuals with skills concentrated within certain domains had more specific career interests.

Based on the developmental approach to competence growth and human capital theory described above, I hypothesize:

*H2: Individuals, who had a higher variety of early interests and activities in adolescence (early variety orientation) develop more skill variety in adulthood.*

### **3.2.3 Entrepreneurial role models as context-level driver of skill variety**

From a developmental perspective, naturally, the question arises, where variety of early interests and activities comes from. One potential determinant of such an early variety are entrepreneurial parents. Entrepreneurial parents can be regarded as entrepreneurial role models during the early formative years (childhood and adolescence) (Bosma et al., 2012a; Chlosta et al. 2012; Falck et al., 2012; Obschonka et al., 2011). It has been argued that entrepreneurial parents can influence entrepreneurial activities of their children via the transfer of knowledge and skills but also via other paths, such as social capital and financial capital (see for a review Bosma et al., 2012a; Schmitt-Rodermund, 2004).<sup>3</sup> This forms my baseline hypothesis that individuals with entrepreneurial parents have stronger entrepreneurial intentions. In the following, I theorize about the influence of entrepreneurial parents on the development of entrepreneurial human capital and entrepreneurial intentions.

I draw on social learning theory (Bandura, 1986), which explains individual learning by the observation of parental actions and transferring these into one's mental models. These mental models determine the offspring's decisions (Bandura, 1986; Bandura and Walters, 1963; Rosenthal and Bandura, 1978; Rotter et al. 1972), such as the choice of early interests and activities or later occupational choice (Scherer et al., 1989; Schulenberg et al., 1984). As children of entrepreneurs observe that their parents are engaged in very different activities in their firm, they might start to engage in a variety of activities – though arguably at a lower level of intensity and in age-appropriate activities and hobbies (cf. Obschonka et al., 2011). It might also be the case that entrepreneurial parents encourage their offspring to try out different hobbies or activities and thus generate a variety of early interests and activities (early variety). In a similar vein, Chlosta et al. (2012) argue that the children of entrepreneurs are introduced

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<sup>3</sup> Note that entrepreneurial parents can influence entrepreneurial also via genetic heritage in terms of entrepreneurial personality traits. I address the effect of entrepreneurial personality traits separately in my theorizing in subsections 3.2.4 and 3.2.5.

to business methods, develop entrepreneurial values (e.g. striving for independence) and obtain a realistic job preview through their entrepreneurial parents at an early age.

Later on, entrepreneurial parents might more directly influence the acquisition of skill variety by giving their offspring the possibility to work in their firm. By doing so, they can engage in the different tasks in a firm, such as talking to customers, production, or bookkeeping. The direct exposure to these different tasks should foster the acquisition of a varied skill set (Gibson, 2004; Parker, 2009; Stuetzer et al., 2013b).

Thus, I conclude that children of entrepreneurs develop skill variety over the path of an early variety and show stronger entrepreneurial intentions. This leads to the following hypotheses:

*H3a: Individuals with an entrepreneurial parent have stronger entrepreneurial intentions than individuals with no entrepreneurial parents.*

*H3b: Individuals with an entrepreneurial parent have more skill variety than individuals with no entrepreneurial parents.*

*H3c: Individuals with an entrepreneurial parent have more early variety orientation than individuals with no entrepreneurial parents.*

### **3.2.4 Personality as person-level driver of growth in entrepreneurial skill variety**

Beside an early stimulating context, research suggests that also basic personality characteristics such as the Big Five personality traits may drive entrepreneurial human capital growth (Obschonka, 2016; Schmitt-Rodermund, 2004). The five-factor model, which is the predominating personality traits model in contemporary psychological science, refers to five fundamental human traits: neuroticism (anxious and depressive), conscientiousness (hard-working and persisting), agreeableness (cooperative and altruistic), extraversion (cheerful and seeks excitement) and openness (receptivity to new experiences). These Big Five traits have a substantial genetic base and are relatively stable over time (Costa and McCrae, 1992; Roberts et al., 2006). Hence, one can assume that they drive human capital accumulation and not the other way around.

The Big Five traits have been frequently studied in entrepreneurship research (Brandstätter, 2011), including developmental studies suggesting that they indeed drive entrepreneurial competence growth from childhood and adolescence on (Schmitt-Rodermund, 2004, 2007; Obschonka, Silbereisen, & Schmitt-Rodermund, 2011). These studies found that

an entrepreneurial personality profile (intraindividual constellation of the Big Five traits with higher scores in extraversion, conscientiousness and openness and lower scores in neuroticism and agreeableness) drive entrepreneurial competence growth when focusing on single competences. Here, I extend this view by focusing on the variety of competences, following Lazear's (2005) human capital approach.

I argue that two aspects on an individual's personality should be particularly relevant for the accumulation of skill variety: Openness and the entrepreneurial Big Five profile.

#### *The role of openness as proxy for taste for variety*

In this subsection, I will focus on openness because I expect a strong connection between openness and the variety approach.<sup>4</sup> People scoring high in openness are characterized as being creative, innovative and untraditional (Zhao and Seibert, 2006). That is, they are widely interested in new and different ideas and tasks (Roccas et al., 2002), which is important for entrepreneurship, as being entrepreneurial often involves a departure from old business models and doing things differently. Several studies have found that people scoring high in openness are more likely to become entrepreneurs, which forms my baseline hypothesis in this subsection (Engle et al., 1997; Schmitt-Rodermund, 2004; Singh and DeNoble, 2003; Zhao and Seibert, 2006).

Motivationally, openness is seen in the need for variety and new experiences (McCrae and John, 1992). Thus, I expect adolescents scoring high in openness to explore very different hobbies and to be interested in a variety of topics. Making these different experiences should lead to a high variety of early interests and activities. A link between openness and skill variety can be found in the need to exert different kinds of jobs. Open people are not satisfied by working in one job for a longer period of time. Thus, open individuals tend to switch jobs more frequently (e.g. Ng et al., 2007) and thereby acquire more skill variety (Stuetzer, 2011). These arguments match the idea of Åstebro and Thompson (2011), who call the intentionality of entrepreneurial skill acquisition into question.<sup>5</sup> They argue that the acquisition of a varied skill set and ultimately the decision to become an entrepreneur are driven by a "taste for variety",

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<sup>4</sup> Please note that I acknowledge the influence of the other four Big Five traits on entrepreneurial intentions by controlling for them in the regressions. I do not use them as predictors for variety because theory does not present strong arguments for a potential influence of these other traits on skill variety.

<sup>5</sup> Åstebro & Thompson (2011) emphasize the importance of a "taste for variety" for the acquisition of skill variety. They use "preference for risk" and "adversity resilience" to operationalize taste for variety in an indirect way. I rather suggest to use openness to new experience, as a high level of openness stands for a need for variety.



which can be characterized as a personality trait. In my approach, openness can be understood as a proxy for taste for variety that might drive the accumulation of skill variety from adolescence on.

This leads to the following hypotheses:

*H4a: Individuals with high openness have stronger entrepreneurial intentions.*

*H4b: Individuals with high openness have more skill variety.*

*H4c: Individuals with high openness have more early variety orientation.*

#### *The role of an entrepreneurial Big Five profile*

Beyond the effect of a single trait, the *entrepreneurial constellation* of the Big Five traits might also drive the accumulation of skill variety. Such an entrepreneurial personality structure (defined as the intraindividual constellation of the Big Five traits with higher scores in extraversion, conscientiousness and openness and lower scores in neuroticism and agreeableness, Obschonka et al., 2013) might signal a certain entrepreneurial propensity of a person (e.g. it makes entrepreneurial developmental of a person more likely, including relevant human capital growth). There should be many entrepreneurs without such an entrepreneurial constellation in their personality structure, but on average this personality structure makes entrepreneurial development more likely (Obschonka and Stuetzer, 2017). Stuetzer et al. (2013) suggested that this entrepreneurial personality profile might therefore mirror a certain innate entrepreneurial talent which drives the growth in entrepreneurial skill variety because the talent gets expressed via concrete interests, activities and competences. This notion matches the idea of Silva (2007), who stresses the role of innate talent as driver of the skill-accumulation process, which later on predicts entrepreneurial activity.

Thus, I propose the following hypotheses:

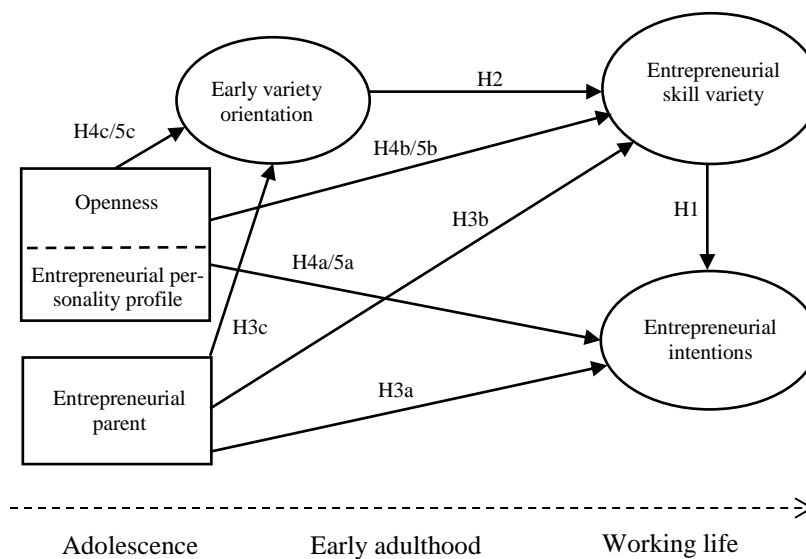
*H5a: Individuals with a more entrepreneurial personality profile have stronger entrepreneurial intentions.*

*H5b: Individuals with a more entrepreneurial personality profile have more skill variety.*

*H5c: Individuals with a more entrepreneurial personality profile have more early variety orientation.*

Figure 3-1 summarizes the hypotheses on 1) the growth of entrepreneurial skill variety with early variety orientation in adolescence as central developmental precursor, 2) the driving role of an early stimulating context (entrepreneurial parents) and 3) the driving role of personality (openness and entrepreneurial personality profile). It is clear that neither personality nor single context factors can explain the total story in human capital accumulation, so I have to note at this point that my model does not claim to fully explain human capital development.

**Figure 3-1: Conceptual model on the growth of entrepreneurial skill variety**



### 3.3 Data description and methods

Prospective longitudinal data covering both the early developmental phase (adolescence) and an adult phase (working life) is appropriate to answer the research questions. Other studies investigating early entrepreneurial competencies and skill variety have often collected data on adolescents retrospectively (e.g. Obschonka et al., 2011), which comes at the risk of measurement errors due to memory decay and hindsight bias (Davidsson, 2006). I use the Finnish FinEdu study – a longitudinal prospective study – in this chapter. The study was launched in 2004 and was conducted in seven waves over a span of ten years. At the first wave of data collection in 2004 of this collaborative project by the University of Helsinki and the University of Jyväskylä, the participants were on average 16 years old. At the most recent wave in 2013, the average age was 26 years. 39.3% of the participants (N = 342) were male, 60.7% (N = 529) were female (2 missings).

The general aim of the FinEdu study is to examine changes in well-being, personal goals and motivation of adolescents as a consequence of the transition into upper secondary school and work life, respectively. The study takes into account the social environment (school, parents, peers, hobbies) of adolescents (Salmela-Aro, 2015). In the last wave of the study, several entrepreneurship items were added (e.g. entrepreneurial intentions/behavior, skill variety). The study was designed to follow students of two different school tracks (A and B). Students of school track A (N = 455) attended lower secondary school, whereas school track B (N = 418) attended the academic track of upper secondary school (Tuominen-Soini et al., 2011). In this analysis, I combine the data of the two school tracks controlling for school track effects. The combination of the two school tracks is possible, because I do not expect that the mechanisms regarding the development of skill variety differ between both school types. Combining both school tracks has been successfully employed in previous research (Ranta et al., 2013; Tuominen-Soini and Salmela-Aro, 2014).

Note that in the first wave of data collection at age 16, I have data from 1,321 respondents. In the last wave at age 26, 941 respondents participated. This means that 29% of the respondents of the first wave were lost to attrition. The main reason for attrition was that at the last wave, respondents had left school at some point during the FinEdu project and their contact details could not be determined or they rejected participation. From the 941 respondents in the last wave, 68 did not answer the skill variety and entrepreneurship items. I exclude those respondents with missing information from the analysis, leaving me with a sample of 873 respondents. Although the attrition rate is comparatively low compared to other longitudinal studies (e.g. Obschonka et al., 2012; Schoon, 2001), I discuss the issue of attrition and the consequences for my empirical strategy in more detail in the results section.

### *Central variables*

Table 3-1 provides an overview of the variables, including means, standard deviations, Cronbach's alphas and sample items. Additional information on the variables are provided in the following.

*Openness* is one of the Big Five personality traits. In the empirical analysis testing the hypotheses regarding openness, I control for the other four Big Five traits. Thus, I describe at this point all Big Five traits together instead of only *openness*. The Big Five traits (*extraversion*,  $\alpha = .59$ ,  $M = 3.43$ ,  $SD = .72$ ; *agreeableness*,  $\alpha = .52$ ,  $M = 3.65$ ,  $SD = .66$ ; *conscientiousness*,  $\alpha = .59$ ,  $M = 3.68$ ,  $SD = .63$ ; *neuroticism*,  $\alpha = .63$ ,  $M = 2.79$ ,  $SD = .78$ ; *openness*,  $\alpha = .64$ ,  $M = 3.68$ ,  $SD = .73$ ) were assessed with a short version (15 items; 1 = Disagree strongly, 5 = Agree strongly) of a well-validated questionnaire in T5 (John and Srivastava, 1999). Note that in my conceptual model, I hypothesized that openness affects early variety (at age 16), but the Big Five personality traits were measured later, around age 22 (T5). However, the Big Five personality traits have a genetic base and are relatively stable over time (Costa and McCrae, 1992; Roberts et al., 2006). Thus, it is unlikely that there is a strong reverse effect from early variety to openness and I am confident that the relationship runs from *openness* to *early variety*.

An *entrepreneurial personality profile* is computed on the basis of a certain intraindividual combination of the Big Five traits. From a meta-analysis, we know that entrepreneurship is more likely if people score high in *extraversion*, *conscientiousness* and *openness* and if people score low in *agreeableness* and *neuroticism* (Zhao and Seibert, 2006). Based on this finding and following previous research (Schmitt-Rodermund, 2004, 2007; Obschonka et al., 2010), I defined a specific entrepreneurial reference type with the highest possible scores (5) in *extraversion*, *conscientiousness* and *openness* and the lowest possible score in (1) in *agreeableness* and *neuroticism*. Then, an index for the individual match with the reference type was calculated. First, each person's squared differences between the personal and the reference scores were summed up over the five traits, then, the algebraic sign of this sum was reversed. The higher (respectively closer to zero) the value of the resulting variable, the higher the fit with an *entrepreneurial personality profile* ( $M = -18.62$ ,  $SD = 6.15$ ).

**Table 3-1: Description of the measured variables**

<b>Variables/Scale/Source</b>	<b>Sample Item</b>	<b>Mean (SD)</b>	<b>Cronbach's alpha</b>
<b>Entrepreneurial intentions (Age 26)</b> (Krueger et al., 2000)			.89
1) <b>Item 1</b> (Scale: 1 to 7)	In the foreseeable future, do you intend to found a new business?	2.28 (1.67)	
2) <b>Item 2</b> (Scale: 1 to 7)	I have recently sought information about the ways and means of founding a new business.	1.92 (1.65)	
3) <b>Item 3</b> (Scale: 1 to 6)	In your opinion, how high is the probability that, in the foreseeable future, you will found a new business?	2.25 (1.28)	
<b>Skill variety (Age 26)</b> (Scale: 0 to 6) (Stuetzer et al., 2013b)	Count of functional areas in which person has had educational/work experience. Six possible categories: 1 = General management; 2 = Sales, marketing, customer service; 3 = Finance, accounting; 4 = Technical, research, science, engineering; 5 = Manufacturing, operations; 6 = Administration, human resource management		n.a.
1) <b>Education</b>		2.55 (1.68)	
2) <b>Work</b>		2.16 (1.51)	
<b>Early variety orientation (Age 16)</b>	For 1)/ 2): Count of dummy variables of importance of/variety in subjects (scale: 1 to 7). Five school subjects: 1 = Mother tongue; 2 = Foreign language; 3 = Science; 4 = Humanistic and social sciences; 5 = Arts and handwork. Dummy: 1 = Rating greater than 3; 0 = Otherwise		n.a.
1) <b>Variety importance of subjects</b> (Scale: 0 to 4)		3.57 (.66)	
2) <b>Variety interest in subjects</b> (Scale: 0 to 4)		3.26 (.96)	
3) <b>Quantity of hobbies</b> (Scale: 1 to 7)		4.05 (1.84)	
<b>Personality (Age 22)</b> (Scale: 1 to 5) (John and Srivastava, 1999)			
1) <b>Extraversion</b> (3 items)	I am someone that is talkative.	3.43 (.72)	.59
2) <b>Conscientiousness</b> (3 items)	I am someone that is does a thorough job.	3.68 (.63)	.59
3) <b>Openness</b> (3 items)	I am someone that is curious about many different things.	3.68 (.73)	.64
4) <b>Agreeableness</b> (3 items)	I am someone that is helpful and unselfish with others.	3.65 (.66)	.52
5) <b>Neuroticism</b> (3 items)	I am someone that is depressed, blue.	2.79 (.78)	.63
<b>Entrepreneurial personality profile (Age 22)</b> (Obschonka et al., 2010)	Definition of entrepreneurial reference type scoring high (5) in extraversion, conscientiousness and openness and low (0) in agreeableness and neuroticism. Index for match with reference calculated by summing up squared difference between personal and reference score over five personality traits and reversing algebraic sign. The higher the result, the higher the personality profile fit.	-18.62 (6.15)	n.a.
<b>Entrepreneurial parent (Age 16)</b>	Dummy: 1 = One/both parents self-employed, worker on own account/liberal profession; 0 = Otherwise	.10	n.a.
<b>Female (Age 16)</b>	Dummy: 1 = Female; 0 = Male	.61	n.a.
<b>School track (Age 16)</b>	Dummy: 1 = School track B; 0 = School track A	.48	n.a.

Note. Cronbach's alpha is only reported for true scales.

*Entrepreneurial parents* were assessed at T1 (age 16). The respective binary variable is one if the respondent indicated that the occupation of the father or the mother or both was 1) self-employed person, 2) workers on own account or 3) liberal profession (0 = No, 1 = Yes;  $M = .1$ ).

#### *Control variables*

I controlled the analyses for affiliation to *school track* (0 = School track A, 1 = School track B;  $M = .48$ ) and *gender* (0 = Male, 1 = Female;  $M = .61$ ). A control for age was not necessary because the participants are about the same age. In all regressions using *openness* as independent variable, the regression is controlled for the remaining four Big Five traits (*extraversion*, *conscientiousness*, *agreeableness* and *neuroticism*). These controls are not included in the regressions using the *entrepreneurial Big Five profile* as independent variable because this variable captures all Big Five traits in one index.

### **3.4 Results**

I test the hypotheses through structural equation modeling (SEM), utilizing Stata 12.1 (Acock, 2013). SEM enables me to examine various direct and indirect effects (mediation) and makes clear how well the data fit the conceptual model. Regarding fit indices, I decided to take  $\chi^2$ , CFI and RMSEA into account (Kline, 2005). SEM further allows the use of latent constructs instead of manifest variables. In my analysis, skill variety, an early variety of interests and activities, as well as entrepreneurial intentions are modeled as latent variables. This brings the advantage that these variables are not affected by measurement errors.

Note that there is some sample attrition (29.0%) from T1 to T7. With regard to the T1 variables, participants who did not answer the follow-up questionnaire differed from those who did on gender;  $\chi^2 = [1, N = 871] = 47.33, p < .001$ , with a higher probability for men to drop out. Furthermore, there are differences concerning the importance ( $t(1098) = 2.17, p < .05$ ) and interest in school subjects ( $t(1101) = 2.42, p < .05$ ) as well as the number of hobbies ( $t(1267) = 1.74, p < .05$ ). As the probability to drop out of the study seems to be linked to failure at school, these results are not surprising. Another reason for dropping out of the study was that the participants were 26 years old at the last wave and thus no longer at school. They could not be reached again despite substantial efforts of the research team conducting FinEdu. In view of this attrition, I restricted the sample to those participants who answered the items on skill variety

and entrepreneurial intentions (raised in the last wave,  $N = 873$ ). Please note that I also performed the analysis imputing the full dataset ( $N = 1,321$ ) with no major differences in the results. Nevertheless, I apply the more conservative restriction of the sample. Within SEM, missing values were dealt with by means of the “method(mlmv)” command in Stata 12.1, which stands for maximum likelihood with missing values. Thus, fitted parameters were estimated when missing values occurred (Stata-Corp, 2011). Comparing the coefficients from the imputed and non-imputed data sets, I found similar size and directionality.

### *Preliminary analyses*

Table 3-2 provides zero-order correlations between the manifest variables (Pearson). To test for multicollinearity between the predictor variables, variance inflator factors (VIF) were calculated. VIF scores were below 2, so no evidence for multicollinearity was indicated (Hair et al., 1998). *Entrepreneurial intentions* are significantly associated with *skill variety* (education and work) as well as the *quantity of hobbies*, an *entrepreneurial personality profile* and *openness*. Beyond that, *skill variety* significantly relates to an *entrepreneurial personality profile* as well as the *quantity of hobbies*. Regarding the variables of *early variety of interests and activities*, there are significant correlations to an *entrepreneurial personality* and *openness*. *Entrepreneurial role models* are not significantly correlated with the other major variables, except for one item of *entrepreneurial intentions*.

I tested the measurement model, including the latent variables used in further analysis (*early variety orientation*, *skill variety* and *entrepreneurial intentions*). The model showed an acceptable fit ( $\chi^2 [5] = 31.950$ ,  $p = .022$ , CFI = .993, RMSEA = .030), indicating that the factorial structure of the latent variables is robust (Kline, 2005).

**Table 3-2: Pearson correlations between the variables**

	1	2	3	4	5	6	7	8	9	10	11	12
1. Entrepreneurial intentions (item 1)	—											
2. Entrepreneurial intentions (item 2)	.84***	—										
3. Entrepreneurial intentions (item 3)	.73***	.69***	—									
4. Educational skill variety	.18***	.20***	.19***	—								
5. Work skill variety	.29***	.29***	.26***	.39***	—							
6. Variety importance of subjects	.01	-.00	.00	.09*	.05	—						
7. Variety interest in subjects	-.01	.02	.02	.05	-.01	.31***	—					
8. Quantity of hobbies	.10**	.11**	.11***	.13***	.10**	.15***	.13***	—				
9. Openness	.12**	.15***	.12**	.06	.08*	.12**	.06	.17***	—			
10. Entrepreneurial personality profile	.10**	.15***	.10*	.12**	.20***	.09*	.06	.22***	.43***	—		
11. Entrepreneurial parent	.05	-.12***	.05	-.01	.04	-.00	-.01	.01	.04	.05	—	
12. Female	-.25***	-.22***	-.19***	-.08*	-.19***	.16***	.09*	-.10**	-.01	.01	-.00	—
13. School track	-.11***	-.11***	-.08*	.02	-.08*	.12**	.11**	-.02	-.02	-.08*	.05	.09**

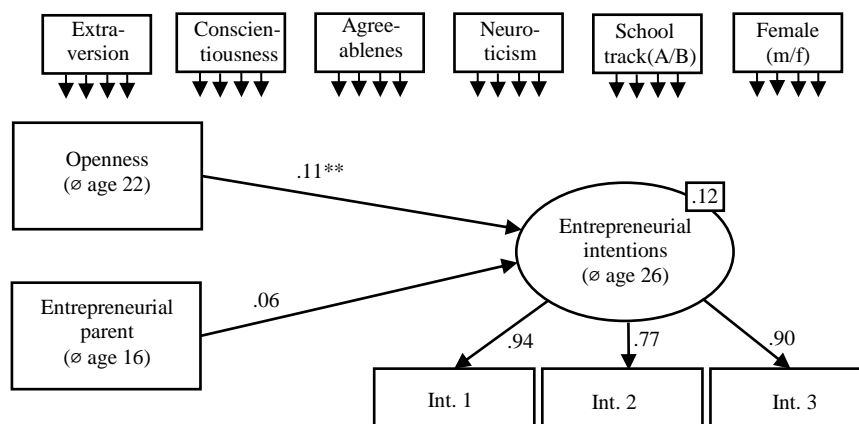
Note. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$



### Model test

Unlike one might expect, I do not test the hypotheses from 1 to 5 in sequential order. Instead, I first test the baseline hypotheses whether *entrepreneurial intentions* are predicted by *entrepreneurial parents* (H3a), *openness* (H4a) and an *entrepreneurial personality profile* (H5a). To test these baseline hypotheses I set up two models (see Fig. 3-2A and B). The models show an acceptable fit (Fig. 3-2A:  $\chi^2$  [16] = 21.87,  $p$  = .147, CFI = .997, RMSEA = .021; Fig. 3-2B:  $\chi^2$  [8] = 9.83,  $p$  = .277, CFI = .999, RMSEA = .016). Having an *entrepreneurial parent* does not predict *entrepreneurial intentions* ( $\beta$  = .06,  $p$  > 0.05). However, *openness* predicts *entrepreneurial intentions* with a positive effect of ( $\beta$  = .11,  $p$  < .01).<sup>6</sup> An *entrepreneurial personality profile* also positively predicts *entrepreneurial intentions* ( $\beta$  = .12,  $p$  < .01). Hence, H4c respectively H5c receive full support, while H3c was not supported.

**Figure 3-2A: Direct effects of openness on entrepreneurial intentions (N = 873)**

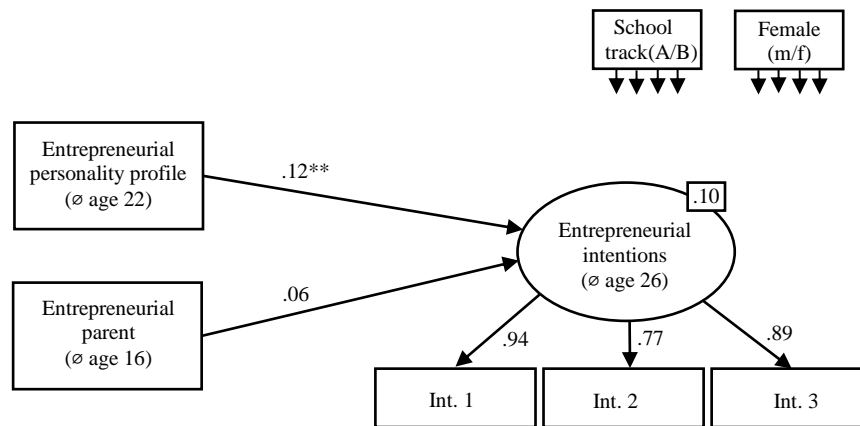


*Note.* Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variables.

Correlations between the control variables as well as correlations between the two independent variables were allowed.

\* $p$  < .05; \*\* $p$  < .01; \*\*\* $p$  < .001

<sup>6</sup> Fig 3-2A: Looking at the remaining four Big Five traits, extraversion ( $\beta$  = .12,  $p$  < 0.05) and agreeableness ( $\beta$  = .08,  $p$  < 0.05) influence entrepreneurial intentions significantly. The remaining traits, neuroticism and conscientiousness, do not yield significant results.

**Figure 3-2B: Direct effects of personality on entrepreneurial intentions (N = 873)**

Note. Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variables.

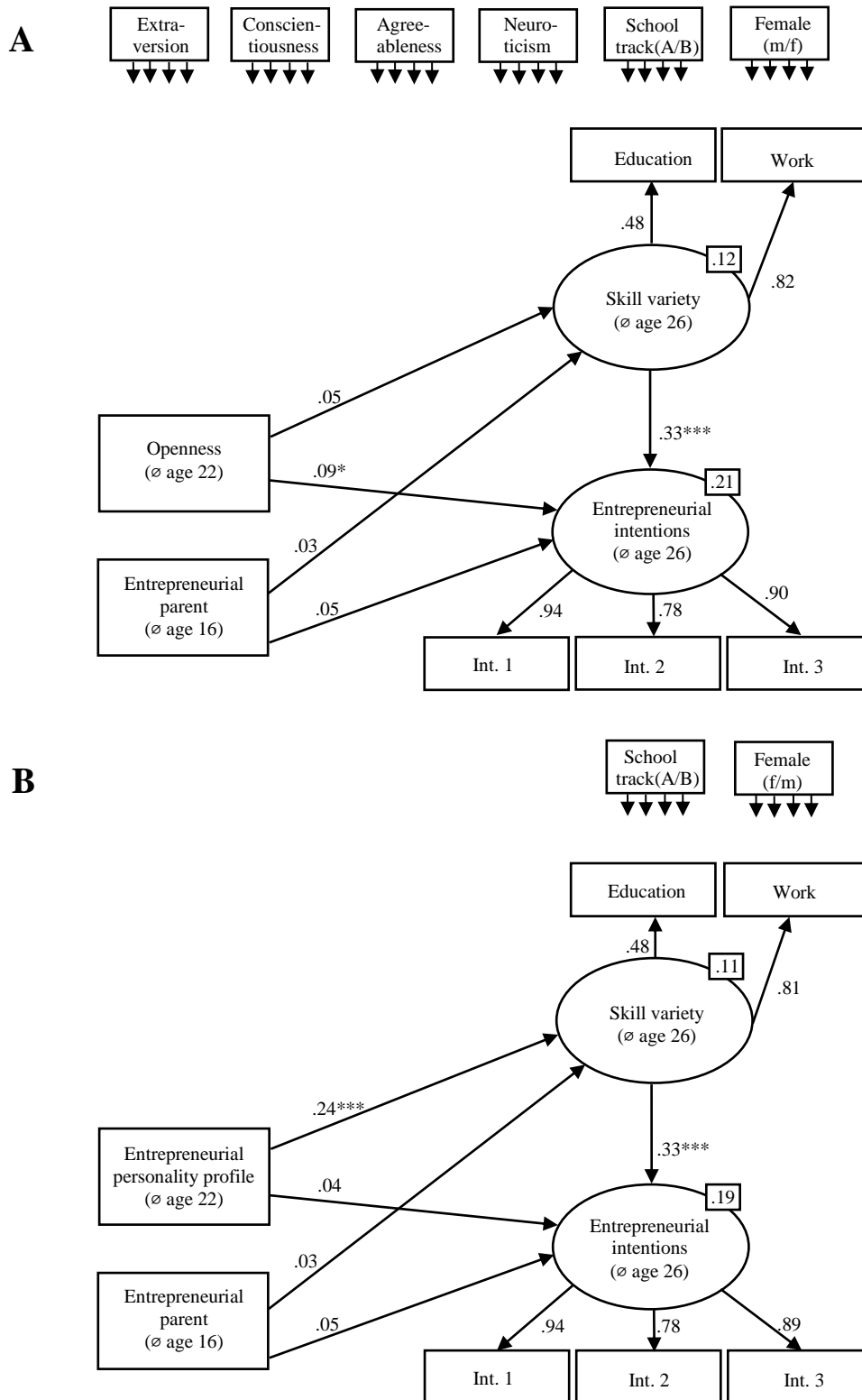
Correlations between the control variables as well as correlations between the two independent variables were allowed.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

In a second step, I put forth two models to examine the effect of personality and role models on skill variety as well as the direct effect of *skill variety* on *entrepreneurial intentions* (see Fig. 3-3A and B). Both models show an acceptable fit (Fig. 3-3A:  $\chi^2 [28] = 33.65$ ,  $p = .147$ , CFI = .997, RMSEA = .015; Fig. 3-3B:  $\chi^2 [16] = 20.26$ ,  $p = .209$ , CFI = .998, RMSEA = .017). The models reveal that *skill variety* positively predicts *entrepreneurial intentions* ( $\beta = .33$ ,  $p < .001$ ), which supports H1. Looking at the determinants of *skill variety*, I find that having an *entrepreneurial parent* does not predict *skill variety* ( $\beta = .03$ ,  $p > .05$ ). Thus, H3b is rejected. *Openness* does also not predict *skill variety* significantly ( $\beta = .05$ ,  $p > .05$ ), which leads me to also reject H4b.<sup>7</sup> The effect of *openness* on *entrepreneurial intentions* remains relatively stable in the extended model. In contrast, an *entrepreneurial personality profile* positively affects *skill variety* ( $\beta = .24$ ,  $p < .001$ ) supporting the respective hypothesis H5b.

<sup>7</sup> Fig 3-3A: Looking at the remaining four Big Five traits, extraversion ( $\beta = .18$ ,  $p < 0.01$ ) influences skill variety significantly. The remaining traits, agreeableness, neuroticism and conscientiousness, do not yield significant results.

**Figure 3-3A/B: Direct effects of openness/personality on skill variety (N = 873)**



Note. Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variables.

Correlations between the control variables as well as correlations between the two independent variables were allowed.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

Interestingly, the direct effect (of the profile) on *entrepreneurial intentions* vanishes. This suggests that the effect of an *entrepreneurial personality* on *entrepreneurial intentions* is mediated by *skill variety*. I tested for this potential mediation effect and present the results for the indirect effect in Table 3-3. I applied bootstrapping with 2,000 replications. For each of 2,000 bootstrapped samples the unstandardized indirect effects and the 90% confidence intervals were computed by determining the indirect effects at the 5th and 95th percentiles. The standardized indirect effect of an *entrepreneurial personality* over *skill variety* on *entrepreneurial intentions* was  $\beta = .079$  ( $p < .001$ ). The unstandardized bootstrapped effect was .017, with 90% confidence intervals of .009 to .025. Together with the no longer significant direct path, this suggests that the effect of an *entrepreneurial personality profile* on *entrepreneurial intentions* is fully mediated by *skill variety*.

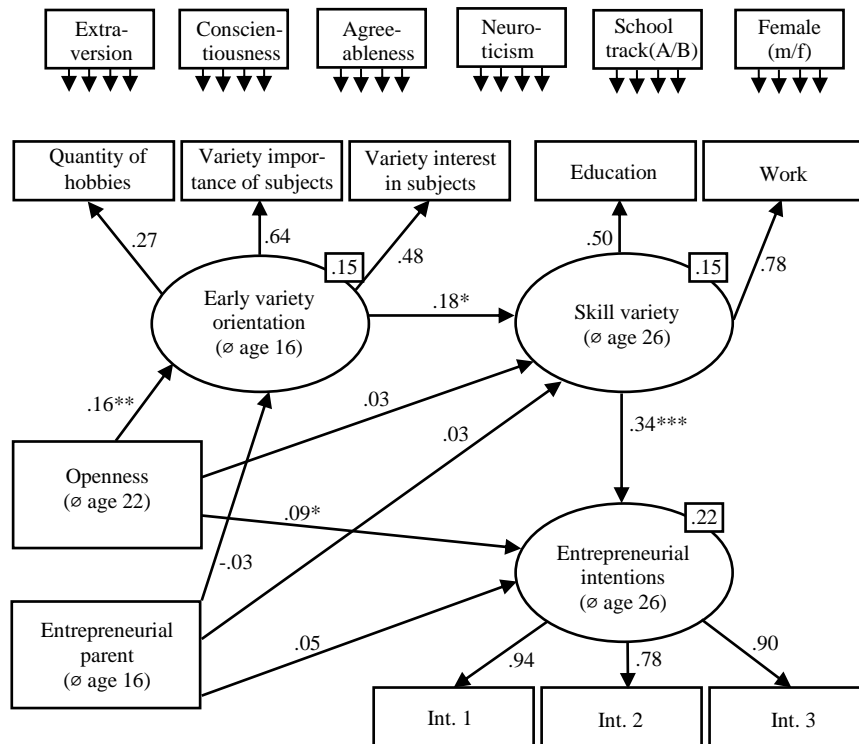
In a third step, I expand the models to incorporate an *early variety orientation* in adolescence. Both models have an acceptable fit (Fig. 3-4A:  $\chi^2 [58] = 109.96$ ,  $p = .000$ , CFI = .977, RMSEA = .032; Fig. 3-4B:  $\chi^2 [38] = 87.02$ ,  $p = .000$ , CFI = .978, RMSEA = .038). Again, *entrepreneurial parents* have no significant effect on an early variety orientation ( $\beta = .03$ ,  $p > .05$ ) – rejecting H3c. However, as expected, both openness ( $\beta = .16$ ,  $p < .01$ ) and an *entrepreneurial personality profile* ( $\beta = .21$ ,  $p < .001$ ) have a positive effect on an *early variety orientation*.<sup>8</sup> This supports the hypotheses H4c and H5c. *Early variety* in turn predicts *skill variety* ( $\beta = .18$ ,  $p < .05$  in Figure 3-4A, respectively  $\beta = .18$ ,  $p < .01$  in Figure 3-4B), which supports H2. This pattern of effects suggests that the effect of *openness* and an *entrepreneurial personality profile* on *entrepreneurial intentions* is (partly) mediated via *early variety* and *skill variety*.

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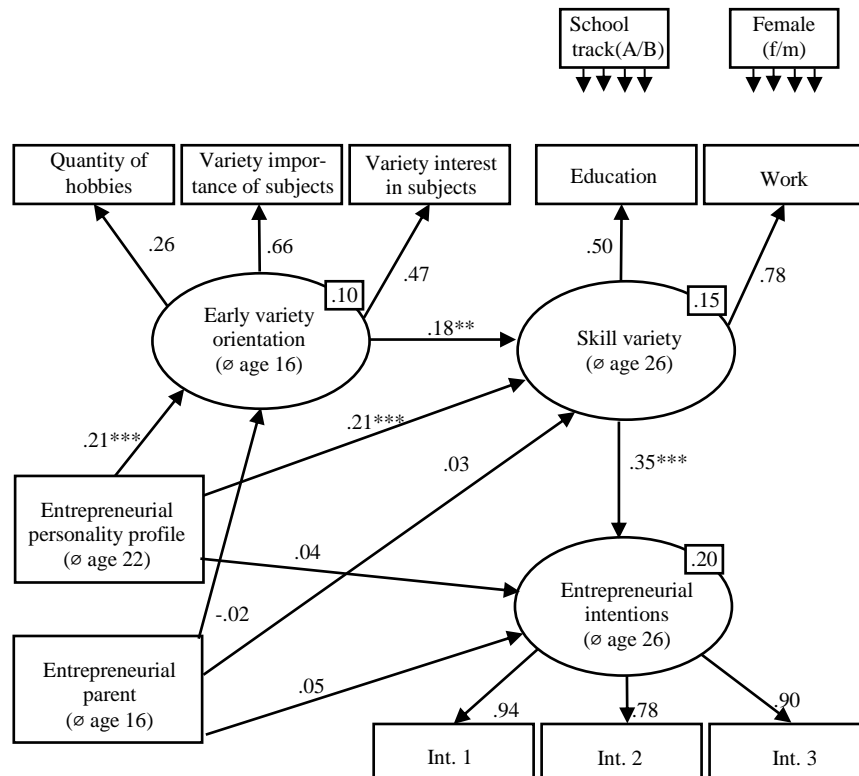
<sup>8</sup> Fig 3-4A: Looking at the remaining four Big Five traits, extraversion ( $\beta = .19$ ,  $p < 0.01$ ) influences an early variety orientation significantly. The remaining traits, agreeableness, neuroticism and conscientiousness, do not yield significant results.

**Figure 3-4A/B: Full model (N = 873)**

**A**



**B**



Note. Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variables.

Correlations between the control variables as well as correlations between the two independent variables were allowed.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

The results of the respective test for this proposed serial mediation are summarized in Table 3-3. Within the main model, I calculated the serial mediation effect of *openness/entrepreneurial personality* over *early variety* and *skill variety* on *intentions* using bootstrapping with 2,000 replications. The SEM model is the same as in Figure 3-4A/B, but the coefficients of the relationship between *openness/entrepreneurial personality* and *skill variety* is not used to calculate the indirect effect. So the indirect effect refers only to the path between *openness/entrepreneurial personality* over *early variety* and subsequently over *skill variety* on *intentions*. The standardized indirect effect of an *entrepreneurial personality* on *entrepreneurial intentions* was  $\beta = .005$  ( $p < .1$ ). The unstandardized bootstrapped effect was .001, with 90% confidence intervals of .000 to .004. Thus, the indirect effect was statistically significant. The standardized indirect effect of *openness* on *entrepreneurial intentions* in this model is .007 ( $p < 0.1$ ). The unstandardized bootstrapped effect was .011, with 90% confidence intervals of .008 to .017. Thus, the indirect effect was statistically significant. In total, 8.57% of the direct effect of *openness* on *entrepreneurial intentions* are explained by this path. Because there is still a significant direct effect of *openness* on *entrepreneurial intentions*, this suggests partial mediation.

**Table 3-3: Mediation effects**

Relationship	Direct effect without mediators	Direct effect with mediator: skill variety	Indirect effect with mediator: skill variety	Direct effect with mediators: early variety and skill variety	Indirect effect with sequential mediators: early variety and skill variety
Openness → Entrepreneurial intentions	.11**	.09*	.017 (.027) (-.000 to .052)	.09*	.007† (.011) (.008 to .017)
Entrepreneurial personality profile → Entrepreneurial intentions	.12**	.04	.079*** (.017) (.009 to .025)	.04	.005† (.001) (.000 to .004)

*Note.* Standardized effects are given (unstandardized effects in parenthesis). Indirect effects and confidence intervals (90% CI) were estimated with 2,000 bootstrap resamples. Unstandardized confidence intervals are reported. All effects are controlled for gender and school track. The model with openness is also controlled for the other four Big Five variables. The sequential mediation effect does not include the path from openness/personality over skill variety.

† $p < .1$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

*OLS regressions as a methodical robustness check*

In the following, I present the results of OLS regressions and compare these results to the SEM models discussed above as a robustness check (see Table 3-5 and 3-6). For the OLS regressions, the latent variables (*early variety orientation*, *skill variety* and *entrepreneurial intentions*) were extracted from factor analysis (maximum likelihood). Please note that the results from SEM slightly vary from the results of OLS. One reason for this variation is that in SEM measurement errors for the latent factors are taken into account. Further, the OLS models were calculated without the imputation of missing data. The results from the comparison between OLS regressions and SEM in regard to the hypotheses are summed up in Table 3-4. The results remain stable with the exception of hypothesis H4b (*openness on skill variety*) that was not confirmed in SEM but is confirmed in OLS. As explained above, this difference and differences in the values of the regression coefficients are explained by methodical differences.

**Table 3-4: Overview of methodical comparison**

Method Hypothesis	SEM	OLS
H1	✓	✓
H2	✓	✓
H3a	✗	✗
H3b	✗	✗
H3c	✗	✗
H4a	✓	✓
H4b	✗	✓
H4c	✓	✓
H5a	✓	✓
H5b	✓	✓
H5c	✓	✓

**Table 3-5: Robustness checks Figures 3-2A, 3-3A and 3-4A†**

<b>Model</b> <b>Dependent variable</b>	<b>Model 1</b> <b>Entr.</b> <b>intentions</b> <b>H3a, H4a</b>	<b>Model 2</b> <b>Entr.</b> <b>intentions</b> <b>H1</b>	<b>Model 3</b> <b>Entr. skill</b> <b>variety</b> <b>H3b, H4b</b>	<b>Model 4</b> <b>Entr. skill</b> <b>variety</b> <b>H2</b>	<b>Model 5</b> <b>Early variety</b> <b>orientation</b> <b>H3c, H4c</b>
Tested hypotheses					
Early variety orientation				0.25*** (0.04)	
Skill variety		0.42*** (0.04)			
Openness	0.15*** (0.04)	0.11** (0.04)	0.09* (0.04)	0.05 (0.04)	0.16*** (0.03)
Entr. parent	0.05 (0.04)	0.04 (0.03)	0.03 (0.04)	0.05 (0.03)	-0.06 (0.03)
Extraversion	0.15** (0.05)	0.03 (0.05)	0.26*** (0.05)	0.21*** (0.05)	0.24*** (0.04)
Conscientiousness	-0.05 (0.04)	-0.07 (0.04)	0.04 (0.04)	0.03 (0.04)	0.03 (0.03)
Agreeableness	-0.09* (0.04)	-0.04 (0.04)	-0.12** (0.04)	-0.15*** (0.04)	0.13*** (0.03)
Neuroticism	0.07 (0.05)	0.11* (0.05)	-0.10* (0.05)	-0.12* (0.05)	0.06 (0.04)
School track (A/B)	-0.16*** (0.04)	-0.13*** (0.04)	-0.08* (0.04)	-0.13*** (0.04)	0.22*** (0.03)
Female (m/f)	-0.34*** (0.04)	-0.19*** (0.04)	-0.34*** (0.04)	-0.39*** (0.04)	0.21*** (0.04)
Constant	-0.01 (0.04)	0.00 (0.04)	-0.02 (0.04)	-0.04 (0.04)	0.06 (0.03)
N	697	697	697	697	697
Adjusted R2	0.148	0.285	0.205	0.242	0.226
F-test	16.16	31.76	23.42	25.69	26.38

**Table 3-6: Robustness checks Figures 3-2B, 3-3B and 3-4B†**

<b>Model</b> <b>Dependent variable</b>	<b>Model 1</b> <b>Entr.</b> <b>intentions</b> <b>H3a, H5a</b>	<b>Model 2</b> <b>Entr.</b> <b>intentions</b> <b>H1</b>	<b>Model 3</b> <b>Entr. skill</b> <b>variety</b> <b>H3b, H5b</b>	<b>Model 4</b> <b>Entr. skill</b> <b>variety</b> <b>H2</b>	<b>Model 5</b> <b>Early variety</b> <b>orientation</b> <b>H3c, H5c</b>
Tested hypotheses					
Early variety orientation				0.25*** (0.04)	
Skill variety		0.43*** (0.04)			
Entr. personality profile	0.14*** (0.04)	0.00 (0.04)	0.34*** (0.04)	0.29*** (0.04)	0.19*** (0.03)
Entr. parent	0.05 (0.04)	0.03 (0.03)	0.04 (0.04)	0.05 (0.04)	-0.05 (0.03)
School track (A/B)	-0.16*** (0.04)	-0.13*** (0.04)	-0.08* (0.04)	-0.14*** (0.04)	0.22*** (0.03)
Female (m/f)	-0.31*** (0.04)	-0.18*** (0.04)	-0.32*** (0.04)	-0.38*** (0.04)	0.25*** (0.04)
Constant	-0.01 (0.04)	0.00 (0.04)	-0.02 (0.04)	-0.03 (0.04)	0.06 (0.03)
N	697	697	697	697	697
Adjusted R2	0.123	0.263	0.195	0.237	0.151
F-test	25.44	50.57	43.08	44.20	31.92

†Note. OLS regressions. Standardized coefficients are given. Standard errors (SE) in parentheses. All variables were z-standardized.

\*p < .05. \*\*p < .01. \*\*\*p < .001.



### 3.5 Discussion and limitations

The aim of this chapter was to examine the growth in entrepreneurial skill variety by drawing from prospective data. Based on human capital theory and developmental psychology, I theorized on the formation of skill variety. I focused on two research questions. Firstly, do early precursors of skill variety exist in adolescence? According to the empirical results, the answer is yes. A *variety of early interests and activities in adolescence* (age 16) precedes subsequent variety in skills and knowledge at age 26. The *skill variety* then subsequently predicts *entrepreneurial intentions*. This finding is in line with the major approach in developmental psychology and economics that development of skills is a cumulative process (Cunha and Heckman, 2007; Heckman, 2006; Holland and Nichols, 1964; Obschonka and Silbereisen, 2012).

This finding can also inform entrepreneurship education programs on two points. On the one hand, entrepreneurship training might emphasize teaching a variety of skills or, given the young age of the participants, of engaging in a variety of activities. On the other hand, entrepreneurship education programs might be more successful when focusing on adolescents. According to Åstebro (2016), one lesson that can be learned from the evaluation studies on entrepreneurship education programs is that programs targeting younger age groups such as the BIZ World Program (Huber et al., 2014) and Junior Achievement Program (Elert et al., 2015; Peterman and Kennedy, 2003) seem to have a stronger impact than programs focusing on students such as the GATE program (Fairlie et al., 2015) and a French program to foster social entrepreneurship among students (Åstebro and Hoos, 2016). My investigation only measures early variety at one particular point in time (age 16) and not for different points in time. However, the fact that there is a connection between early variety at age 16 and subsequent skill variety supports my reasoning.

The second research question was on the determinants of these early precursors and subsequent skill variety. I found that an *early variety orientation* was predicted by *openness* and an *entrepreneurial personality profile*. I also found that *skill variety* (at age 26) was predicted by an *entrepreneurial personality profile*. This concurs with developmental research on the effect of personality traits on the formation of entrepreneurial competencies (Obschonka and Silbereisen, 2012). The positive and significant relationship between openness and early variety further supports the “taste for variety” approach, which argued that individuals who turn out to become entrepreneurs are often driven by an innate strive for making different

experiences in life (Åstebro and Thompson, 2011). The positive and significant relationship between an *entrepreneurial personality profile* and *early variety* as well as subsequent *skill variety* is in line with empirical findings from Silva (2007), Stuetzer et al. (2013b) and Obschonka et al. (2016), who argued that innate talent also impacts the skill accumulation process.

From these results, additional implications arise for entrepreneurship education programs. One reason for the rather weak effects of entrepreneurship education programs could be that the effectiveness of these programs might depend on the participants' personality traits and innate abilities. It is not too speculative to argue that the programs might be more effective for a participant with high innate abilities and personality traits that are conducive to entrepreneurial action. In contrast, the teacher's effort might fall on deaf ears if a participant's personality traits are at odds with entrepreneurship or if there is no innate talent for entrepreneurship. Empirical support for this kind of differentiated effect comes from Schröder and Schmitt-Rodermund (2006), who show that the effectiveness of an entrepreneurship education program conducted at the age of 16 in German schools was strongest among participants with an *entrepreneurial personality profile* (measured the exact same way as in this study).

I did not find any significant effect of *entrepreneurial parents* on *entrepreneurial intentions*, *early variety* and *skill variety*, which is surprising, because there is strong empirical evidence by other studies on the importance of role models for entrepreneurial intentions (e.g. Bosma et al., 2012). There are several possible explanations. Firstly, I empirically tested whether entrepreneurial parents at the age of 16 matter for the formation of variety, but it might be that entrepreneurial parents matter more at a later age. I could not test this conjecture with my data, because the occupation of the parents was only assessed in T1 (at age 16) but not in subsequent waves.

Secondly, the variable *entrepreneurial parents* might not capture parental role models in the Finnish context well. According to the 2011 data from the Global Entrepreneurship Monitor (Bosma et al., 2012b), Finland has a below average percentage of the adult population engaged in entrepreneurial activity (Finnish TEA-rate = 6.3%, average TEA-rate across innovation-driven economies = 6.9%). However, Finland ranks well above average in the percentage of people involved in intrapreneurial activity (EEA) (Finnish EEA-rate = 8.0%, average EEA-rate across innovation-driven economies = 4.6). In this context, intrapreneurship refers to launching a new product, setting up a new business unit or subsidiary for an employer

as part of the normal work – all tasks that are comparable to setting up a new firm as entrepreneur. These tasks also require a somewhat varied skill set. Thus, it might be possible that intrapreneurs can also serve as parental role models, which in my approach are coded not to be role models. I thus tested whether entrepreneurial plus intrapreneurial parents predict the formation of early variety, skill variety and entrepreneurial intentions. To this end, I computed a dummy taking the value of 1 if either one or both parents were 1) entrepreneurs, 2) working in research and planning, 3) were clerical and sales workers (independent work). However, rerunning the models with this modified definition of a parental role models did not yield different results as my main models described above do. The results are not reported here for brevity but can be obtained from the author upon request. Given this empirical evidence, I have to conclude that early variety and skill variety are not channels through which entrepreneurial parents impact the entrepreneurial intentions of their offspring. If learning from parental entrepreneurs is important, the learning might occur on a rather narrow set of skills. My results might also suggest that other factors such as social capital and financial capital might serve as channels behind the link between entrepreneurial parents and their entrepreneurial offspring.

This chapter is not without limitations. Firstly, as mentioned above, major independent variables (*openness* and the *entrepreneurial personality profile*) were measured after some dependent variables (*early variety orientation*). However, personality traits are relatively stable over the course of life (Costa and McCrae, 1992; Roberts et al., 2006), and thus the relationship between the personality traits and early variety will arguably run in the hypothesized direction from personality traits to early variety and not the other way around. Empirical evidence for this direction comes from Schmitt-Rodermund (2007), who showed that the entrepreneurial personality profile assessed in adolescence predicts entrepreneurial activity over the lifetime. Secondly, the participants of the FinEdu study are of age 26 at the most recent wave of data collection. At this age, some respondents are still students at university and it thus might have been too early to assess their entrepreneurial intentions. However, rerunning the models only with those participants who have already entered the labor market does not yield much different results. The results are not reported here for brevity but can be obtained from the author upon request. Moreover, other research found that entrepreneurial intentions measured during adolescence indeed predict subsequent entrepreneurial activity (Schoon and Duckworth, 2012).

### 3.6 Conclusion

To conclude, this longitudinal investigation on the making of skill variety in entrepreneurship contributes to research on three points. First, I find further proof for Lazear's skill variety approach. Second, I identify early precursors of skill variety, such as an *early variety orientation*. Third, I find evidence for the endowment view on the development of skill variety. An entrepreneurial personality/talent is important for the development of an *early variety orientation*, *skill variety* and *entrepreneurial intentions*. Besides the direct effects, I detect an indirect effect of an *entrepreneurial personality* over *early variety* and *skill variety* on *entrepreneurial intentions*. *Openness* as a proxy for a taste for variety is important for *entrepreneurial intentions* as well, with a similar indirect effect of an *early variety* over *skill variety* on *entrepreneurial intentions*. *Skill variety*, though, seems to be more dependent from the *personality profile* than *openness*. Further research might focus on the investment view in more detail. It would be interesting to investigate the influence of entrepreneurial peers or the role of society on the making of entrepreneurial human capital.

## 4 Skill variety and the gender gap in entrepreneurship<sup>9</sup>

### 4.1 Introduction

There is compelling empirical evidence for a gender gap in entrepreneurship. Looking at entrepreneurial intentions, Kelley et al. (2015) report the lowest female-to-male ratios for innovation-driven European economies (.67 compared to a worldwide ratio of .76). Similar ratios are reported for the TEA rates (innovation-driven European economies: .55; worldwide: .69). In general, men also have higher growth aspirations than women. Interestingly, at least this number is identical in Finland, the source of the data in this chapter. The question naturally arises why there is a gender gap in entrepreneurship. Most research about entrepreneurial choice does not specifically focus on the gender issue or has the typical male entrepreneur and his corresponding business in mind (Greene et al., 2003). Even though female entrepreneurship might not have experienced the degree of research it deserves (Parker, 2004), there is a sufficing body of empirical studies that tackle female entrepreneurial choice from different theoretical perspectives. First, in regard to social capital, differences between men and women have been found especially in social business networks (e.g. Klyver, 2011). Second, there is evidence that women might be disadvantaged in raising debt or equity capital (e.g. Koper, 1993; Verheul and Thurik, 2001). Third, research has shown personality differences (in constructs that are important for entrepreneurship) between the sexes. Women score lower in risk tolerance (e.g. Boente and Piegeler, 2012), competitiveness as well as an individual entrepreneurial personality profile, based on a specific constellation of the Big Five (Obschonka et al., 2014). Last, research has tried to utilize human capital as an explanation for the gender gap in entrepreneurship. However, the relevant literature shows no clear evidence whether human capital differences between the genders contribute to the gender gap in entrepreneurship (e.g. Cowling and Taylor, 2001). For an in-depth discussion please see subsection 4.2.1.

This chapter focuses on entrepreneurial human capital as an explanatory variable for the gender gap in entrepreneurship. Not only in relation to female entrepreneurship, but also in general, the influence of human capital on the entrepreneurial choice has been discussed recently (Davidsson and Gordon, 2012; Unger et al., 2011). In their meta-analytical study, Unger et al. (2011) report relatively low correlations between traditional human capital

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<sup>9</sup> Chapter 4 is based on a working paper written in conjunction with Jörn Block, Michael Stuetzer and Martin Obschonka. This working paper was presented at the G-Forum 2017 in Wuppertal.

variables (e.g. level of education, management experience) and entrepreneurial engagement. Lazear (2005) introduced the concept of skill variety, providing a concept that arguably covers the nature of the entrepreneurial task better than traditional human capital variables. The entrepreneurial task is characterized by conducting a wide variety of tasks with the goal of setting up the venture and keeping it running (Davidsson, 2006; Lazear, 2005). Thus, entrepreneurs should be rather multi-skilled than specialized in one field. Even though several studies have found empirical support for Lazear's skill variety approach (e.g. Åstebro and Thompson, 2011; Chen and Thompson, 2016; Lazear, 2005), scholars use different operationalizations of skill variety (e.g. number of job changes, educational or work experience in different functional fields, number of job roles held). This fact makes it difficult to compare the results and to draw conclusions. To me, it appears plausible to use different measures for skill variety over an individual career. For example, educational skill variety might be more important for younger individuals while the number of functional job experiences might be more applicable to individuals with more work experience.

Studies analyzing the importance of skill variety for entrepreneurship tend to report lower skill variety for women as well as lower entrepreneurial success for women (e.g. Lechmann and Schnabel, 2014; Spanjer and van Witteloostuijn, 2017; Stuetzer et al., 2013b). Please note that Tegtmeier et al. (2016) find evidence that skill variety is important for the entry decision of women (all-female sample). Therefore, skill variety is a potential mediator for the gender gap in entrepreneurship. Despite that fact, to the best of my knowledge, there exists only one (unpublished) working paper which has explored the mediating effect of skill variety on the gender gap in entrepreneurship. Tonoyan et al. (2009) report that gender differences in skill variety explain 33% of the gender gap in entrepreneurship. Thus, skill variety should be taken into account as a mediator that might possibly explain substantial part of the gender gap. This chapter focuses on two research questions: 1) Does skill variety provide an explanation (as a mediator) for the gender gap in entrepreneurship? 2) Are there differences between different measures of skill variety at varying points in careers and do these measures affect the gender gap in entrepreneurship differently?

Answering these research questions is important because there are no good reasons why women should not be able to become (successful) entrepreneurs. Not only the Organization for Economic Cooperation and Development (OECD) has emphasized that "women entrepreneurs play an important role in the entrepreneurial economy, both in their ability to create jobs for themselves and to create jobs for others" (2004, p. 6). If women are blocked

from entrepreneurship for any reason, there will be less suitable men taking their positions. This corresponds to a misallocation of entrepreneurial talent. Answering the research questions is also important for policy makers. Many general entrepreneurship education programs exist. For example, the Junior Achievement Program tries to stimulate entrepreneurship among 16- to 18-year-old students (Oosterbeck et al., 2008). Studies have found that these general programs have larger impacts on men than on women (Johansen, 2013; Petridou et al., 2009). The number of education programs especially designed for female entrepreneurs is rather small (e.g. Merge Lane 12 week program or Ernst & Young Entrepreneurial Winning Women Program). To be able to design successful entrepreneurship programs for women, policy makers and entrepreneurship educators need a better understanding of factors contributing to the entrepreneurial choice and success of female entrepreneurs (Adema et al., 2014).

In order to answer both research questions, I use human capital theory (Becker, 1964), the skill variety approach (Lazear, 2005) and research on differences in labor market participation between the sexes. I investigate whether skill variety explains a substantial part of the gender gap in entrepreneurship. I use three different operationalizations of skill variety to account for developmental differences between the sexes. As an early measure of skill variety, I employ *variety interest in subjects* (age 16). Further measures are *educational* and *work skill variety*, indicating variety over functional areas of business activities (e.g. production or marketing activities). I relate the operationalizations of skill variety to entrepreneurial intentions to study the gender gap.

I test the hypotheses with longitudinal data from Finland (FinEdu project that collected data from participants aged 16 to 26 over a span of 10 years). Structural equation modeling was used to test the hypotheses. First, I find a gender gap in entrepreneurship in the data. For example, looking at the first item on entrepreneurial intentions (“In the foreseeable future, do you intend to found a new business?”; 1 = Do not agree at all, 7 = Strongly agree), I find 20% of men to have values above the neutral answer (4), compared to 7% of women. Second, I show that women exhibit less *educational* and *work skill variety*, while they have more *variety interest in subjects* at age 16. Third, all three skill variety measures predict entrepreneurial intentions. Fourth, I find evidence that both *educational* and *work skill variety* mediate part of the gender gap in entrepreneurial intentions.

This chapter makes contributions to the field of entrepreneurship in regard to a better understanding of women’s entrepreneurial intentions. I examine gender differences in skill variety with regard to the gender gap in entrepreneurship. My dataset covers not only the first

years of the career of young adults but also the early formative years in secondary education. This is reflected in the measurement of skill variety at three different points of career. Thus, I inform both human capital theory, as well as entrepreneurship educators. The remainder of the chapter is organized as follows. In subsection 4.2, I develop the hypotheses. In subsection 4.3, I present the data, methods and measured variables. In subsection 4.4, I explain the empirical strategy and present the results of the hypothesis testing. The results are discussed in subsection 4.5, before subsection 4.6 summarizes the main limitations and looks at future research. Subsection 4.7 concludes with the contributions of chapter 4.

## **4.2 Theoretical background and hypotheses**

### **4.2.1 Gender gap in entrepreneurship**

There is a broad consensus about the existence of a gender gap in entrepreneurial career choice (e.g. Blanchflower, 2004; Kelley et al., 2015; Minniti and Nardone, 2007). This gender gap is reflected in a lower number of established businesses, lower total early-stage entrepreneurship activity (TEA) as well as lower entrepreneurial intentions (e.g. Grilo and Irigoyen, 2006; Kelley et al., 2015; Wilson et al., 2007). The fact that there is a gender gap holds true especially for innovation-driven economies, such as Europe or the United States (Kelley et al., 2015).

Becoming an entrepreneur is said to be a deliberate choice because many people dedicate a large part of their time and money to this path (Obschonka et al., 2010). Entrepreneurial intentions can be described as “states of mind that direct attention, experience and action toward a business concept” (Bird, 1988, p. 442), that is, a given disposition to start a business (Goethner et al., 2012). It has been argued that such entrepreneurial intentions are an effective indicator for entrepreneurial action (Krueger, 2009; Lee et al., 2011). Therefore, the following arguments apply to entrepreneurial intentions similarly. Which factors are deciding is controversially discussed in literature and not fully understood yet (Boente and Piegeler, 2013). However, the gender gap in entrepreneurship is acknowledged as a multi-causal phenomenon (Kelley et al., 2015; Obschonka et al., 2014; Wilson et al., 2007). This is reflected in a wide range of research topics as possible explanations. In this subsection, I give an overview of possible explanatory factors before I develop hypotheses regarding one specific factor – skill variety.



First, *human capital* factors play a dominant role explaining the gender gap in entrepreneurship. Human capital theory predicts that knowledge leads to individual increases in cognitive abilities, which in turn leads to more productivity and efficiency in potential activities (Becker, 1964; Mincer, 1974). Here, human capital is defined by knowledge and skills that are acquired through schooling, on-the-job training and other kinds of experience (Becker, 1964). Originally, human capital theory relates employees' human capital with their income in paid employment (Unger et al., 2011). Human capital variables have been extensively investigated in entrepreneurship research for decades (Brüderl et al., 1992; Davidsson and Honig, 2003; Schultz, 1980; Unger et al., 2011). Human capital is important for entrepreneurship for several reasons (Venkataraman, 1997). One reason is that people with more human capital are better at spotting and developing entrepreneurial opportunities. Another reason is that setting up and running a business is a complex task which requires various skills and knowledge (Davidsson and Honig, 2003). Human capital is of more utility if it directly applies to a specific task, e.g. startup or industry experience in entrepreneurship. Thus, literature distinguishes between general and specific human capital (Cooper et al., 1994). In their critical review about human capital in entrepreneurship, Marvel et al. (2016) reveal that roughly 51% of all human capital constructs used in entrepreneurship studies were rather general.

Literature on female entrepreneurship and human capital shows mixed evidence. Before I analyze skill variety as one form of specific human capital in subsection 4.2.2, in the following, I will focus on general human capital variables employed in entrepreneurship studies, such as formal education and prior work experience. There has been a gender difference in average years of education until the 1970s (Blau, 1998; Corcoran and Duncan, 1979). However, nowadays, in the developed economies, education levels have converged between male and female, which has also narrowed the wage gap (Blau and Kahn, 2006; Blau and Kahn, 1997; O'Neill and Polachek, 1993) and thus is not a compelling explanation for the gender gap in entrepreneurship (Strohmeyer 2007, Wagner 2007).

More convincing is the hypothesis that there are gender differences in work experience explaining the part of the entrepreneurship gender gap that is related to human capital. This hypothesis is based on the standard model of human capital acquisition, which predicts lower human capital for persons who work fewer hours and fewer years over their careers. Such differences in labor force participation can be observed for men and women. During the last decades, women's accumulated labor force participation has increased (Blau and Kahn, 1997). However, women are still more likely to have worked part-time and fewer years overall.

Especially in business and management as well as technical functions, men have more practical experience (Cowling and Taylor, 2001). It should be noted that individuals working in managerial, technical and craft functions are more likely to become entrepreneurs (e.g. Boyd, 1990). The reasoning can be summed up as follows: Concerning educational attainment, there seems to be no difference between the genders, but in regard to work, there are differences. Thus, women might have less human capital, which can explain part of the gender gap in entrepreneurship.

Second, *social capital* factors were investigated in connection with the gender gap in entrepreneurship. The concept of social capital was originally developed in sociology and deals with individuals' social relations as well as possible benefits or drawbacks resulting from these relations (Bourdieu, 1986; Coleman, 1988; Granovetter, 1973). Regarding entrepreneurship, social capital is important in two ways. First, social capital helps nascent entrepreneurs to overcome substantial resource constraints (e.g. Baker et al., 2003). Second, social capital can provide access to novel information and granted feedback about business strategies, which is particularly important to shape entrepreneurial intentions and behavior (Bosma et al., 2012; Schmitt-Rodermund, 2004; Uzzi, 1997). In the context of entrepreneurship, social capital is often measured by the number and quality of entrepreneurial peers, such as entrepreneurial parents, family members or co-workers (e.g. Bosma et al., 2012; Chlosta et al., 2012; Obschonka et al., 2012).

Literature on female entrepreneurship and social capital shows clear differences in the individual social networks between the sexes (e.g. Aldrich, 1989). Women view social networks differently than men (Aldrich et al., 1989). In social networks, men see what they may gain from it, while women place a focus on responsibilities and obligations (Aldrich and Cliff, 2003). Male entrepreneurs still have fewer women in their business networks and the world of business remains a male domain in wide parts (Aldrich et al., 1989; Buttner, 1993). This is also in line with the finding that women rather involve female and family members within their business activities, while men also rely on external partners, often other entrepreneurs, who are important role models (Klyver, 2011; Klyver et al., 2008). As argued above, business networks of suppliers, customers, bankers or creditors bring access to resources as well as foster entrepreneurial intentions. In that way, women experience a disadvantage with regard to an entrepreneurial career.

Third, *financial capital* has been investigated to explain the gender gap in entrepreneurship. Women entrepreneurs often start with significantly lower levels of

financial capital than men (Orser et al., 2006; Robb, 2013). Research has found different areas of the financing process to pose obstacles women have to overcome in the process of setting up a new venture (Carter and Rosa, 1998), even though women tend to found smaller, less growth-oriented firms in industries where there is less startup capital needed, for example in the retail and service sector (Anna et al., 2000; Cliff, 1998; Orser and Hogarth-Scott, 2003).

There is evidence that women might be disadvantaged in raising start-up capital (Johnson and Storey, 1993; Koper, 1993), as well as in providing guarantees, such as personal assets or track records (Hisrich and Brush, 1984; Riding and Swift, 1990). Research has also found that women apply less for debt capital than men (Buttner and Rosen, 1992; Cavalluzzo et al., 2002). Fielden et al. (2003) confirm this result and further report that women have lower beliefs in getting credit. Even though there is not much research about it, one can state that women also face disadvantages regarding equity capital (Amatucci and Sohl, 2004; Brush et al., 2002; Verheul and Thurik, 2001). In sum, women seem to make more use of their own resources and money borrowed from family or friends (Carter and Rosa, 1998; Johnson and Storey, 1993). It is well known that financial capital is crucial at the beginning of a venture (e.g. Robb, 2013; Verheul and Thurik, 2001). With regard to the obstacles women face in financing future ventures, one can argue that this might discourage female entrepreneurial intentions as well as start-up rates. Perhaps because of that, a higher socio-economic status within the family might raise the probability for women to become self-employed.

Finally, *personality factors* influence entrepreneurial behavior and might explain part of the gender gap. Setting up a venture is a demanding process which requires a high degree of endurance (Langowitz and Minniti, 2007). Therefore, the entrepreneur has to be confident in his skills, which is reflected in a high degree of self-efficacy (Bandura, 1982). Empirical evidence is provided by Markman et al. (2002, 2005), who show that entrepreneurs have a higher self-efficacy than non-entrepreneurs. In general, women have a more negative self-perception than men (Matthews and Moser, 1996). Drawing from data raised in 17 countries, Koellinger et al. (2013) report that women are less confident in their entrepreneurial skills and display a higher fear of failure, compared to men, which explains a substantial part of the gender gap in entrepreneurship. Thus, due to less confidence in their own skills combined with a higher fear of failure women might shy away from an entrepreneurial job choice (Wilson et al., 2007).

Entrepreneurs are individuals, who have to be able to cope with risks, especially financial risks (Langowitz and Minniti, 2007). Women's startup propensity might be negatively influenced by their lower risk tolerance (Jianakoplos and Bernasek, 1998; Johnson and Powell,

1994). Boente and Piegeler (2012) report that women have different personalities, being less competitive and willing to take risks than men. Using data gathered in 36 different countries, they show these factors to contribute to the gender gap in entrepreneurship. In a recent multi-national study, Obschonka et al. (2014) showed that there are substantial personality differences between women and men that contribute to the gender gap in entrepreneurship around the globe. In this chapter, the five-factor model of personality (the Big Five: extraversion, conscientiousness, openness, agreeableness and neuroticism) was hypothesized to mediate the gender gap in entrepreneurship. More precisely, an individual personality profile (higher levels in extraversion, conscientiousness and openness and lower levels in agreeableness and neuroticism (Schmitt-Rodermund, 2004)) was shown to be predictive of entrepreneurship (e.g. Zhao et al., 2010) and to be higher for men across many cultures.

The human capital factors discussed above, social capital, financial capital and personality, are arguably interrelated. For example, women have difficulties to participate in informal financial networks, due to their limited social capital (Orser et al., 2006; Riding and Swift, 1990). Or women might acquire less bank debts due to their higher risk aversion (Verheul and Thurik, 2001). Human capital clearly influences the other factors. A person with less human capital will have problems to acquire financial capital or to join potential business networks (Orser et al., 2006).

Taken together, my baseline hypothesis H1 states:

*H1: Being female shows a negative relationship with entrepreneurial intentions.*

#### **4.2.2 Skill variety and gender**

General human capital, such as higher education and prior work experience, is not only important in entrepreneurship but also in many other occupations. For this reason, entrepreneurship research has recently put more emphasis on task-related human capital, such as prior start-up experience. Task-related human capital should be more related to successful entrepreneurial tasks, which involve “environmental scanning, selecting opportunities and formulating strategies for exploitation of opportunities, as well as organization, management and leadership” (Unger et al., 2011, p. 344). To account for the entrepreneurial task profile, Lazear (2005) introduced the concept of skill variety for entrepreneurs. Skill variety is referred to as the entrepreneurial essence of human capital. The entrepreneurial essence is captured by acknowledging the multi-task nature of founding and running a business, such as developing business models, talking to customers, negotiating with suppliers or instructing their

employees. Because entrepreneurs deal with these many different tasks within their enterprises, people with a varied skill set should be better equipped for entrepreneurship and be more successful entrepreneurs. A wide range of papers show the significance of skill variety for entrepreneurial choice and success (Åstebro and Thompson, 2011; Chen and Thompson, 2016; Lazear, 2005; Silva, 2007; Stuetzer et al., 2013b; Wagner, 2006).

As discussed in the previous subsection, there seems to be no gender gap in educational attainment but some in the field of study and in work experience. In the following, I will argue that there are strong differences regarding skill variety. Here and in relation to the definition of human capital above, I define skill variety as having a varied set of skills and knowledge. Skill variety can be acquired by studying in different fields, working in different jobs or in different industries.

First, there are gender differences concerning the choice of major subjects or the horizontal gender segregation in the educational system (Altonji and Blank, 1999; Strohmeyer, 2003). For example, at German universities or technical schools, the highest ratio of female students can be found in subjects like education, humanities and linguistics (Bund-Länder Kommission, 2000; Goerisch et al., 2002). Vocational education in Germany shows comparable gender segregation in male and female-oriented jobs (Biersack, 2002). With regard to the US, the proportion of women studying math, engineering or physical sciences has grown, but remains comparably low (Blau et al., 1998; Brown and Corcoran, 1997; England and Li, 2006; Paglin and Rufolo, 1990). I argue that women are less likely to acquire skill variety in their predominant fields of studies. For example, a teacher or a nurse is on a predefined path in paid employment. This predefined path entails security in the job market but offers little to no returns for investments in skill variety because entrepreneurship is seldom an option in these occupational fields (Fritsch and Sorgner, 2017). Without a subsequent suitable use of skill variety, educational curricula in these fields will arguably not focus on varied skills but will be limited to a small set of skills genuinely necessary in these fields (e.g. teaching skills and knowledge about a specific subject for a teacher). Empirical evidence for this reasoning is provided by Fritsch et al. (2012), who show (with German data) that engineers, chemists and physicists, followed by managers and business consultants, clearly have the highest levels of skill variety.

The source of gender differences in schooling and work preferences is controversially discussed. One explanation is job market discrimination in traditionally male-dominated jobs (Altonji and Blank, 1999), such as science, engineering or production (Polachek, 1978).

A rational response of parents to this discrimination could be a different treatment or breeding of boys versus girls to shape their preferences to be compatible with the labor market (Thomas, 1990). From a competitive advantage point of view, it makes sense for someone to specialize in those fields where there is least discrimination against oneself and thereby accumulate corresponding human capital (Altonji and Blank, 1999; Echevarria and Merlo, 1999; Lazear and Rosen, 1990). Furthermore, Becker (1991) argues that parents encourage their daughters to invest in non-market or domestic skills because these skills might be rewarded in the marriage market. This reasoning has become less compelling as birth rates, marriage rates and marital stability have declined, but still are applicable to birth cohorts working or studying in Western economies nowadays (Altonji and Blank, 1999).

Second, the accumulation of work experience, especially variety in work experience, is (after educational human capital) perhaps the most important human capital factor for entrepreneurship (e.g. Stuetzer et al., 2013b). As discussed in the previous subsection, women have in sum worked fewer years and are more likely to be part-time workers. To the extent that women do not work or work part-time, it is very difficult to gather variety in their human capital portfolio. This is because one can arguably do more different things when working full-time and longer years instead of part-time and fewer years. Beyond time restrictions, female-dominated occupations in paid employment (e.g. in education and health care) are more often found in subordinate positions, compared to male-dominated occupations (Boden and Nucci, 2000; Strohmeier and Tonoyan, 2005). In a subordinate position, one is less likely to acquire entrepreneurial human capital, especially in the management and decision-making process. This means women lack skill variety due to the character of the jobs they hold (Strohmeier, 2007).

Women are also arguably less likely to acquire skill variety by switching jobs. One potential reason for this are gender differences in fear of failure and risk-aversion. It is well known that women tend to have higher fear of failure and risk aversion (Arch, 1993; Byrnes et al., 1999). Fear of failure and risk aversion prevent people from trying out new things, e.g. new and different jobs and induce staying with the same job or within the same industry (Levhari and Weiss, 1974; Shaw, 1996; Pfeifer, 2011). Another reason for less job switching is that women are less locally and timely flexible, due to child and family commitments (Cuttillo and Centra, 2017; Polachek, 1981; Loprest, 1991). This limits their choices for potential employers as well as different industries and thus their chances to acquire skill variety through job mobility. This is not to say that women do not switch employers, but their job pattern is more

characterized by switching employers in the same industry (Barnett and Hyde, 2001; Bianchi and Cohen, 1999; England, 2005), which does not lead to much more skill variety. In addition, women tend to concentrate in more specialized sectors, such as health care or the public sector, that make the accumulation of skill variety difficult (Lauxen-Ulbrich and Leicht, 2005; Lechmann and Schnabel, 2012; Minniti, 2009; World Bank, 2012). This choice of job sector might be a result of discrimination in the labor market and subsequent educational skill attainment. It is also argued that women became increasingly engaged in these sectors because they offer opportunities to reconcile work and family responsibilities. These opportunities include possibilities to work in part-time and flexible working hours combined with high job security (Gornick et al., 1997; Korpi, 2000). The acquisition of skill variety is less likely to occur in the public sector. This is because especially the public sector includes large, bureaucratic and hierarchical organizations with a pronounced division of labor. Skill variety is rather acquired in small firms (Stromeyer and Leicht, 2001; Wagner, 2007), where there are less predefined job descriptions and therefore less division of labor (Johnson, 1986; Mason, 1991). From a human capital perspective, the switch from the public sector to self-employment is associated with high switching costs for women and thus a rare event (Menzies et al., 2004; Stromeyer, 2007; Stromeyer and Leicht, 2001).

Taking together the arguments from above on educational and subsequent work segregation between male and female, as well as different preferences in schooling and work, I hypothesize:

*H2: Being female shows a negative relationship with skill variety.*

### **4.2.3 Skill variety and entrepreneurial intentions**

One of the greatest challenges for an entrepreneur is the heterogeneous nature of the profession. In contrast to most jobs in paid employment, where specialization is an asset (Lazear, 2005), self-employed persons often profit most from being just the opposite (Lechmann and Schnabel, 2014). By possessing a well-diversified set of skills, a jack-of-all-trades is better equipped to master the variety of challenges of starting-up and running a business (Stuetzer et al., 2013a).

Lazear (2005) concluded that a variety in experiences and competencies is a crucial characteristic of self-employed persons. Quite a number of studies have shown that such skill variety increases the probability of becoming an entrepreneur (Åstebro and Thompson, 2011; Chen and Thompson, 2016; Lazear, 2005; Silva, 2007; Wagner, 2006). A diverse educational

curriculum as well as working in different functions and for a number of employers have been named likely sources of skill variety (Chen and Thompson, 2016). Other research has investigated the performance effects of skill variety with somewhat mixed results. Stuetzer et al. (2013b) find that skill variety helps nascent entrepreneurs to make progress in the venture creation process and Oberschachtsiek (2012) reports that entrepreneurs with a more varied skill set remain in self-employment longer. However, Åstebro and Thompson (2011) find that a varied skill set is related with less income from self-employment.

Given this generally positive relationship between skill variety and entrepreneurship, I argue that people who exhibit variety in skills realize that correlation and are thus more likely to unfold intentions to become an entrepreneur. This reasoning is based on theoretical models in psychology arguing that intentions to perform a task are partly driven by the ability and the belief in the ability to perform this task (Ajzen, 1991; Bandura, 1997). Backes-Gellner and Moog (2013) provide suitable empirical evidence on this argument by pointing out the correlation between a broad human capital portfolio and entrepreneurial intentions. In conclusion, my hypothesis is:

*H3: Skill variety shows a positive relationship with entrepreneurial intentions.*

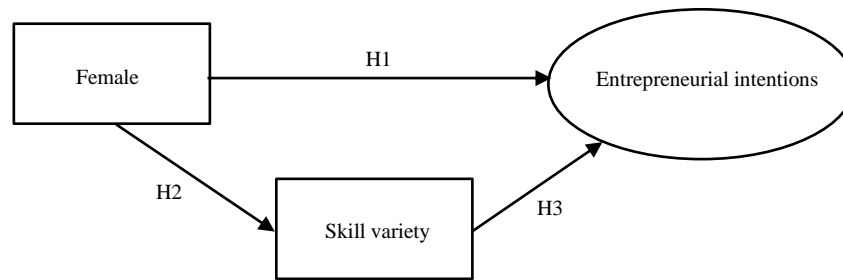
#### **4.2.4 The mediating role of skill variety**

Figure 4-1 summarizes the hypotheses on the relationship between gender, skill variety and entrepreneurial intentions. Given the argument that being female negatively predicts the accumulation of skill variety and skill variety to predict entrepreneurship, I expect skill variety to mediate the relationship between being female and entrepreneurial intentions. Selecting skill variety as a mediating factor is also in line with other studies examining the effects of genetically determined attributes on entrepreneurship. For example, Obschonka et al. (2016) find that a variety of entrepreneurial competencies partly mediates the effect of an entrepreneurial personality profile, which is to a large extent influenced by genetic heritage, on entrepreneurial intentions. Further, Sell (2013) finds that skill variety partly mediates the effect of voluntary mismatching (vocational education versus actual job) on the entrepreneurial choice.

I thus formulate the following mediation hypothesis:

*H4: The relationship between being female and entrepreneurial intentions is mediated by skill variety.*



**Figure 4-1: Conceptual model**

## 4.3 Methods

### 4.3.1 Data collection

I test the hypotheses in a longitudinal sample of students, covering both an early developmental phase (adolescence) as well as working life. More precisely, I use the (ongoing) Finnish FinEdu study, a data set collected by the University of Helsinki and the University of Jyväskylä, aimed at young adults' personal goals and concerns in the domains of career, comprising education, work and financial issues (Salmela-Aro, 2015) and entrepreneurship items (e.g. entrepreneurial intentions, skill variety).

The first wave was raised in 2004, followed by six further waves over a span of ten years. At the first wave, the respondents' average age was 16 years, therefore the survey was conducted at school. Students from two different school tracks (A: lower secondary school,  $N = 707$ ; B: academic track of upper secondary school,  $N = 614$ ) were followed through their school lives and early careers (Tuominen-Soini et al., 2011). In the present analysis, I combine the data from both school tracks, controlling for school track effects. This procedure has been successfully employed in previous research (Tuominen-Soini and Salmela-Aro, 2014; Ranta et al., 2013). The respondents' average age was 26 at the most recent wave in 2014. Here, the study was sent out by mail and completed by phone (Tuominen-Soini and Salmela-Aro, 2014; Ranta et al., 2013). Looking at the gender distribution, 46% of the participants were male ( $N = 603$ ) and 54% ( $N = 708$ ) were female. Here, women are slightly overrepresented, which reflects the overall distribution of students at this educational level (Official Statistics of Finland, 2013; Ranta et al., 2013). In sum, I rely on data collected among 1,311 participants. As expected in a longitudinal survey, from the initial 1,311 participants 28% were lost due to attrition. The final sample for the analysis consists of 941 participants. Please note that this attrition rate is comparatively low for longitudinal studies (e.g. Obschonka et al., 2012; Schoon,

2001). I discuss the issue of attrition and consequences for my empirical strategy in the results section.

### 4.3.2 Measures

Table 4-1 describes the measured variables in detail. This includes means, standard deviations, Cronbach's alphas and sample items. In the following, I provide additional information on the variables.

#### *Dependent variable*

To measure the dependent variable *entrepreneurial intentions* (assessed in T7, average age 26), participants were asked to answer three questions (item 1: "In the foreseeable future, do you intend to found a new business?"; 1 = Do not agree at all, 7 = Strongly agree; item 2: "I have recently sought information about the ways and means of founding a new business."; 1 = Do not agree at all, 7 = Strongly agree; item 3: "In your opinion, how high is the probability that, in the foreseeable future, you will found a new business?"; 1 = 0%, 6 = 100%). The items have already been assessed in different studies (Krueger et al., 2000; Obschonka et al., 2010).

#### *Independent variable*

In this chapter, *female* serves as independent variable. I create a dichotomous variable where "1" represents being female and "0" denotes being male.

#### *Mediator*

I measure skill variety in three different ways. First, I analyze skill variety at secondary school level (accessed in T1, average age 16). Here, I calculate a variety index over different school subjects. At secondary school, all students have the same subjects. Thus, I cannot employ a variable covering different experiences or choices. But there is strong empirical evidence that interest in learning content leads to higher knowledge spillover and achievements in individual competencies (Krapp et al., 1993; Winteler et al., 1988). Therefore, interest in subjects is a good proxy for learning outcomes (skills and knowledge).

**Table 4-1: Description of the measured variables**

Variables/Scale/Source	Sample Item	Mean (SD)	Cronbach's alpha
<b>Entrepreneurial intentions (Age 26)</b> (Krueger et al., 2000)			.89
1) <b>Item 1</b> (Scale: 1 to 7)	In the foreseeable future, do you intend to found a new business?	2.28 (1.67)	
2) <b>Item 2</b> (Scale: 1 to 7)	I have recently sought information about the ways and means of founding a new business.	1.92 (1.65)	
3) <b>Item 3</b> (Scale: 1 to 6)	In your opinion, how high is the probability that, in the foreseeable future, you will found a new business?	2.25 (1.28)	
<b>Skill variety (Age 26)</b> (Stuetzer et al., 2013b)			n.a.
1) <b>Variety interest in subjects</b> (Scale: 0 to 4)	Count of dummy variables of interest in/variety in subjects (scale: 1 to 7). Five school subjects: 1 = Mother tongue; 2 = Foreign language; 3 = Science; 4 = Humanistic and social sciences; 5 = Arts and handwork. Dummy: 1 = Rating greater than 3; 0 = Otherwise	3.21 (1.00)	
2) <b>Education</b> (Scale: 0 to 6)	Count of functional areas in which person has had educational/work experience. Six possible categories: 1 = General management; 2 = Sales, marketing, customer service; 3 = Finance, accounting; 4 = Technical, research, science, engineering; 5 = Manufacturing, operations; 6 = Administration, human resource management	2.55 (1.68)	
3) <b>Work</b> (Scale: 0 to 6)		2.16 (1.51)	
<b>Female (Age 16)</b>	Dummy: 1 = Female; 0 = Male	.54	n.a.
<b>Fear of failure (Age 26)</b> (Scale: 1 to 7)	I try to avoid situations in which I may fail or make mistakes.	3.70 (1.71)	n.a.
<b>Children (Age 26)</b>	Dummy: 1 = Yes; 0 = No	.18	n.a.
<b>Entrepreneurial parent (Age 16)</b>	Dummy: 1 = One/both parents self-employed, worker on own account/liberal profession; 0 = Otherwise	.09	n.a.
<b>SES (Age 16)</b> Sortheix et al. (2015) (Scale: 1 to 3)	Socio-economic status of household: 1 = Blue collar; 2 = Lower white collar; 3 = Upper white collar. Only highest-scoring result is counted.	1.88	n.a.
<b>Entrepreneurial personality profile (Age 22)</b> (Obschonka et al., 2010)	Definition of entrepreneurial reference type scoring high (5) in extraversion, conscientiousness and openness and low (0) in agreeableness and neuroticism. Index for match with reference calculated by summing up squared difference between personal and reference score over five personality traits and reversing algebraic sign. The higher the result, the higher the personality profile fit.	-18.55 (6.32)	n.a.
<b>School track (A/B) (Age 16)</b>	Dummy: 1 = School track B; 0 = School track A	.48	n.a.

Note. Cronbach's alpha is only reported for true scales.

The underlying school subjects are: (1) Mother tongue; (2) Foreign languages; (3) Science; (4) Humanistic and social sciences; (5) Arts and handwork (1 = Not at all interested, 7 = Interested very much). Please note that the categories mother tongue and foreign languages were coded into interest in languages in general. If the interest in a specific subject was greater than five, I created an auxiliary dummy variable with the value of one, otherwise the dummy variable was coded zero.<sup>10</sup> The final variable *variety interest in subjects* was computed by summing up the four corresponding dummy variables. Thus, the final variable ranges from zero to four.

Second, I analyze skill variety at university or vocational training level (tertiary education). Third, I analyze skill variety at work level. For both measures, I utilize the number of functional areas in which the participants have *educational* or *work* experience as an indicator for *skill variety* (accessed in T7, average age 26). I created two independent count variables each underlying six possible categories: (1) General management; (2) Sales, marketing, customer service; (3) Finance, accounting; (4) Technical, research, science, engineering; (5) Manufacturing, operations; (6) Administration, human resource management. Thus, the final variables range from zero to six. Similar measures have been employed successfully by Stuetzer et al. (2013b) and others (Lazear, 2005; Stuetzer et al., 2013b; Wagner, 2006).

Although work experience is arguably the most important predictor of entrepreneurship (e.g. Lazear, 2005), I consider it important to look at skill variety from a developmental perspective (secondary and tertiary education level), in particular taking a gender perspective. It is well known that vocational differences between men and women grow over time, especially from middle school on (Mattern and Schau, 2002). Further arguments to include the developmental perspective stem from the sample. FinEdu is a longitudinal study that pursues the development from adolescence to young adulthood. At the last wave the respondents are 26 years old. To some extent the respondents are still at school or at university (42%), which is quite typical for the Finnish educational system (Statistics Finland, 2010) but makes it somewhat unlikely for those to have skill variety in work. Other entrepreneurship studies have found curriculum variety to be an important predictor of future skill variety in work and entry into entrepreneurship (Stuetzer et al., 2013a; Lazear, 2005).

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<sup>10</sup> I use this cutoff point because it implies the best overall model fit, while the results do not noticeably change with other cutoff points.

### *Control variables*

Prior research has shown that skill variety (e.g. Stuetzer et al., 2013a) and entrepreneurship (e.g. Laspita et al., 2012) strongly depend on the presence of self-employed parents (social capital). Thus, I control for *entrepreneurial parents* (assessed at T1, average age 16); with the value of one, if the respondent reported to have a father or a mother that is a 1) Self-employed person, 2) Worker on own account or 3) Freelancer in a liberal profession. With regard to financial capital within the family, I control for the family *socio-economic status* (SES, assessed at T1, average age 16). The participants were asked to report their parents' occupations. The answers were coded into three socio-economic categories, following a Finnish standard classification system (Statistics Finland, 1989): 1 = Blue-collar (e.g. electrician, baker or hairdresser); 2 = Lower white-collar (e.g. nurse, real estate agent or salesperson); 3 = Upper white-collar (e.g. engineer, doctor or journalist). Parents who were not employed (e.g. students, pensioners or disabled), were coded as missing (Lechner et al., 2017). Following Sortheix et al. (2015), the parent with the highest occupation serves as reference for the SES. Further, I controlled for the affiliation to school track (0 = School track A, 1 = School track B).

## **4.4 Results**

### **4.4.1 Empirical strategy**

To test my hypotheses, I estimate structural equation models (SEM), utilizing Stata 12.1 (Acock, 2013). SEM brings the advantage that I can examine different direct and indirect effects (mediation) in one model. Further, several fit indices make clear how well the data fit the conceptual model. I take  $\chi^2$ , CFI and RMSEA into account (Kline, 2005). Last, SEM enables me to model latent variables, which are not affected by measurement errors. Following Obschonka et al. (2010), in my analysis, entrepreneurial intentions are modeled as latent variables.

Please note that I observe some attrition (28%) from the first wave (T1) to the last wave (T7). Men had a higher probability to drop out of the study than women ( $\chi^2 = [1, N = 871] = 47.33, p < .001$ ). Associated with this fact, there are also differences concerning the *interest in school subjects* ( $t(1101) = 2.42, p < .05$ ). The probability to drop out of the study is linked to the interest in different school subjects, which itself seems to be higher among women. These results are not surprising because the early waves of the study were conducted at school and school leavers were hard to follow. In view of the attrition, I imputed missing values by means of the “method(mlmv)” command in Stata 12.1 (maximum likelihood with missing values; Stata-Corp, 2011). Note that I also performed the analysis with a restricted sample (participants that were available through all waves), which did not yield substantially different results.

#### 4.4.2 Preliminary analyses

Correlation analysis and variance inflation factors (VIF) indicate that problems of multicollinearity are unlikely. While the mean VIF score is 1.16, the highest VIF score is 1.29 for *work skill variety*. The reported VIF is well below the recommended level of 10 (Hair et al., 1998). Table 4-2 provides zero-order correlations between the manifest variables (Pearson). There is a significant correlation between *entrepreneurial intentions* and *skill variety* (education and work), *female* as well as an *entrepreneurial personality profile*. The third item measuring *entrepreneurial intentions* also shows a significant correlation to *entrepreneurial parents*. Each of the three variables measuring *skill variety* shows a significant correlation with *female* and an *entrepreneurial personality profile*. In addition, *educational* and *work skill variety* are significantly correlated with *children* and *fear of failure*, respectively. *Female* is significantly correlated to both *children* and *fear of failure*.

**Table 4-2: Pearson correlations between the variables**

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Entrepreneurial intentions (item 1)	—												
2. Entrepreneurial intentions (item 2)	.73***	—											
3. Entrepreneurial intentions (item 3)	.84***	.69***	—										
4. Variety interest in subjects	-.01	.02	.02	—									
5. Educational skill variety	.18***	.19***	.20***	.05	—								
6. Work skill variety	.29***	.26***	.29***	-.01	.39***	—							
7. Female	-.25***	-.19***	-.22***	<b>.10**</b>	<b>-.08*</b>	<b>-.19***</b>	—						
8. Fear of failure	-.03	-.01	-.03	-.02	-.06	-.14***	.15***	—					
9. Children	-.11**	-.05	-.07*	.01	-.11**	-.05	.11***	-.02	—				
10. Entrepreneurial parent	.05	.05	.08*	-.00	-.01	.04	.03	-.03	.03	—			
11. SES	.06	.03	.06	.03	.01	-.02	-.03	-.00	-.07	.09**	—		
12. Entrepreneurial personality profile	.10**	.10*	.15***	.05	.12**	.20***	-.03	-.15***	.06	.06	.03	—	
13. School track	-.12***	-.08*	-.11***	.09**	.02	-.08*	.14***	-.02	.02	.04	.09**	-.25	—

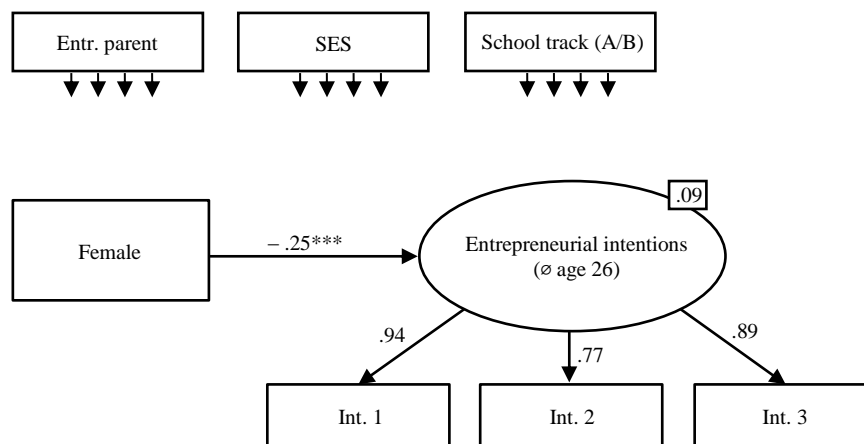
Note. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

#### 4.4.3 Hypotheses testing

##### *The direct effect of gender on entrepreneurial intentions*

To test the baseline hypothesis, stating that being *female* negatively predicts *entrepreneurial intentions*, I set up a structural equation model (Fig. 4-2) that is controlled for entrepreneurial parents and SES. The model shows an excellent fit ( $\chi^2 [8] = 4.95$ ,  $p = .762$ , CFI = 1.000, RMSEA = .000). Being *female* predicts *entrepreneurial intentions* with a negative effect of  $\beta = -.25$  ( $p < .001$ ). Hence, H1 received full support.

**Figure 4-2: Direct effects on entrepreneurial intentions (N = 1,321)**



*Note.* Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variable.

Correlations between the control variables were allowed.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

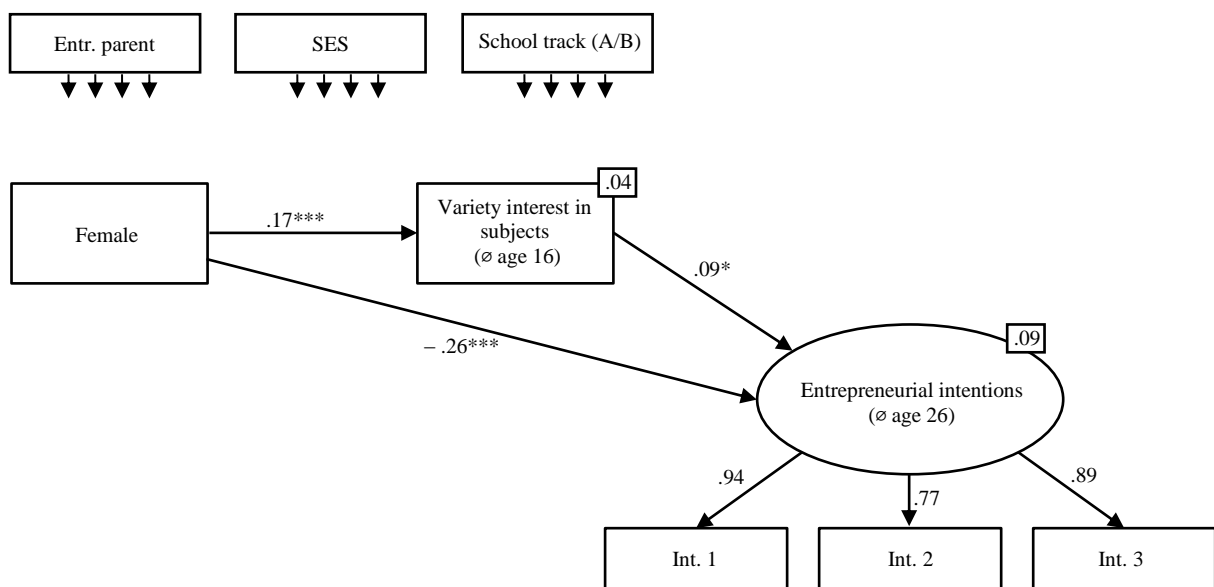
##### *Skill variety as mediator*

I use three different measures for skill variety (*variety interest in subjects*, age 16; *educational skill variety*, age 26; *work skill variety*, age 26), as described in subsection 4.3.2. In a first step, I look at the different measures for skill variety in separate models (Fig. 4-3A-C). In a second step, I compare the coefficients of the three different measures using the technique of seemingly unrelated regression (Fig. 4-4). Please note that I expect the effect of gender on *skill variety* to grow stronger throughout the educational pathway from adolescence to adulthood, the more work-related knowledge and skills become. The reasoning behind this is that women might find it increasingly difficult to acquire skill variety for various reasons (e.g. working part-time or not working at all, fewer chances to switch jobs because of having children, self-selection into certain industries that do not offer so much potential to



acquire different skills) as discussed in the theory section. At the same time, I expect that the effect from skill variety on entrepreneurial intentions is also stronger at later stages of the educational path. This is because the skills and knowledge acquired at later stages of the educational path are more relevant for occupational choice (employed or self-employed). I further expect that the mediated effect of *female* via *skill variety* on *entrepreneurial intentions* gets stronger across the educational trajectory. This is a result of the stronger relevance of skills acquired at later stages for entrepreneurship and therefore entrepreneurial intentions as well as the stronger negative relationship of gender on skill variety.

**Figure 4-3A: Variety interest in subjects as mediator (N = 1,321)**



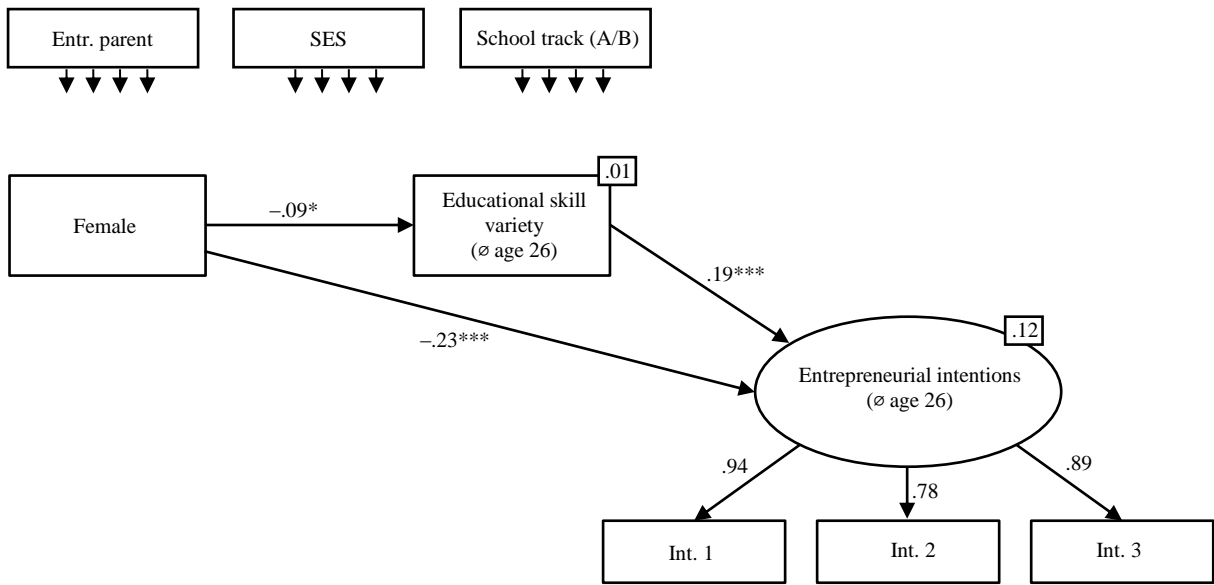
*Note.* Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variable.

Correlations between the control variables were allowed.

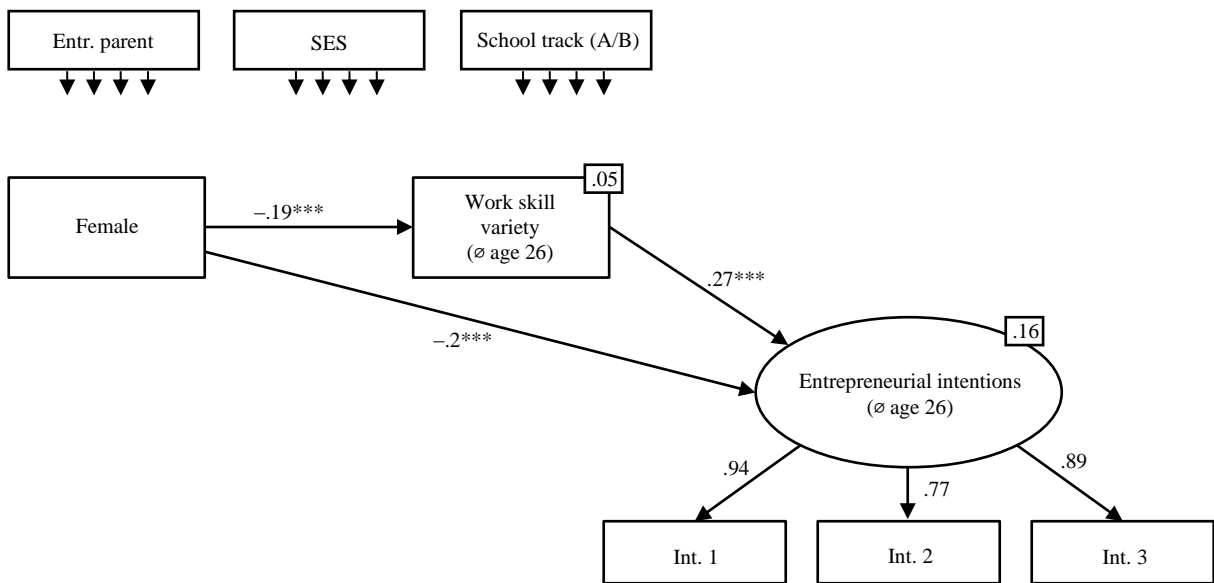
\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

Figure 4-3A shows the mediation model using *variety interest in subjects* as measure for skill variety. Figure 4-3B shows the mediation model using *educational skill variety* as measure for skill variety. Figure 4-3C shows the mediation model using *work skill variety* as measure for skill variety. The models show an excellent fit (Fig. 4-3A:  $\chi^2 [10] = 9.73$ ,  $p = .464$ , CFI = 1.000, RMSEA = .000; Fig. 4-3B:  $\chi^2 [10] = 8.76$ ,  $p = .555$ , CFI = 1.000, RMSEA = .000; Fig. 4-3C:  $\chi^2 [10] = 5.81$ ,  $p = .83$ , CFI = 1.000, RMSEA = .000).

**Figure 4-3B: Educational skill variety as mediator (N = 1,321)†**



**Figure 4-3C: Work skill variety as mediator (N = 1,321)†**



†Note. Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variable.

Correlations between the control variables were allowed.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

In regard to the second hypothesis, stating that being female negatively predicts skill variety, I found mixed evidence over the three models. Being *female* did not negatively predict *variety interest in subjects*; in contrast, there is a positive relation ( $\beta = .17, p < .001$ ). But being *female* negatively predicted both *educational skill variety* ( $\beta = -.09, p < .05$ ) and *work skill variety* ( $\beta = -.19, p < .001$ ). Hence, H2 received partial support over the models.

To test the third hypothesis, stating that skill variety positively predicts entrepreneurial intentions, I also used the three models described above. All three skill variety measures predict entrepreneurial intentions (*variety interest in subjects*:  $\beta = .09, p < .05$ ; *educational skill variety*:  $\beta = .19, p < .001$ ; *work skill variety*:  $\beta = .27, p < .001$ ). Hence, H3 received full support over the models.

To test the fourth hypothesis, stating that the relationship between being *female* and *entrepreneurial intentions* is mediated by *skill variety*, I used the three models described above and applied bootstrapping with 2,000 replications. For each of 2,000 bootstrapped samples the unstandardized indirect effects and the 95% confidence intervals were computed by determining the indirect effects at the 2.5th and 97.5th percentiles. The mediation results are summarized in Table 4-3. First, the standardized indirect effect of being *female* over *variety interest in subjects* on *entrepreneurial intentions* was  $\beta = .02$ . The unstandardized bootstrapped effect was .04, with 95% confidence intervals of .01 to .07. Even though the indirect effect was statistically significant, the effect works the other way round than expected.

Second, the standardized indirect effect of being female over educational skill variety on entrepreneurial intentions was  $\beta = -.02$ . The unstandardized bootstrapped effect was -.04, with 95% confidence intervals of -.08 to -.01. Thus, the indirect effect was statistically significant. Because I still observe a significant negative effect of being female on entrepreneurial intentions, this suggests partial mediation. Third, the standardized indirect effect of being female over work skill variety on entrepreneurial intentions was  $\beta = -.05$ . The unstandardized bootstrapped effect was -.12, with 95% confidence intervals of -.18 to -.07. Thus, the indirect effect was statistically significant, again suggesting partial mediation. Hence, H4 received support.

**Table 4-3: Mediation effects**

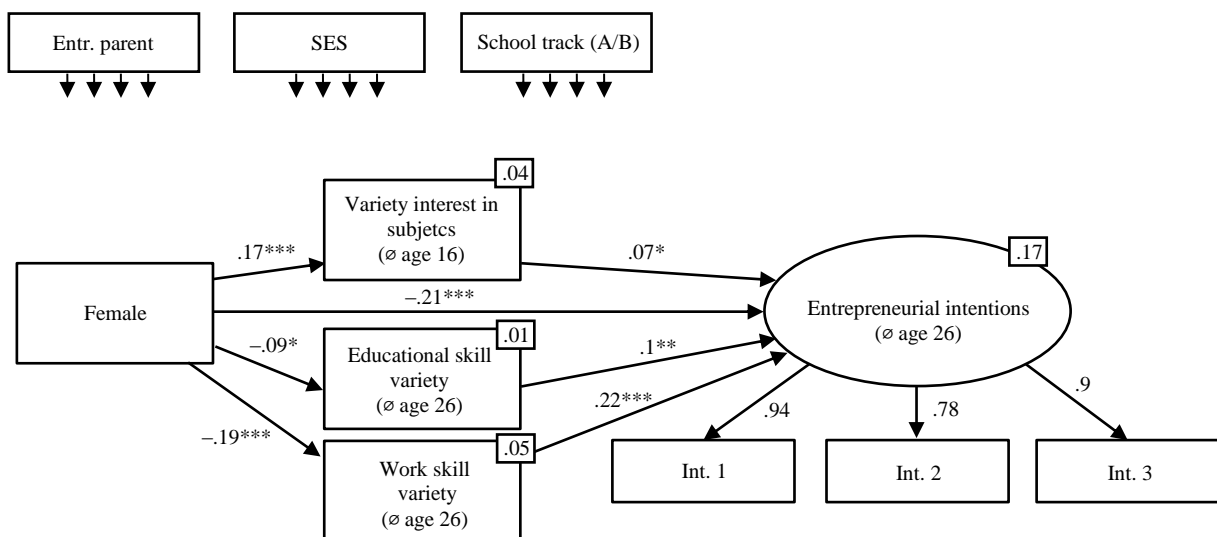
<b>Relationship</b>	<b>Direct effect without mediators</b>	<b>Direct effect with mediator: variety interest in subjects</b>	<b>Indirect effect with mediator: variety interest in subjects</b>	<b>Direct effect with mediator: educational skill variety</b>	<b>Indirect effect with mediator: educational skill variety</b>	<b>Direct effect with mediator: work skill variety</b>	<b>Indirect effect with mediator: work skill variety</b>
Female → Entrepreneurial intentions	-.25***	-.26***	.02** (.04) (.01 to .07)	-.23***	-.02** (-.04) (-.08 to -.01)	-.2***	-.05** (-.12) (-.18 to -.07)

*Note.* Standardized effects are given (unstandardized effects in parenthesis). Indirect effects and confidence intervals (95% CI) were estimated with 2,000 bootstrap resamples. Unstandardized confidence intervals are reported. All effects are controlled for entrepreneurial parents, SES and school track.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

Figure 4-4 shows the seemingly unrelated regression model. One cannot simply compare the coefficients of *female* on the different *skill variety* measures and use an eye-test to determine whether one is larger than the other. Instead, I follow the recommendations of Clogg et al. (1995) and Paternoster et al. (1998) to test the equality of regression coefficients. Using SEM, the three models described above are estimated simultaneously and the coefficients are compared afterwards. Please note that the error terms are assumed to be correlated across the different measures for *skill variety*. This procedure yields the correct coefficients and their standard errors. The coefficients represent the point estimators. For a comparison of whether these estimated regression coefficients are different, I then determine the difference between the coefficients and see if this difference is greater than a certain limit value. This procedure corresponds to an F-test. The comparison model shows an excellent fit ( $\chi^2 [14] = 13.37$ ,  $p < .498$ , CFI = 1.000, RMSEA = .000). Please note that I report standardized coefficients and standard errors. For the F-tests unstandardized values were used.

**Figure 4-4: Seemingly unrelated regression (N = 1,321)**



Note. Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variable.

Correlations between the control variables were allowed.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

First, I present the results of the comparison of the relationship between being *female* and the three *skill variety* variables. The negative effect of being *female* on *educational skill variety* ( $\beta = -.09$ ,  $SE = .03$ ) is stronger than the effect of being *female* on *variety interest in subjects* ( $\beta = .17$ ,  $SE = .03$ ),  $z = -5.23$ ,  $p < .001$ . Furthermore, the negative effect of being *female* on *work skill variety* ( $\beta = -.19$ ,  $SE = .03$ ) is stronger than the effect of being *female* on *variety*

*interest in subjects* ( $\beta = .17$ ,  $SE = .03$ ),  $z = -8.02$ ,  $p < .001$ . Moreover, the negative effect of being *female* on *work skill variety* ( $\beta = -.19$ ,  $SE = .03$ ) is stronger than the effect of being *female* on *educational skill variety* ( $\beta = -.09$ ,  $SE = .03$ ),  $z = -1.87$ ,  $p < .05$ .

Second, I compare the relation between the three different measures of *skill variety* and *entrepreneurial intentions*. The procedure applied comparing the three measures is similar to the procedure above, even though it cannot be labelled seemingly unrelated regression because I have one common dependent variable instead of three. The correlation between the different variety measures has to be included within the model to retrace the developmental character of the three measures. Two out of three comparisons show significant differences. The positive effect of *educational skill variety* on *entrepreneurial intentions* ( $\beta = .1$ ,  $SE = .04$ ) is not significantly stronger than the effect of *variety interest in subjects* on *entrepreneurial intentions* ( $\beta = .07$ ,  $SE = .04$ ),  $z = -0.03$ ,  $p > .1$ . In contrast, the positive effect of *work skill variety* on *entrepreneurial intentions* ( $\beta = .22$ ,  $SE = .04$ ) is significantly stronger than the effect of *variety interest in subjects* on *entrepreneurial intentions* ( $\beta = .07$ ,  $SE = .04$ ),  $z = 2.31$ ,  $p < .05$ . Moreover, the positive effect of *work skill variety* on *entrepreneurial intentions* ( $\beta = .22$ ,  $SE = .04$ ) is significantly stronger than the effect of *educational skill variety* on *entrepreneurial intentions* ( $\beta = .1$ ,  $SE = .04$ ),  $z = 2.77$ ,  $p < .01$ .

Third, I compare the indirect effects within the comparison model. The procedure applied corresponds to the one used above. Please note that the indirect effects and their standard errors were computed with Bootstrapping, using 2,000 replications. All three indirect effects were significant at the 5%-level.<sup>11</sup> In the following, I report unstandardized coefficients and standard errors as I am only interested in differences between the indirect effects rather than the effects themselves. The mediating effect of *female* via *educational skill variety* on *entrepreneurial intentions* ( $\beta = -.02$ ,  $SE = .012$ ) is significantly stronger than the mediated effect of *female* via *variety interest in subjects* on *entrepreneurial intentions* ( $\beta = .03$ ,  $SE = .017$ ),  $z = -2.43$ ,  $p < 0.01$ . The mediated effect of *female* via *work skill variety* on *entrepreneurial intentions* ( $\beta = -.1$ ,  $SE = .026$ ) is significantly stronger than the mediated effect of *female* via *variety interest in subjects* on *entrepreneurial intentions* ( $\beta = .03$ ,  $SE = .017$ ),  $z = -4.23$ ,  $p < .001$ . Last, the mediated effect of *female* via *work skill variety* on *entrepreneurial intentions* ( $\beta = -.1$ ,  $SE = .026$ ) is significantly stronger than the mediated effect of *female* via *educational skill variety* on *entrepreneurial intentions* ( $\beta = -.02$ ,  $SE = .012$ ),  $z = -2.79$ ,  $p < 0.01$ .

<sup>11</sup> I do not provide further details on these bootstrapping results because I do not observe differences in comparison to the indirect effects within the models 4-3A-C.

*OLS regressions as a methodical robustness check*

In the following, I present the results of OLS regressions (see Table 4-5 and 4-6) and compare these results to the SEM models discussed above as a robustness check. For the OLS regressions, the latent variable *entrepreneurial intentions* was extracted from factor analysis (maximum likelihood). Please note that the results from SEM slightly vary from the results of OLS. One reason for this variation is that in SEM measurement errors for the latent factors are taken into account. Further, the OLS models were calculated without the imputation of missing data. The results from the comparison between OLS regressions and SEM in regard to the hypotheses are summed up in Table 4-4. The results remain stable with the exception of differences in the values of the regression coefficients.

**Table 4-4: Overview of methodical comparison**

Method Hypothesis	SEM	OLS
H1	✓	✓
H2 (Variety interest in subjects)	✗	✗
H2 (Educational skill variety)	✓	✓
H2 (Work skill variety)	✓	✓
H3 (Variety interest in subjects)	✓	✓
H3 (Educational skill variety)	✓	✓
H3 (Work skill variety)	✓	✓
H4 (Variety interest in subjects)	✓	✓
H4 (Educational skill variety)	✓	✓
H4 (Work skill variety)	✓	✓

*Note.* Measurement alternatives for skill variety in parentheses.

**Table 4-5: Robustness checks Figures 4-2, 4-3A, 4-3B, 4-3C**

<b>Model</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>	<b>Model 6</b>	<b>Model 7</b>
<b>Dependent variable</b>	<b>Entr. intentions</b>	<b>Variety interest in subjects</b>	<b>Entr. intentions</b>	<b>Educational skill variety</b>	<b>Entr. intentions</b>	<b>Work skill variety</b>	<b>Entr. intentions</b>
<b>Tested hypotheses</b>	<b>H1</b>	<b>H2</b>	<b>H3</b>	<b>H2</b>	<b>H3</b>	<b>H2</b>	<b>H3</b>
Female (m/f)	-0.32*** (0.03)	0.17*** (0.03)	-0.35*** (0.03)	-0.1** (0.04)	-0.3*** (0.04)	-0.2*** (0.04)	-0.26*** (0.04)
Variety interest in subjects			0.07* (0.03)				
Educational skill variety					0.24*** (0.04)		
Work skill variety							0.31*** (0.04)
Entr. parent	0.05 (0.03)	0.04 (0.04)	0.06 (0.03)	0.01 (0.04)	0.04 (0.04)	0.03 (0.04)	0.04 (0.04)
SES	0.04 (0.03)	0.03 (0.03)	0.04 (0.03)	0.01 (0.04)	0.06 (0.04)	-0.03 (0.04)	0.07 (0.04)
School track (A/B)	-0.14*** (0.03)	0.08* (0.03)	-0.15*** (0.03)	-0.01 (0.04)	-0.15*** (0.04)	-0.06 (0.04)	-0.14** (0.04)
Constant	0.01 (0.03)	0.00 (0.03)	0.01 (0.03)	0.05 (0.04)	0.02 (0.04)	0.04 (0.04)	0.01 (0.04)
Observations	855	929	855	713	713	719	719
Adjusted R2	0.132	0.0359	0.138	0.00550	0.133	0.0396	0.154
F-test	41.83	9.633	30.81	1.984	22.76	8.405	27.10

*Note.* OLS regressions. Standardized coefficients are given. Standard errors (SE) in parentheses. All variables were z-standardized.

\*p < .05. \*\*p < .01. \*\*\*p < .001



**Table 4-6: Mediation effects (OLS)**

<b>Relationship</b>	<b>Direct effect without mediators</b>	<b>Direct effect with mediator: variety interest in subjects</b>	<b>Indirect effect with mediator: variety interest in subjects</b>	<b>Direct effect with mediator: educational skill variety</b>	<b>Indirect effect with mediator: educational skill variety</b>	<b>Direct effect with mediator: work skill variety</b>	<b>Indirect effect with mediator: work skill variety</b>
Female → Entrepreneurial intentions	-.32***	-.35***	.01* (.001 to .024)	-.3***	-.02* (-.038 to -.005)	-.2***	-.05*** (-.076 to -.03)

*Note.* Standardized effects are given. Indirect effects and confidence intervals (95% CI) were estimated with 2,000 bootstrap resamples. Standardized confidence intervals are reported. All effects are controlled for entrepreneurial parents, SES and school track.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

## 4.5 Discussion

### *Summary and discussion of main results*

The aim of this chapter was to investigate the gender gap in entrepreneurship from a skill variety perspective. Drawing on human capital theory (Becker, 1964), the skill variety approach (Lazear, 2005) and research on differences in labor market participation, I theorized on the differences in skill variety between the sexes. I focused on two research questions. First, does skill variety provide an explanation for the gender gap in entrepreneurship? Second, are there differences between different measures of skill variety at varying points in careers and do these measures effect the gender gap in entrepreneurship differently? According to my literature review and empirical results, the overall answer is yes. First of all, I observe a gender gap in *entrepreneurial intentions* (age 26). Looking at the relation between *female* and *skill variety*, I find mixed evidence. *Variety interest in subjects* (age 16) showed a comparably high positive connection with being *female*. However, the other two measures of skill variety, *educational* and *work skill variety* (both age 26), were, as hypothesized, negatively associated with being *female*. Results from seemingly unrelated regression show clear evidence that the negative effect of being *female* on *work skill variety* is stronger than both the effect on *educational skill variety* and in particular than the positive effect on *variety interest in subjects*. The results are not surprising, because all students go through the same curriculum at school. Even though women might be more interested in languages and arts and men might be more interested in math and engineering, overall differences in variety are not likely. These differences in early interests might be learned or innate. When it comes to *educational* and *work skill variety*, gender differences are more pronounced. *Educational skill variety* is shaped by the individual career aspirations. As argued in the theory section, women are more likely to opt for more specialized professions (often in the public sector) and are less likely to switch jobs for several reasons, such as less risk aversion or family commitments.

Beyond that, I find further evidence for Lazear's (2005) skill variety approach. Skill variety is important for *entrepreneurial intentions* at a school level (*variety interest in subjects*), at an educational (tertiary education) as well as work level. Results from seemingly unrelated regression showed that the importance of skill variety for *entrepreneurial intentions* grows significantly stronger over the educational trajectory. As expected, *work skill variety* has the strongest connection to entrepreneurship, followed by *educational skill variety*. School subjects

rather teach general knowledge, while educational skill variety (knowledge for a later profession) is rather action-orientated. A broad theoretical knowledge from different areas of knowledge can help to found and lead an enterprise (Baron, 2006; Taylor and Greve, 2006). Furthermore, it is well known that prior occupation-related knowledge is important for the recognition and exploitation of business opportunities (Shane and Venkataraman, 2000). Given this empirical evidence, I conclude that skill variety is most important for entrepreneurship. Broad practical experience prepares best for the many, varying tasks an entrepreneur has to perform (e.g. Lazear, 2005).

Results from bootstrapping showed significant negative indirect effects from being *female* over *educational* and *work skill variety* on *entrepreneurial intentions*. Interestingly, the indirect effect from being *female* over *variety interest in subjects* on *entrepreneurial intentions* is positive because women show more variety over different school subjects. This suggests that boys and girls might not be that different in regard to variety at younger ages. The formation of variety in skills might be a development that is triggered by the gender-typical occupational choice and socialization, respectively discrimination in the labor market. Women might be both attracted and forced into more specialized jobs (often in the public sector). Results from seemingly unrelated regression showed that the closer the skill variety measure to the labor market, the stronger the negative gender effect is. Thus, the negative indirect effect from being *female* over *work skill variety* on *entrepreneurial intentions* is stronger than the negative indirect effect over *educational skill variety*.

#### *Additional explorations*

As shown above, there are significant changes in the effect pattern across the educational trajectory. Women have more variety interest in subjects than men, this variety is lost at later stages (educational/work variety) for women. However, this work-related variety is of the highest importance for entrepreneurship. In subsection 4.2, I theorized about different channels that might mediate the relationship between gender and the different operationalizations of skill variety. The data allow me to investigate a few of those channels, but not all. First, fear of failure has been shown to be a hindrance to entrepreneurship (e.g. Koellinger et al., 2013). At the same time, women show less confidence in their abilities and higher fear of failure (Wilson et al., 2007). Arguably, fear of failure inhibits the development of skill variety because skill variety demands a certain degree of courage and open-mindedness to try out new things, switch jobs, employers or industries. Trying out new things is always

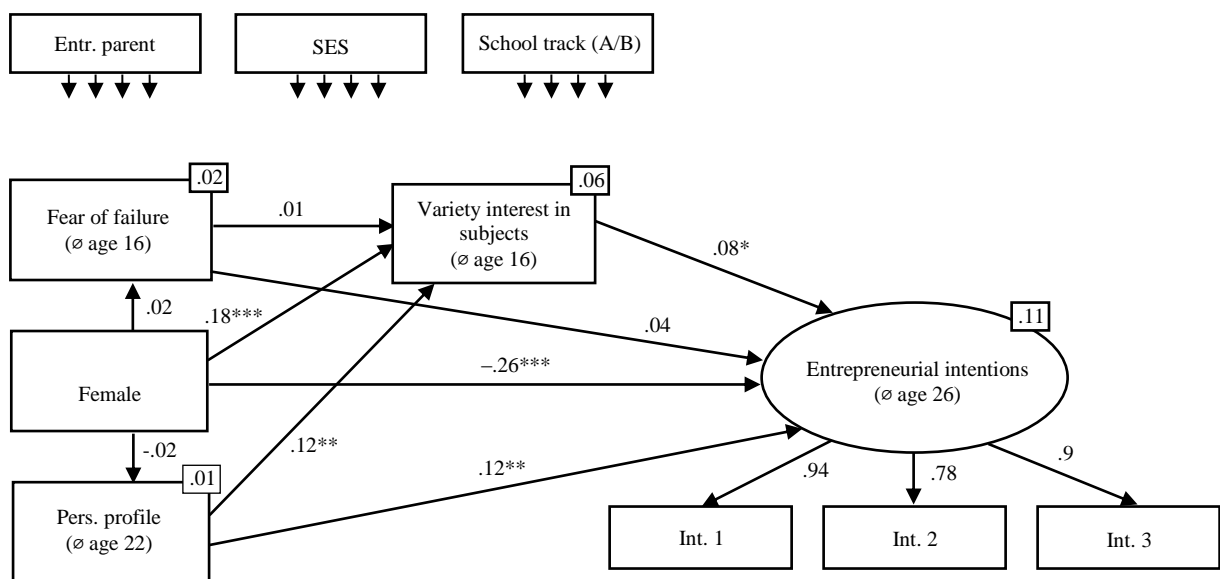
related to the possibility of failure. To measure *fear of failure* (assessed in T7, average age 26), participants were asked to answer the following question (“I try to avoid situations in which I may fail or make mistakes.”; 1 = Do not agree at all, 7 = Strongly agree). The item has been successfully employed in previous research (e.g. Tuominen-Soini et al., 2011).

Second, an *entrepreneurial personality profile* has been shown to be important for entrepreneurship, especially for entrepreneurial competence growth from childhood through adolescence on (Obschonka et al., 2010; Schmitt-Rodermund, 2004, 2007). Recently, Obschonka et al. (2014) find women to exhibit lower scores in entrepreneurial personality profiles. Thus, an entrepreneurial personality profile might also be part of the explanation of the gender gap in entrepreneurship. Following previous research (Schmitt-Rodermund, 2004, 2007; Obschonka et al., 2010; Zhao and Seibert, 2006), this intraindividual profile is based on a specific constellation of the Big Five traits (high in extraversion, conscientiousness and openness; low in agreeableness and neuroticism). For each person, the individual differences between the entrepreneurial reference and personal scores are squared and summed up over the five traits. Hereafter, the algebraic sign of the sum is reversed. The higher (closer to zero) the value, the higher the fit to an *entrepreneurial personality profile*. Please note that the Big Five were assessed with a short version of a well-validated questionnaire in T5, average age 22 (John and Srivastava, 1999).

Third, having *children* at age 26 was investigated. It is an empirical fact that women have children at an earlier age than men. In the US (between 2006 and 2010), the mean age of first birth was 23 for women and 25 for men (Martinez et al., 2012). Having children often prevents women from pursuing their careers. Being out of the labor market (even if only for a certain span of time) hinders the development of skill variety and human capital in general. Research on having children and female entrepreneurship shows mixed evidence. Literature indicates that for women, children might be both hindrance as well as motivation to establish a business. The motivation can be the desire for flexible working hours and independence (e.g. Buttner, 1993). Georgellis and Wall (2005) suggest that female self-employment might be a substitute for part-time jobs and prior inactivity. The hindrance can be that due to child and family commitments women are less locally and timely flexible and might thus not fit in entrepreneurship as a profession (Cutillo and Centra, 2017; Loprest, 1991; Polachek, 1981). For men, children should not play a major role with regard to job related matters (e.g. Altonji, 1999).

Figures 4-5A-C show the results from three mediation models, investigating the effects of the mediators (*fear of failure*, *entrepreneurial personality profile* and *having children*) on the skill variety measures and *entrepreneurial intentions*. Please note that I did not include *having children* in the first model, because the respondents have no children at age 16 (*variety interest in subjects* is also measured at age 16). The models show a good fit (Fig. 4-5A:  $\chi^2 [15] = 29.06$ ,  $p = .016$ , CFI = .993, RMSEA = .027; Fig. 4-5B:  $\chi^2 [19] = 36.96$ ,  $p = .008$ , CFI = .991, RMSEA = .027; Fig. 4-5C:  $\chi^2 [19] = 33.22$ ,  $p = .022$ , CFI = .993, RMSEA = .024).

**Figure 4-5A: Variety interest in subjects and additional mediators (N = 1,321)**



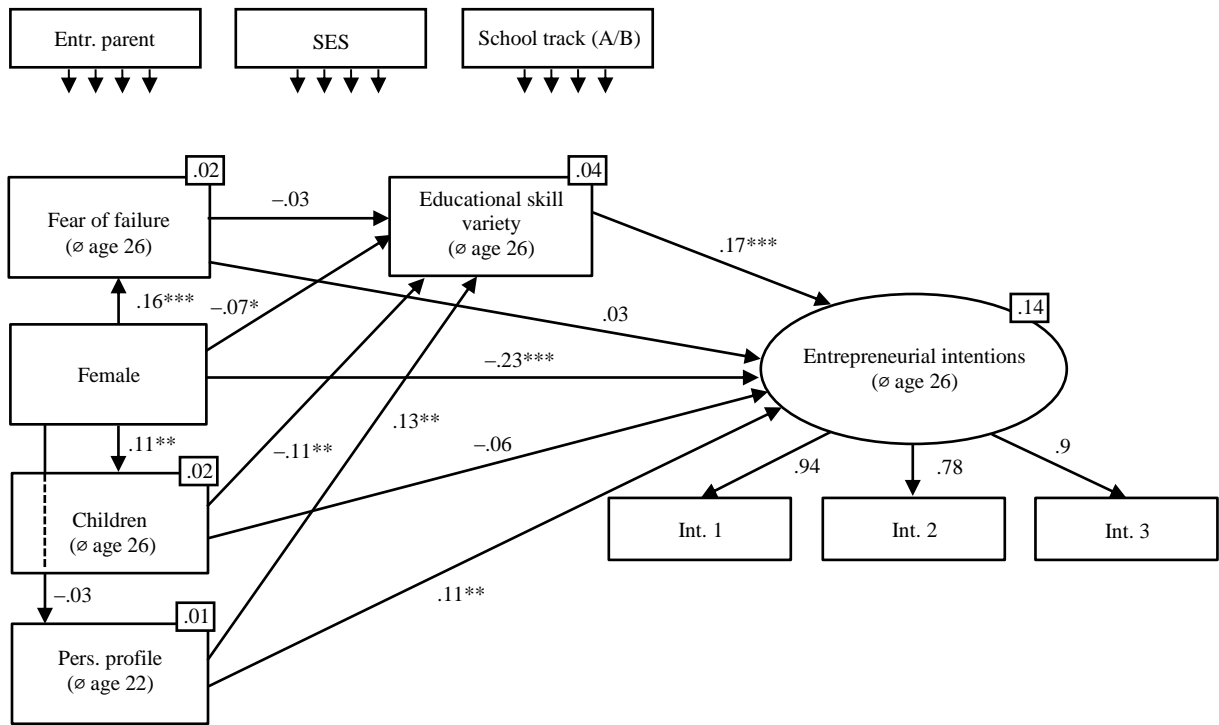
*Note.* Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variable.

Correlations between the control variables were allowed.

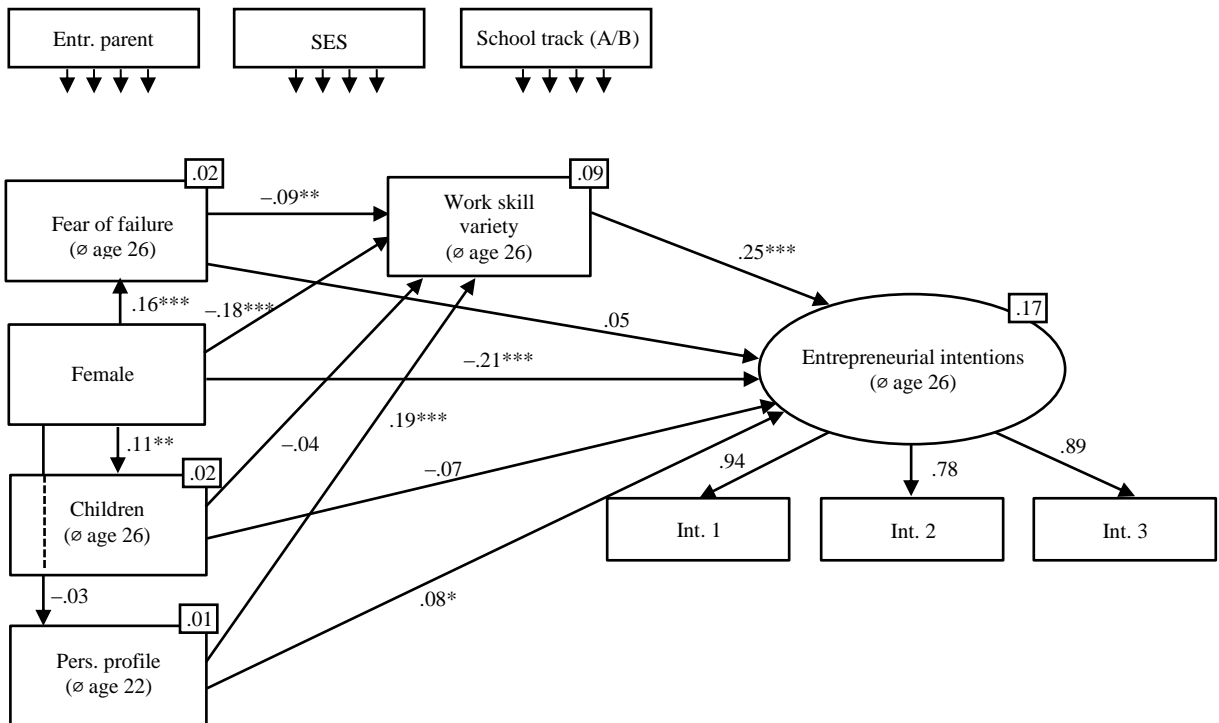
\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

As expected and in line with previous research, being *female* is positively associated with *fear of failure*, measured at age 26 (Fig. 4-5B:  $\beta = .16$ ,  $p < .001$ ; Fig. 4-5C:  $\beta = .16$ ,  $p < .001$ ) and *having children* is positively associated with *fear of failure* (Fig 4-5B:  $\beta = .11$ ,  $p < .01$ ; Fig 4-5C:  $\beta = .11$ ,  $p < .01$ ) in the models investigated at age 26. Thus, both factors offer further explanatory potential in regard to the differences between the skill variety measures. Even though an *entrepreneurial personality profile* shows to be important for all skill variety measures, as well as *entrepreneurial intentions*, I did not find evidence that being *female* is negatively associated with an *entrepreneurial personality profile*. This is in contrast to Obschonka et al. (2014), who found such a relationship across several countries.

**Figure 4-5B: Educational skill variety and additional mediators (N = 1,321)†**



**Figure 4-5C: Work skill variety and additional mediators (N = 1,321)†**



†Note. Standardized coefficients are given.  $R^2$  is shown in the upper right corner of the dependent variable.

Correlations between the control variables were allowed.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

First, I report the results of the model with *variety interest in subjects* as skill variety measure. Fear of failure does not significantly predict school interest variety. This is in line with my expectations because at this early stage, there are not as many risky tasks to perform as at later stages. Second, I report the results of the model with *educational skill variety* as skill variety measure. *Educational skill variety* is negatively predicted by having *children* at age 26 ( $\beta = -.11, p < .01$ ). Furthermore, there is a mediated effect of *female* via having *children* on educational skill variety ( $\beta = -.01$ ). The unstandardized bootstrapped effect was  $-.04$ , with 95% confidence intervals of  $-.09$  to  $-.02$ . Thus, the indirect effect is statistically significant. This indicates that having *children* could be a hindrance to the development of *educational skill variety*. This could be due to a non-educational status (child care at home) or to a higher need for security resulting in a specific education to fulfill a certain job that might be child-friendly. *Fear of failure* does not influence *educational skill variety* significantly. Third, I report the results of the third model with *work skill variety* as skill variety measure. *Work skill variety* is negatively predicted by *fear of failure* ( $\beta = -.09, p < .01$ ). Furthermore, there is a mediated effect of *female* via *fear of failure* on *work skill variety* ( $\beta = -.01$ ). The unstandardized bootstrapped effect was  $-.04$ , with 95% confidence intervals of  $-.09$  to  $-.01$ . Thus, the indirect effect is statistically significant. This indicates that *fear of failure* could be a hindrance to the development of *work skill variety*. Fear of failure could be an inducement to stay with the same job. Having *children* surprisingly does not predict *work skill variety*.

Summing up, *fear of failure* and having *children* seem to negatively impact the acquisition of skill variety. Interestingly, having *children* does only affect *educational skill variety* and has no effect on *work skill variety*. *Fear of failure* is most important for *work skill variety*. However, the standardized regression coefficients are relatively small (below 0.2). This suggests that other factors, which were theorized in the beginning of the chapter, such as social capital or financial capital factors, might play a more prominent role in explaining the less varied skill set of women. Unfortunately, I had no data to test these additional channels.

#### 4.6 Limitations and future research

This chapter has several limitations. First, I acknowledge that the effect sizes of the skill variety measures in explaining the gender gap in entrepreneurial intentions are relatively small. *Educational skill variety* explains approximately 8%, while *work skill variety* explains 20% of the gender gap. The gender gap is a multi-causal phenomenon (e.g. Kelley et al., 2015). Future research could thus include a broader set of gender typical explanatory variables from

social and financial capital. Future research could also explore the conditions under which being female actually leads to less skill variety. The role of the socio-economic environment, culture or micro-level indicators (e.g. entrepreneurial parents) might be important drivers or inhibitors of female entrepreneurship. With regard to the measurement of skill variety, in a gender context, it might be an interesting idea for future research, to measure movement around firms and industries. From this mobility, chances to acquire skill variety arise. Women might be particularly disadvantaged here, because of their reconciliation of family and work as well as their higher risk aversion.

Second, the participants of the FinEdu study were only 26 years old at the last wave of data collection. Not all respondents have completed the transition into working life yet. Thus, it might be argued that it was too early to assess entrepreneurial intentions. Therefore, I reran the models with those participants that already have entered the labor market, obtaining similar results. Beyond that, previous research has shown that entrepreneurial intentions, measured in adolescence, predict subsequent entrepreneurial activity (Schoon and Duckworth, 2012). The potential mediator having a child might also have been measured too early. In modern Western economies, the average child bearing age is higher. It thus might be interesting to readdress certain aspects of my research at later waves.

Furthermore, one main limitation is that this study was conducted in Finland and the results thus cannot be generalized to other countries easily. Finland is a welfare state, both in terms of education and social system. The data was raised for only two different types of school, it might be more useful to investigate participants with more heterogeneous educational backgrounds. Furthermore, it might be interesting to replicate the results for countries with different institutional frameworks or formal rules (e.g. concerning child care or household obligations). With a look at the issue of attrition, I cannot be sure whether those participants who dropped out of the study differed from those who lasted till the end, in terms of skill variety or entrepreneurial intentions. A clear limitation is that male participants were more likely to drop out than female participants. Although in this school setting of data collection this is reasonable, in particular for a gender discussion a more balanced attrition would have been desirable.



## 4.7 Implications for practice and conclusions

To conclude, this chapter on skill variety and the gender gap in entrepreneurship contributes to research on three points. First, I am able to provide further support for Lazear's skill variety approach. Second, I am able to explain part of the gender gap by employing skill variety measures as mediating factors between being female and entrepreneurial intentions. Third, I shed some light on the issue of measurement of skill variety. I compare three different functional measures of skill variety over the educational trajectory. My findings stress the superior importance of work-related measures over educational measures. Interestingly, going back to the early formative years of adolescents, I find that women might have more variety compared to men. This variety gets lost on the way to the transition into adulthood, respectively working life.

My research has important implications for policy makers and entrepreneurship educators. Skill variety is important for entrepreneurial choice, success and entrepreneurship in general. If women have less skill variety than men, policy makers should then promote female entrepreneurship by investments in the variety of different skills of future, potential female entrepreneurs. Politics could create institutional environments and entrepreneurship programs which provide women with opportunities and incentives to acquire skill variety. To become entrepreneurs, women should, as men, invest in many types of skills. Entrepreneurship education could also concentrate on women in particular. Programs designed only for men are not purposeful. Here, psychological attributes of individuals should also, besides skill variety, play a major role. Women tend to score lower in (entrepreneurial) self-efficacy and risk-taking, which both are crucial drivers of entrepreneurial skill accumulation and choice. Women-specific training programs that address broad entrepreneurial skills and tasks do not only enrich expertise but also increase levels of self-confidence (Greene et al., 2003). My results indicate that in adolescence there seems to be even more school-related skill variety that could be expanded later on. An entrepreneurial career should therefore be promoted as a practicable alternative for women and their life goals (including children and family). The fact that timing and commitment to a business play a greater role for women than for men should be taken into account.

## 5 Summary, implications and outlook

### 5.1 Summary of main findings and limitations

#### *Summary*

This dissertation focused on entrepreneurial human capital, which has been employed in entrepreneurial research frequently (see Davidsson and Gordon, 2012). Grounded in economics (Becker, 1964), human capital is argued to be associated with getting a venture running (Davidsson and Honig, 2003), firm survival (Bruederl et al., 1992), venture growth (Baum and Locke, 2004) and profitability (Bosma et al., 2004). Recently, this dominant view on human capital has been questioned. Traditional human capital variables have not shown the expected correlations with entrepreneurial outcomes (e.g. Unger et al., 2011). One possible reason for this finding might be that scholars have focused on a set of variables that is conceptually only weakly related to the entrepreneurial task. Lazear (2005) argues that skill variety is more important in entrepreneurship than any particular in-depth experience. This is derived from the insight that the essence of entrepreneurship is tackling different tasks while establishing and managing a business.

Table 5-1 summarizes the main findings of this dissertation. Even though existing studies on skill variety in entrepreneurship have delivered promising results with regard to entrepreneurial choice and success (e.g. Oberschachtsiek, 2012; Wagner, 2005), there exists no systematic literature review on skill variety. **Chapter 2** closed this research gap by providing a systematic literature review on skill variety in entrepreneurship. The literature review revealed that there is quite some consensus on the relevance of skill variety for the entrepreneurial choice. This holds true for non-profit and profit entrepreneurs (Cho et al., 2014) as well as single- and co-founders (Spiegel et al., 2013). Skill variety is also important for entrepreneurial intentions of both students and employees (Obschonka et al., 2016; Hyytinen and Ilmakunna, 2007a). With respect to the relation between skill variety and entrepreneurial success, results are less clear. Entrepreneurial success can be accounted for in several ways. Financial success factors, such as income or firm survival, show to be negatively correlated with skill variety (e.g. Åstebro and Thompson, 2011) or U-shaped (Spanjer and van Witteloostuijn, 2017). Skill variety might thus be conducive to entrepreneurship only upon a certain threshold.

Other success measures, such as innovativeness, progress in the venture or entrepreneurial competencies are more clearly predicted by skill variety.

**Table 5-1: Summary of main findings**

Research topic	Main findings
Chap 2. Literature review on skill variety in entrepreneurship	<ul style="list-style-type: none"> <li>-Skill variety is important for the entrepreneurial choice</li> <li>-Mixed evidence on skill variety and entrepreneurial success</li> <li>-Are origins of skill variety influenced by endowments or investments?</li> <li>-Is skill variety an explanation for the gender gap in entrepreneurship?</li> <li>-Different measurements for skill variety are used</li> </ul>
Chap 3. Origins of skill variety	<ul style="list-style-type: none"> <li>-Skill variety is important for entrepreneurial intentions</li> <li>-Early variety orientation as precursor of skill variety</li> <li>-Openness and personality profile are important for entrepreneurial skill acquisition</li> </ul>
Chap 4. Gender and skill variety	<ul style="list-style-type: none"> <li>-Skill variety explains part of the gender gap in entrepreneurial intentions</li> <li>-Work skill variety is most important for entrepreneurship and most negatively associated with being female</li> <li>-Educational and work skill variety mediate part of the gender gap in entrepreneurial intentions</li> <li>-Fear of failure hinders women from acquiring work skill variety, having children from acquiring educational skill variety</li> </ul>

These results should be considered with a look on the antecedents of skill variety. Lazear (2003) theorized that skill variety is acquired intentionally with the purpose of personal income maximization. This clashes with the above-discussed results on skill variety and monetary success measures. But the findings on the non-monetary success measures are in line with research conducted by Silva (2007) or Åstebro and Thompson (2011), who find evidence for a dependency of the acquisition of skill variety on endowments, such as an entrepreneurial talent or a taste for variety. A person that acquires skill variety and chooses entrepreneurship as a profession subsequently because of a taste for variety, might accept lower earnings in exchange for non-pecuniary benefits, such as personal fulfillment. Research on the determinants of skill variety is still in its infancy. Further research that discovers the role of endowments and the interplay between endowment- and investment-factors should be undertaken. The literature review showed that there exist only five studies with a focus on determinants of skill variety. The literature also revealed that skill variety is measured in

working life mostly. By using early forms and indicators of skill variety further insights on the development of skill variety can be gained. At least it should be differentiated between skill variety acquired by schooling and skill variety acquired on the job. The research gap with regard to the determinants and measurement of skill variety was addressed in chapter 3. Furthermore, the literature review revealed that skill variety might be a potential mediator for the gender gap in entrepreneurship. Despite the fact that many studies report low correlations between skill variety and being female, few studies have inspected this relation in regard to the gender gap (e.g. Tonoyan et al., 2009). Chapter 4 of this dissertation focused on this research gap.

As discussed above, **chapter 3** of this dissertation investigated the early precursors and determinants of skill variety. Based on human capital theory, developmental psychology and sociology, I theorized on the formation of skill variety. Using the Finnish longitudinal survey FinEDU young adolescents could be traced up to early adulthood. A variety of interests and activities in adolescence (age 16) precedes subsequent skill variety (measured by functional skill variety acquired by schooling or by work, age 26). Skill variety predicts entrepreneurial intentions (as highly expected after the results of the literature review). With a look on the determinants of early variety and skill variety, I found both an entrepreneurial personality profile (proxy for entrepreneurial talent) and openness (proxy for a taste for variety) to play major roles. Both concepts predict entrepreneurial intentions directly, the entrepreneurial profile also predicts skill variety directly (not so openness). The relation between the personality profile and entrepreneurial intentions is fully mediated by skill variety. Besides the direct effects, two three-way indirect effects of an entrepreneurial personality/openness over early variety and skill variety on entrepreneurial intentions were detected. Interestingly, there are major differences between the entrepreneurial personality and openness. The entrepreneurial personality is expressed via early variety and skill variety, but is related to skill variety as well. Openness however, is only expressed via an early variety and expresses directly via entrepreneurial intentions. These findings are in line with the endowment view on entrepreneurship (e.g. Åstebro and Thompson, 2011; Silva, 2007). Surprisingly, no significant effect of entrepreneurial parents (age 16) on early variety or skill variety was found.

**Chapter 4** of this dissertation investigated skill variety as a potential mediator of the gender gap in entrepreneurship. Drawing from human capital theory and research on labor market differences between the sexes, I theorized about gender differences in skill variety that might explain part of the gender gap in entrepreneurship. Again, the longitudinal FinEdu data were utilized to be able to measure skill variety at different points in career (school interests,

educational and work skill variety). A substantial gender gap was observed in entrepreneurial intentions that was in part explained by skill variety. Interestingly, the early (age 16) skill variety measure over different school interests was positively correlated with being female (meaning that girls had more early variety). However, educational and work skill variety are clearly negatively related to being female. Results from Seemingly Unrelated Regression showed that the negative effect from being female on work skill variety is stronger than the other two effects. Looking at the importance of skill variety for entrepreneurial intentions, I also found that work skill variety has the strongest influence. But both, variety over interests in subjects and educational skill variety, also affect entrepreneurial intentions. Consequently, results from bootstrapping revealed that the indirect effect from being female over work skill variety on entrepreneurial intentions is also stronger than the other two indirect effects. Additional explorations aimed at explaining why women lose variety over the educational trajectory. In that sense, an entrepreneurial personality, fear of failure and having children were investigated as potential explanatory factors. Having children at age 26 showed to be a hindrance for women to acquiring educational skill variety, but not work skill variety. Fear of failure partly explained why women have less work skill variety. It has to be noted that both fear of failure and having children only explain a small part of the gender gap in skill variety. Thus, other factors, such as social capital or discrimination, should also be considered.

### *Limitations*

The interpretation of the results of this dissertation comes with some limitations. The limitations have been addressed in detail at the end of the respective chapters (3.5 and 4.6). In the following, a summary is given. With respect to the data used in chapter 3 and 4, the Finnish FinEdu data, it has to be noted that results derived from one country cannot be easily generalized to other countries. Further, the data were raised at two specific school types (at the beginning of the longitudinal survey). Due to the school setting of data collection, more attrition was observed among male students and among less capable students. This is a clear limitation because especially with respect to the gender discussion a more balanced attrition would have been desirable. Entrepreneurial intentions were employed as entrepreneurial outcome variable. This is due to the relatively young age (26) of the participants at the last wave of data collection. Even though intentions are a strong predictor of entrepreneurial behavior (Krueger, 2009; Lee et al., 2011), it would have been preferable to follow the participants longer and use entrepreneurial behavior instead. Another limitation is related to the measurement of the

Big Five items. This major independent variable was measured after some dependent variables. Even though it is well known that personality traits are relatively stable over time (Costa and McCrae, 1992; Roberts et al., 2006) and arguably personality traits are not influenced by the dependent variables, this limitation has to be mentioned. With respect to the measurement of entrepreneurial role models, I used entrepreneurial parents. Entrepreneurial parents were not related to the dependent variables (e.g. entrepreneurial intentions or skill variety), which is against the theorized hypotheses. Entrepreneurial role models might not capture role models in the Finnish context well (comparably low TEA rate in Finland).

Hence, the results should be regarded as first insights in the development and effects of skill variety in entrepreneurship. Future research is required to provide more generalizable results. Some avenues of future research are discussed in subsection 5.2. Even though this dissertation has limitations, there are also implications and contributions for theory and practice that are discussed in the following.

## **5.2 Implications and future research**

### *Implications for theory and practice*

This dissertation contributes to the field of entrepreneurship and research on the vocational development over the life course as well as the world of practice in several ways. First, further support for Lazear's skill variety approach is given. It has been shown that different measurement alternatives of skill variety are important for entrepreneurial intentions, as a precursor of entrepreneurial behavior. Second, this dissertation contributes to the fragmented and under-researched topic of origins of skill variety. For the first time, an interdisciplinary model of human capital acquisition, integrating ideas from economics, psychology and sociology, is investigated in a longitudinal setting. Interdisciplinary approaches are highly valuable to the field of entrepreneurship, which is by nature an interdisciplinary research field (Sorenson and Stuart, 2008). The longitudinal setting allows the investigation of an early variety orientation in interests and activities as a precursor of skill variety. Further, this dissertation sheds light upon the relevance of endowments, such as an entrepreneurial personality or a taste for variety. Third, skill variety was found to be a mediator of the gender gap in entrepreneurial intentions. Especially work-related skill variety explains substantial part of the gender gap. Fear of failure is identified as one potential reason why women have less work skill variety in general.

Besides the contributions to a better understanding of the development of entrepreneurial human capital, this dissertation can inform (school) policy makers, entrepreneurship educators and even self-employed parents on how to promote entrepreneurial mindsets and prepare new generations of potential entrepreneurs. To design entrepreneurship education at schools or entrepreneurship programs, it is necessary to know about the determinants of entrepreneurship. Entrepreneurship programs should teach skills and knowledge that are truly conducive to entrepreneurship. Entrepreneurship education might be improved by teaching a variety of skills and knowledge. If possible, this variety should be stimulated throughout the early formative years of adolescence, starting with age-appropriate activities and interests, expanded to more entrepreneurial tasks over time. Similarly, self-employed parents may encourage their children to accumulate educational and work skill variety, thus preparing them for the succession of the family business.

Entrepreneurship education might be more successful if participants are selected upon their endowments (e.g. personality profile or openness). From a psychological or traits perspective it might be helpful to select those candidates for entrepreneurship programs that have the best preconditions for entrepreneurship. With regard to openness (as a proxy for a taste for variety), influence should be exerted on individuals early on because openness affects entrepreneurial intentions over an early variety orientation and skill variety. An entrepreneurial personality profile showed to be important at all stages of the skill acquisition process. Nevertheless, as Stuetzer (2011, p. 162) states, “it is not possible and advisable to transform every child into an entrepreneur“. Female entrepreneurship deserves an education that is designed for women. Personality differences between the sexes, such as fear of failure or competitiveness, should be taken into account. It also should be taken into account that women might have different incentives towards entrepreneurship. The typical male entrepreneur might choose entrepreneurship, because he wants to maximize his potential income (Lazear, 2005). Please note that Åstebro and Thompson (2011) question this view in general, and especially for women, other motives, such as work family compatibility or the social impact are more decisive (Tegtmeier et al., 2016). Entrepreneurship provides such incentives, e.g. through social entrepreneurship, and these should then be highlighted within female programs. Overall, women should be encouraged to acquire skill variety early on and also when it comes to choosing a profession.

*Future research*

The final subsection of this dissertation is concerned with promising research avenues that are derived from the results and limitations presented above. First, the empirical results and conclusions are drawn from the Finnish FinEdu dataset. To make the results comparable over different socio-economic contexts, future research should also comprise data from more flexible labor markets (US or UK), more regulated ones (e.g. Germany) or developing countries (e.g. India or China).

Second, further variables measuring the individual social capital should be included in future research (e.g. entrepreneurial peers, SES or business networks). Entrepreneurial parents as employed in chapter 3, were, at least in the Finnish context, no relevant factor. Further variables concerning the investment view of skill variety acquisition should also be taken into account. For example, the age of a first entrepreneurial career interest was successfully employed in skill variety research (Stuetzer et al., 2013b). Combining both the investment and endowment view could also provide insights on the early development of age-appropriate skill variety. In this dissertation, an early variety orientation was only measured at one particular point in time (age 16). Further insight could be gained tracing this variety over childhood and adolescence. In regard to female skill variety, it would be interesting to know when and why female variety orientation decreases or gets lost. Beyond that, more explanatory variables should be included to find out why women acquire less skill variety in higher education or at work. These variables should comprise the personal as well as the socio-economic environment of potential female entrepreneurs. It would also be interesting to investigate if women are less intrapreneurial than their male counterparts.

Open research questions (concerning entrepreneurial skill variety) independent from the empirical investigations within this dissertation are the connection of bricolage and skill variety or effectuation and skill variety. Bricolage is doing things with what is at hand and applying this to new problems (e.g. Senyard et al., 2014). Having a varied skill set should make the entrepreneur much more equipped for recombining different resources because one has more experience in different fields. Bricolage might also be a potential mediator between skill variety and entrepreneurial success. There exist some studies which report that skill variety is important for entrepreneurial success, but there exist no studies on the mechanism behind that. In the same sense, the relation between skill variety and effectuation could be investigated. Effectuation is a focus on given means and possible outcomes rather than the combination of



potential means to create a specific output (Sarasvathy, 2001). Entrepreneurs with more skill variety might use effectuation more effectively.

Skill variety might be distributed unequally among different groups of entrepreneurs. My literature review revealed that skill variety is important for entrepreneurs at different stages of the founding process (e.g. Wagner 2006). Beyond that, looking at the motivations to become entrepreneurs, work-related skill variety has been shown to be important for both necessity- and opportunity-driven entrepreneurship (Wagner, 2005a), but probably for different reasons. Skill variety is clearly not only constituted by work experience, but also by education. Necessity-driven entrepreneurs have less educational human capital on average (e.g. secondary education or university degree). This probably leads to less chances to acquire educational skill variety. At the same time, fewer chances in the labor market might lead to job switching, which again can foster work skill variety. It is well known that skill variety is conducive to the detection of profitable, innovative business opportunities (e.g. Lazear, 2005; Stuetzer et al., 2013a), a key competence of opportunity-driven entrepreneurs. More research is needed to shed light on the relationship between different skill variety measures and necessity- and opportunity-driven entrepreneurship.

There might also be differences in the distribution of skill variety among low and high growth firms. Low vs. high growth is of course empirically related to necessity vs. opportunity entrepreneurship. However, opportunity and necessity are motivational aspects while growth is a quantifiable result. The constructs are therefore conceptually different. Businesses that are not growth-oriented are often solo businesses and small firms (e.g. nail salon or hot dog station). In a small or solo business the founder has to fulfill many different tasks on his own. In contrast, high-growth-oriented firms are rather team foundations. Here, skill variety might matter on the team level, rather than on an individual level. Little is known regarding skill variety in low-growth and high-growth firms, which is why more research is clearly needed. The only publication looking at this topic is from Spiegel et al. (2013), but Spiegel rather compares single founders and team founders, which can be regarded as no-growth firms and high-growth firms, respectively. They find no major differences in skill variety on an individual level (Spiegel et al., 2013). Arguably, team members can make up for the skills another team member lacks, though individual skill variety might not be as important as for solo entrepreneurs. A team might however profit from the varied aggregate experiences of its members (sum of the individual skills).

Another research gap just looms one step away as there is little known about the processes how skill variety affects entrepreneurial performance. Looking at team founders, it is well known that heterogeneity within teams can, for example, improve the quality of the decision processes (Hambrick et al., 1996) or the capacity for innovation (Hayton and Zahra, 2005). Skill variety can be seen as a good proxy for heterogeneity in knowledge. Thus, it might be interesting to analyze whether skill variety improves decision processes and innovation. Especially regarding innovation, there are good theoretical arguments for a connection with skill variety. Innovation emerges out of the recombination of existing knowledge into novel combinations (Stuetzer, 2011). As skill variety is having knowledge in different fields, the entrepreneur or the entrepreneurial team equipped with skill variety should have the different knowledge bases necessary for recombination and thus innovation. However, it is also known that heterogeneity in teams might lead to communication (Lovelace et al., 2001) and cooperation problems (Mesmer-Magnus and DeChurch 2009). At this point, further research is needed to disentangle the positive and negative influences of skill variety on teams.

Another open research question is: does skill variety differ between part-time and full-time entrepreneurs? Part-time entrepreneurs often work as a paid employee concurrently. Part-time entrepreneurship often takes place alongside paid employment. It frequently follows childcare leaves or previous part-time employment spells. Therefore, part-time entrepreneurs probably have less skill variety (cf. Folta et al., 2010). This is because, according to Lazear's (2003) original thought, employees are rather specialized. Maybe this rather less diverse skill set inhibits part-time entrepreneurs to become full-time entrepreneurs. More research on the skill variety endowment of part-time entrepreneurs could shed light on this issue.

One last avenue of future research might be to focus on skill variety as a potential moderator of the intention-action gap in entrepreneurship. Because entrepreneurship is a rare event, entrepreneurial intentions are particularly useful to understand underlying processes, such as determinants or even consequences of the entrepreneurial choice (Ajzen, 1987). Even though the entrepreneurial choice is a planned behavior and is thus best predicted by entrepreneurial intentions, one observes an intention-action gap (Krueger and Carsrud, 1993). Considering the theory of planned behavior (Ajzen, 1991), skill variety might be one of the exogenous factors that positively affect the perceived self-efficacy or behavioral control for entrepreneurial actions. Arguably, skill variety is an essential equipment of entrepreneurs and might thus raise the potential founders' self-efficacy for entrepreneurship. High levels of

skill variety might encourage individuals with entrepreneurial intentions to found a business; low levels of skill variety might in turn discourage these individuals.

Skill variety is a young, promising field of entrepreneurship research. Beyond the advancements made in this dissertation, a multitude of aspects is waiting to be analyzed. Skill variety remains a rewarding area for future research.

## References

- Acock, A. C. (2013). *Discovering Structural Equation Modeling Using Stata*. College Station, TX: Stata Press Books.
- Adema, W., Ali, N., Frey, V., Kim, H., Lunati, M., Piacentini, M., & Queisser, M. (2014). *Enhancing Women's Economic Empowerment through Entrepreneurship and Business Leadership in OECD Countries*. Paris: OECD.
- Aerts, K., Matthyssens, P., & Vandenbempt, K. (2007). Critical role and screening practices of European business incubators. *Technovation*, 27(5), 254-267.
- Ajzen, I. (1987). Attitudes, traits, and actions: Dispositional prediction of behavior in personality and social psychology. *Advances in Experimental Social Psychology*, 20, 1-63.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Aldrich, H. (1989). I heard it through the grapevine: Networking among women entrepreneurs. In O. Hagen, C. Riichun, & D. Sexton (Eds.), *Women Owned Businesses* (pp. 103-132). New York: Praeger.
- Aldrich, H. E., & Cliff, J. E. (2003). The pervasive effects of family on entrepreneurship: Toward a family embeddedness perspective. *Journal of Business Venturing*, 18(5), 573-596.
- Aldrich, H., Reese, P. R., & Dubini, P. (1989). Women on the verge of a breakthrough: Networking among entrepreneurs in the United States and Italy. *Entrepreneurship & Regional Development*, 1(4), 339-356.
- Aldén, L., Hammarstedt, M., & Neuman, E. (2014). *All about Balance?: A Test of the Jack-of-all-Trades Theory among the Self-employed in Sweden*. Linnaeus centre for labour market and discrimination studies.
- Altonji, J. G., & Blank, R. M. (1999). Race and gender in the labor market. In O. Ashenfelter, & D. Card (Eds.), *Handbook of Labor Economics* (pp. 3143-3259). Amsterdam: North Holland.
- Amatucci, F. M., & Sohl, J. E. (2004). Women entrepreneurs securing business angel financing: Tales from the field. *Venture Capital*, 6(2-3), 181-196.
- Anna, A. L., Chandler, G. N., Jansen, E., & Mero, N. P. (2000). Women business owners in traditional and non-traditional industries. *Journal of Business Venturing*, 15(3), 279-303.
- Arch, E. C. (1993). Risk-taking: A motivational basis for sex differences. *Psychological Reports*, 73(1), 3-11.
- Arenius, P., & De Clerc, D. (2005). A network-based approach on opportunity recognition. *Small Business Economics*, 24(3), 249-256.
- Assouline, M., & Meir, E. I. (1987). Meta-analysis of the relationship between congruence and well-being measures. *Journal of Vocational Behavior*, 31(3), 319-332.
- Åstebro, T., & Thompson, P. (2011). Entrepreneurs. Jacks of all trades or hobos? *Research Policy*, 40(5), 637-649.

- Åstebro, T. (2016). *Plenary Session at the CoDE Conference, ZEW Mannheim, June 7, 2016.*
- Åstebro, T., Chen, J., & Thompson, P. (2011). Stars and misfits: Self-employment and labor market frictions. *Management Science*, 57(11), 1999-2017.
- Åstebro, T., & Hoos, F. (2016). *The Effects of a Training Program to Encourage Social Entrepreneurship.* HCE Paris Research Paper, No. SPE-2016-1128.
- Åstebro, T., & Yong, K. (2016). Invention quality and entrepreneurial earnings: The role of prior employment variety. *Entrepreneurship Theory and Practice*, 40(2), 381-400.
- Audretsch, D., Grilo, I., & Thurik, R. (2007). Explaining entrepreneurship and the role of policy: A framework. In D. Audretsch, I. Grilo and R. Thurik (Eds.), *Handbook of Entrepreneurship Policy* (pp. 1-17), Cheltenham, UK: Edward Elgar Publishing Ltd.
- Backes-Gellner, U., & Moog, P. (2013). The disposition to become an entrepreneur and the jacks-of-all-trades in social and human. *Journal of Socio-Economics*, 47, 55-72.
- Backes-Gellner, U., Tuor, S. N., & Wettstein, D. (2010). Differences in the educational paths of entrepreneurs and employees. *Empirical Research in Vocational Education and Training*, 2(2), 83-105.
- Baker, T., Miner, A. S., & Esley, D. T. (2003). Improvising firms: Bricolage account giving and improvisational competencies in the founding process, *Research Policy*, 32(3), 255-276.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, 37(2), 122-147.
- Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1997). *Self-efficacy: The Exercise of Control.* New York: Freeman.
- Bandura, A., & Walters, R. (1963). *Social Learning and Personality Development.* New York: Holt, Rinehart & Winston.
- Barnett, R. C., & Hyde, J. S. (2001). Women, men, work, and family. *American Psychologist*, 56(10), 781-796.
- Baron, R. A. (2006). Opportunity recognition as pattern recognition: How entrepreneurs “connect the dots” to identify new business opportunities. *The Academy of Management Perspectives*, 20(1), 104-119.
- 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.
- Becker, G. S. (1964). *Human Capital Theory.* New York: Columbia.
- Becker, G. S., (1991). *A Treatise on the Family.* Cambridge, MA: Harvard University Press.
- Bianchi, S. M., & Cohen, P. N. (1999). Marriage, children, and women's employment: What do we know? *Monthly Labor Review*, 122(12), 22-31.
- Biersack, W. (2002) Überblick zur Beschäftigung und Arbeitslosigkeit von Frauen nach Berufen. In G. Engelbrech (Ed.), *Arbeitsmarktchancen für Frauen* (pp. 127-144), Nürnberg: BeitrAB 258.
- Bird, B. (1988). Implementing entrepreneurial ideas: The case for intention. *Academy of Management Review*, 13(3), 442-453.

- Blanchflower, D. G. (2000). Self-employment in OECD countries. *Labour Economics*, 7(5), 471-505.
- Blanchflower, D. G. (2004). Self-employment: More may not be better. *Swedish Economic Policy Review*, 11, 15-74.
- Blau, F. D. (1998). Trends in the well-being of American women, 1970-1995. *Journal of Economic Literature*, 36, 112-165.
- Blau, F. D., Ferber, M. A., & Winkler, A. E. (1998). *The Economics of Women, Men, and Work*. Englewood Cliffs, NJ: Prentice-Hall.
- Blau, F. D., & Kahn, L. M. (1997). Swimming upstream: Trends in the gender wage differential in the 1980s. *Journal of Labor Economics*, 15(1), 1-42.
- Blau, F. D., & Kahn, L. M. (2006). The gender pay gap: Going, going... but not gone. In F. D. Blau, M. C. Brinton, & D. B. Grusky (Eds.), *The Declining Significance of Gender* (pp. 37-66). New York: Russell Sage Foundation.
- Block, J. H., Hoogerheide, L., & Thurik, R. (2012). Are education and entrepreneurial income endogenous? A bayesian analysis. *Entrepreneurship Research Journal*, 2(3), 1-29.
- Block, J. H., Hoogerheide, L., & Thurik, R. (2013). Education and entrepreneurial choice: An instrumental variables analysis. *International Small Business Journal*, 31(1), 23-33.
- Block, J. H., & Sandner, P. (2009). Necessity and opportunity entrepreneurs and their duration in self-employment: evidence from German micro data. *Journal of Industry, Competition and Trade*, 9(2), 117-137.
- Boden, R. J., & Nucci, A. R. (2000). On the survival prospects of men's and women's new business ventures. *Journal of Business Venturing*, 15(4), 347-362.
- Boehm, D. N., & Hogan, T. (2014). "A jack of all trades": The role of PIs in the establishment and management of collaborative networks in scientific knowledge commercialisation. *Journal of Technology Transfer*, 39(1), 134-149.
- Boente, W., & Piegeler, M. (2013). Gender gap in latent and nascent entrepreneurship: Driven by competitiveness. *Small Business Economics*, 41(4), 961-987.
- Bosma, N., Hessels, J., Schutjens, V., van Praag, M., & Verheul, I. (2012a). Entrepreneurship and role models. *Journal of Economic Psychology*, 33(2), 410-424.
- 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.
- Bosma, N., Wennekers, S., & Amorós, J. E. (2012b). *Global Entrepreneurship Monitor 2011 Extended Report: Entrepreneurs and Entrepreneurial Employees across the Globe*. Global Entrepreneurship Research Association (GERA), London.
- Bourdieu, P. (1986). The forms of capital. In: J. G. Richardson (Ed.), *Handbook of Theory and Research for Sociology of Education* (pp. 241-258). New York: Greenwood Press.
- Boyd, R. L. (1990). Black and asian self-employment in large metropolitan areas: A comparative analysis. *Social Problems*, 37(2), 258-274.
- Brandstätter, H. (2011). Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and Individual Differences*, 51(3), 222-230.

- Brixy, U., & Hessels, J. (2010). *Human Capital and Start-up Success of Nascent Entrepreneurs*. EIM Research Reports H, 201013.
- Brown, C., & Corcoran, M. (1997). Sex-based differences in school content and the male-female wage gap. *Journal of Labor Economics*, 15(3), 431-465.
- Bruce, D. (2002). Taxes and entrepreneurial endurance: Evidence from the self-employed. *National Tax Journal*, 5-24.
- Brüderl, J., Preisendörfer, P., & Ziegler, R. (1992). Survival chances of newly founded business organizations. *American Sociological Review*, 57(2), 227-242.
- Brush, C. G., Carter, N. M., Greene, P. G., Hart, M. M., & Gatewood, E. (2002). The role of social capital and gender in linking financial suppliers and entrepreneurial firms: A framework for future research. *Venture Capital: An International Journal of Entrepreneurial Finance*, 4(4), 305-323.
- Bublitz, E., Fritsch, M., & Wyrwich, M. (2015). Balanced skills and the city: An analysis of the relationship between entrepreneurial skill balance, thickness, and innovation. *Economic Geography*, 91(4), 475-508.
- Bublitz, E., Nielsen, K., Noseleit, F., Timmermans, B. (2015). *Entrepreneurship, Human Capital, and Labor Demand: A Story of Signaling and Matching*. HWWI Research Paper, No. 166.
- Bublitz, E., & Noseleit, F. (2014). The skill balancing act: When does broad expertise pay off? *Small Business Economics*, 42(1), 17-32.
- Bund-Länder-Kommission (2000). *Verbesserung der Chancen von Frauen in Ausbildung und Beruf - Ausbildungs- und Studienwahlverhalten von Frauen. Materialien zur Bildungsplanung und zur Forschungsförderung*. Bonn: BLK.
- Buttner, E. H. (1993). Female entrepreneurs: How far have they come? *Business Horizons*, 36(2), 59-65.
- Buttner, E. H., & Rosen, B. (1992). Rejection in the loan application process: Male and female entrepreneurs' perceptions and subsequent intentions. *Journal of Small Business Management*, 30(1), 58-65.
- Byrnes, J. P., Miller, D. C., & Schafer, W. D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin*, 125(3), 367-383.
- Cardon, M. S., Wincent, J., Singh, J., & Drnovsek, M. (2009). The nature and experience of entrepreneurial passion. *Academy of Management Review*, 34, 511-532.
- Carree, M., Van Stel, A., Thurik, R., & Wennekers, S. (2002). Economic development and business ownership: An analysis using data of 23 OECD countries in the period 1976-1996. *Small Business Economics*, 19(3), 271-290.
- Carter, S., & Rosa, P. (1998). The financing of male-and female-owned businesses. *Entrepreneurship & Regional Development*, 10(3), 225-242.
- Caspi, A.; Roberts, B. W. & Shiner, R. L. (2005), Personality development: Stability and change, *Annual Review of Psychology*, 56(1), 453-484.
- Cavalluzzo, K. S., & Cavalluzzo, L. C. (1998). Market structure and discrimination: The case of small businesses. *Journal of Money, Credit and Banking*, 771-792.
- Chen, L-W., & Thompson, P. (2016). Skill balance and entrepreneurship: Evidence from online career histories, *Entrepreneurship Theory and Practice*, 40(2), 289-305.

- Chlosta, 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, 121-138.
- Cho, I., & Orazem, P. F. (2014). Are nonprofit entrepreneurs also jacks-of-all-trades? *IZA Journal of Labor Economics*, 3(1), 1-15.
- Cliff, J. E. (1998). Does one size fit all? Exploring the relationship between attitudes towards growth, gender, and business size. *Journal of Business Venturing*, 13(6), 523-542.
- Clogg, C. C., Petkova, E., & Haritou, A. (1995). Statistical methods for comparing regression coefficients between models. *American Journal of Sociology*, 100(5), 1261-1293.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94, 95-120.
- Colombatto, E., & Melnik, A. (2007). Early work experience and the transition into entrepreneurship. *Journal of Entrepreneurial Finance, JEF*, 12(1), 9-25.
- 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.
- Corcoran, M., & Duncan, G. J. (1979). Work history, labor force attachment, and earnings differences between the races and sexes. *Journal of Human Resources*, 3-20.
- Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory and NEO Five Factor Inventory Professional Manual*. Odessa, FL: Psychological assessment resources.
- Cowling, M., & Taylor, M. (2001). Entrepreneurial women and men: Two different species? *Small Business Economics*, 16(3), 167-175.
- Cramer, J. S., Hartog, J., Jonker, N., & Van Praag, C. M. (2002). Low risk aversion encourages the choice for entrepreneurship: An empirical test of a truism. *Journal of Economic Behavior & Organization*, 48(1), 29-36.
- Cumming, D., Walz, U., & Werth, J. C. (2016). Entrepreneurial spawning: Experience, education, and exit. *Financial Review*, 51(4), 507-525.
- Cunha, F., & Heckman, J. (2007). The technology of skill formation. *American Economic Review*, 97(2), 31-47.
- Cutillo, A., & Centra, M. (2017). Gender-based occupational choices and family responsibilities: The gender wage gap in Italy. *Feminist Economics*, 1-31.
- Daghbashyan, Z., Hårsman, B., 2012. *Entrepreneurship and Arts-related Education*. CESIS Working Paper No. 295.
- Davidsson, P. (2006). Nascent entrepreneurship: Empirical studies and developments. *Foundations and Trends in Entrepreneurship*, 2(1), 1-79.
- Davidsson, P., & Gordon, S. R. (2012). Panel studies of new venture creation: A methods-focused review and suggestions for future research. *Small Business Economics*, 39(4), 853-876.
- Davidsson, P., & Honig, B. (2003). The role of social and human capital among nascent entrepreneurs. *Journal of Business Venturing*, 18(3), 301-331.



- Dencker, J. C., Gruber, M., & Shah, S. K. (2009). Individual and opportunity factors influencing job creation in new firms. *Academy of Management Journal*, 52(6), 1125-1147.
- Dimov, D. (2007). From opportunity insight to opportunity intention: The importance of person-situation learning match. *Entrepreneurship Theory and Practice*, 31(4), 561-583.
- Douhan, R. (2009). *Compulsory Education and Jack-of-all-trades Entrepreneurs*. IFN Working Paper No. 797.
- Dutta, D. K., Li, J., & Merenda, M. (2011). Fostering entrepreneurship: Impact of specialization and diversity in education. *International Entrepreneurship and Management Journal*, 7(2), 163-179.
- Echevarria, C., & Merlo, A. (1999). Gender differences in education in a dynamic household bargaining model. *International Economic Review*, 40(2), 265-286.
- Elert, N., Andersson, F. W., & Wennberg, K. (2015). The impact of entrepreneurship education in high school on long-term entrepreneurial performance. *Journal of Economic Behavior & Organization*, 111, 209-223.
- Elfenbein, D. W., Hamilton, B. H., & Zenger, T. R. (2010). The small firm effect and the entrepreneurial spawning of scientists and engineers. *Management Science*, 56(4), 659-681.
- Elfring, T., & Hulsink, W. (2003). Networks in entrepreneurship: The case of high-technology firms. *Small Business Economics*, 21(4), 409-422.
- England, P. (2005). Gender inequality in labor markets: The role of motherhood and segregation. *Social Politics*, 12, 264-288.
- England, P., & Li, S. (2006). Desegregation stalled: The changing gender composition of college majors, 1971-2002. *Gender & Society*, 20(5), 657-677.
- Engle, D. E., Mah, J. J., & Sadri, G. (1997). An empirical comparison of entrepreneurs and employees: Implications of innovation. *Creativity Research Journal*, 10(1), 45-49.
- Evans, D. S., & Leighton, L. S. (1989). Some empirical aspects of entrepreneurship. *The American Economic Review*, 79(3), 519-535.
- Failla, V. (2015, June). Pre-entry career experience and start-up survival. Paper presented at the *DRUID15 Conference*.
- Fairlie, R. W., Karlan, D., Zinman, J. (2015). The effects of entrepreneurship training: Evidence from a randomized control experiment. *American Economic Journal: Economic Policy*, 7(2), 125-161.
- Falck, O., Heblich, S., & Luedemann, E. (2012). Identity and entrepreneurship: Do school peers shape entrepreneurial intentions? *Small Business Economics*, 39(1), 39-59.
- Fielden, S. L., Davidson, M. J., Dawe, A. J., & Makin, P. J. (2003). Factors inhibiting the economic growth of female owned small businesses in North West England. *Journal of Small Business and Enterprise Development*, 10(2), 152-166.
- Fleming, L., Mingo, S., & Chen, D. (2007). Collaborative brokerage, generative creativity, and creative success. *Administrative Science Quarterly*, 52(3), 443-475.
- Folta, T. B., Delmar, F., Wennberg, K., 2010. Hybrid entrepreneurship. *Management Science*, 56(2), 253-269.

- Fritsch, M., Bublitz, E., & Rusakova, A. (2012): Berufstätigkeit und Entrepreneurial Choice - Welchen Einfluss hat die Berufstätigkeit auf die Entscheidung zur unternehmerischen Selbständigkeit? In C. Köhler and A. Krause (Eds.), *Arbeit als Ware? Zur Theorie Flexibler Arbeitsmärkte*, Bielefeld: Transcript.
- Fritsch, M., & Sorgner, A. (2017). Entrepreneurial career paths: Occupational context and the propensity to start-up. Unpublished Working Paper.
- Georgellis, Y., & Wall, H. J. (2005). Gender differences in self-employment. *International Review of Applied Economics*, 19(3), 321-342.
- Gibson, D. E. (2004). Role models in career development: New directions for theory and research. *Journal of Vocational Behavior*, 65(1), 134-156.
- Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the fittest? Human entrepreneurial capital and the persistence of underperforming firms. *Administrative Science Quarterly*, 42(4), 750-783.
- Giuri, P., Rullani, F., & Torrisi, S. (2008). Explaining leadership in virtual teams: The case of open source software. *Information Economics and Policy*, 20(4), 305-315.
- Goerisch, J., Kulicke, M., & Bruns, R. W. (2002). *Studierende und Selbständigkeit. Ergebnisse der EXIST-Studierendenbefragung*. Bonn: BMBF-Studie.
- Goethner, M., Obschonka, M., Silbereisen, R. K., & Cantner, U. (2012). Scientists' transition to academic entrepreneurship: Economic and psychological determinants. *Journal of Economic Psychology*, 33(3), 628-641.
- Gornick, J. C., Meyers, M. K., & Ross, K. E. (1997). Supporting the employment of mothers: Policy variation across fourteen welfare states. *Journal of European Social Policy*, 7(1), 45-70.
- Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, 78(6), 1360-1380.
- Greene, P. G., Hart, M. M., Gatewood, E. J., Brush, C. G., & Carter, N. M. (2003). Women entrepreneurs: Moving front and center: An overview of research and theory. *Coleman White Paper Series*, 3, 1-47.
- Grilo, I., & Irigoyen, J. (2006). Entrepreneurship in the EU: To wish and not to be. In: *Small Business Economics*, 26(4), 305-318.
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis*. New York, NY: Macmillan.
- Hambrick, D. C., & Cho, T. (1996). The influence of top management team heterogeneity on firms' competitive moves. *Administrative Science Quarterly*, 41(4), 659-684.
- Harrison, D. A., & Klein, K. J. (2007). What's the difference? Diversity constructs as separation, variety, or disparity in organizations. *Academy of Management Review*, 32(4), 1199-1228.
- 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 & Management Strategy*, 19(4), 947-989.
- Hartung, P. J., Porfeli, E. J., & Vondracek, F. W. (2005). Child vocational development: A review and reconsideration. *Journal of Vocational Behavior*, 66(3), 385-419.

- Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-based Approach*. New York, NY: Guilford Press.
- Hayton, J. C., & Zahra, S. A. (2005). Venture team human capital and absorptive capacity in high technology new ventures. *International Journal of Technology Management*, 31(3-4), 256-274.
- Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. *Science*, 312(5782), 1900-1902.
- Hessels, J., Brixy, U., Naudé, W., & Gries, T. (2014). *Skill Variety, Innovation and New Business Formation*. IZA Discussion Paper.
- Hisrich, R. & Brush, C. (1983). The women entrepreneur: Implications of family, educational and occupational experience. In J. A. Hornaday, J. A. Timmons, & K. H. Vesper (Eds.), *Frontiers of Entrepreneurship Research* (pp. 255-270). Boston: Babson College.
- Holland, J. L. (1985). *Making Vocational Choices: A Theory of Vocational Personalities and Work Environments*. Englewood Cliffs, NJ: Prentice Hall.
- Holland, J. L., & Nichols, R. C. (1964). Prediction of academic and extra-curricular achievement in college. *Journal of Educational Psychology*, 55(1), 55-65.
- Hong, E., Milgram, R. M., & Whiston, S. C. (1993). Leisure activities in adolescents as a predictor of occupational choice in young adults: A longitudinal study. *Journal of Career Development*, 19(3), 221-229.
- Hsieh, C. (2016). Do the self-employed more likely emerge from sequential or parallel work experience in business-related functions? *Entrepreneurship Theory and Practice*, 40(2), 307-334.
- Hsieh, C., Parker, S. C., & van Praag, M. (2017). Risk, balanced skills and entrepreneurship. *Small Business Economics*, 48(2), 287-302.
- Huber, L. R., Sloof, R., & Van Praag, M. (2014). *Jacks-of-All-Trades?* IZA Discussion Paper.
- Hundley, G. (2001). Why and when are the self-employed more satisfied with their work? *Industrial Relations*, 40(2), 293-316.
- Hyytinen, A., & Ilmakunnas, P. (2007). Entrepreneurial aspirations: Another form of job search? *Small Business Economics*, 29(1-2), 63-80.
- Hyytinen, A., & Ilmakunnas, P. (2007b). What distinguishes a serial entrepreneur? *Industrial and Corporate Change*, 16(5), 793-821.
- Jayawarna, D., Jones, O., & Macpherson, A. (2015). Becoming an entrepreneur: The unexplored role of childhood and adolescent human capital. In: D. Rae, & C. Wang (Eds.), *Entrepreneurial Learning: New Perspectives in Research, Education and Practice* (pp. 45-72). Hoboken: Routledge.
- Jianakoplos, N. A., & Bernasek, A. (1998). Are women more risk averse? *Economic Inquiry*, 36(4), 620-630.
- Johansen, V. (2013). Entrepreneurship education and start-up activity: A gender perspective. *International Journal of Gender and Entrepreneurship*, 5(2), 216-231.
- John, O. P., & Srivastava, S. (1999). The big five trait taxonomy: History, measurement, and theoretical perspectives. In: L. A. Pervin, & O. P. John, (Eds.), *Handbook of Personality: Theory and Research* (pp. 102-138). New York: Guilford Press.

- Johnson, P. S. (1986). *New Firms: An Economic Perspective*. London: Allen and Unwin.
- Johnson, J. E., & Powell, P. L. (1994). Decision making, risk and gender: Are managers different? *British Journal of Management*, 5(2), 123-138.
- Johnson, S., & Storey, D. J. (1993). Male and female entrepreneurs and their businesses. In S. Allen and C. Truman (Eds.), *Women in Business: Perspectives on Women Entrepreneurs*, London & New York: Routledge.
- Kelley, D., Brush, C., Greene, P., Harrington, M., Ali, A., & Kew, P. (2015). *GEM Special Report: Women's Entrepreneurship 2015*.
- Kennedy, P. (2008). *A Guide to Econometrics*. Oxford: Blackwell Publishing.
- Kline, R. B. (2005). *Principles and Practice of Structural Equation Modeling*. New York, NY: Guilford Press.
- Klyver, K. (2011). Gender differences in entrepreneurial networks: Adding an alter perspective. *Gender in Management: An International Journal*, 26(5), 332-350.
- Klyver, K., Hindle, K., & Meyer, D. (2008). Influence of social network structure on entrepreneurship participation - a study of 20 national cultures. *International Entrepreneurship and Management Journal*, 4(3), 331-347.
- Knight, F. (1921). *Risk, Uncertainty and Profit*, New York, NY: Houghton Mifflin.
- Koellinger, P., Minniti, M., & Schade, C. (2013). Gender differences in entrepreneurial Propensity. *Oxford Bulletin of Economics and Statistics*, 75(2), 213-234.
- Kolb, D. (1984). *Experiential Education: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice Hall.
- Koper, G. (1993). Women entrepreneurs and the granting of business credit. In S. Allen, and C. Truman (Eds.), *Women in Business: Perspectives on Women Entrepreneurs*, London and New York: Routledge.
- Korpi, W. (2000). Faces of inequality: Gender, class, and patterns of inequalities in different types of welfare states. *Social Politics: International Studies in Gender, State & Society*, 7(2), 127-191.
- Krapp, A., Schiefele, U., & Schreyer, I. (1993). Metaanalyse des Zusammenhangs von Interesse und schulischer Leistung. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, 10(2), 120-148.
- Kremer, M. (1993). The O-ring theory of economic development. *The Quarterly Journal of Economics*, 108(3), 551-575.
- Krueger, N. F. (2007). What lies beneath? The experiential essence of entrepreneurial thinking. *Entrepreneurship: Theory & Practice*. 31, 123-138.
- Krueger, N. F. (2009). Entrepreneurial intentions are dead: Long live entrepreneurial intentions. In A. L. Carsrud & M. Brännback (Eds.), *Understanding the Entrepreneurial Mind: Opening the Black Box* (pp. 51-72). New York: Springer.
- Krueger, N. F., & Carsrud, A. L. (1993). Entrepreneurial intentions: applying the theory of planned behaviour. *Entrepreneurship & Regional Development*, 5(4), 315-330.
- Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15(5-6), 411-432.

- Kucel, A., & Vilalta-Bufi, M. (2016). Entrepreneurial skills and wage employment. *International Journal of Manpower*, 37(3), 556-588.
- Kuratko, D. F. (2005). The emergence of entrepreneurship education: Development, trends, and challenges. *Entrepreneurship Theory and Practice*, 29(5), 577-598.
- Langowitz, N., & Minniti, M. (2007). The entrepreneurial propensity of women. *Entrepreneurship theory and practice*, 31(3), 341-364.
- Laspita, S., Breugst, N., Heblich, S., & Patzelt, H. (2012). Intergenerational transmission of entrepreneurial intentions. *Journal of Business Venturing*, 27(4), 414-435.
- Lauxen-Ulbrich, M., & Leicht, R. (2005). *Wie Frauen Gründen und was Sie Unternehmen: Nationaler Report Deutschland*. Teilprojekt: Statistiken über Gründerinnen und selbständige Frauen, Mannheim, Institut für Mittelstandsforschung. Mannheim: IFM.
- Lazear, E. P. (2003). *Entrepreneurship*. Discussion paper no. 760. Bonn: Institute for the Study of Labor.
- Lazear, E. P. (2004). Balanced skills and entrepreneurship. *The American Economic Review*, 94(2), 208-211.
- Lazear, E. P. (2005). Entrepreneurship. *Journal of Labor Economics*, 23(4), 649-680.
- Lazear, E. P. (2012). Leadership: A personnel economics approach. *Labour Economics*, 19(1), 92-101.
- Lazear, E., & Rosen, S. (1990). Male-female wage differentials in job ladders. *Journal of Labor Economics*, 8(1), 106-123.
- Lechmann, D. S., & Schnabel, C. (2012). Why is there a gender earnings gap in self-employment? A decomposition analysis with German data. *IZA Journal of European Labor Studies*, 1, 1-25.
- Lechmann, D., & Schnabel, C. (2014). Are the self-employed really jacks-of-all-trades? Testing the assumptions and implications of Lazear's theory of entrepreneurship with German data. *Small Business Economics*, 42(1), 59-76.
- Lechner, C., & Dowling, M. (2003). Firm networks: External relationships as sources for the growth and competitiveness of entrepreneurial firms. *Entrepreneurship & Regional Development*, 15(1), 1-26.
- Lechner, C., Pavlova M. K., Sortheix F. M., & Salmela-Aro J. K. (in press). Unpacking the link between family socioeconomic status and civic engagement during the transition to adulthood: Do work values play a role? *Applied Developmental Science*.
- Lee, L., Wong, P. K., Foo, M. Der, & Leung, A. (2011). Entrepreneurial intentions: The influence of organizational and individual factors. *Journal of Business Venturing*, 26(1), 124-136.
- Lerner, M., & Almor, T. (2002). Relationships among strategic capabilities and the performance of women-owned small ventures. *Journal of Small Business Management*, 40(2), 109-125.
- Levhari, D., & Weiss, Y. (1974). The effect of risk on the investment in human capital. *The American Economic Review*, 64(6), 950-963.
- Li, H., & Zhang, Y. (2007). The role of managers' political networking and functional experience in new venture performance: Evidence from China's transition economy. *Strategic Management Journal*, 28(8), 791-804.

- Lin, A. (2016). Effect of human capital on the entrepreneurship gender gap. Unpublished working paper.
- Loprest, P. (1992). Gender differences in wage growth and job mobility. *The American Economic Review*, 82(2), 526-532.
- Lovelace, K., Shapiro, D. L., & Weingart, L. R. (2001). Maximizing cross-functional new product teams' innovativeness and constraint adherence: A conflict communications perspective. *Academy of Management Journal*, 44(4), 779-793.
- Lucas, R. E. (1978). On the size distribution of business firm. *Bell Journal of Economics*, 9(2), 508-523.
- Mahé, C. (2016). *Skills and Entrepreneurship: Are Return Migrants "Jacks-of-all-trades"?* MERIT Working Papers.
- Marino, M., Parrotta, P., & Pozzoli, D. (2012). Does labor diversity promote entrepreneurship? *Economics Letters*, 116(1), 15-19.
- Markman, G. D., Balkin, D. B., & Baron, R. A. (2002). Inventors and new venture formation: The effects of general self-efficacy and regretful thinking. *Entrepreneurship Theory and Practice*, 27(2), 149-165.
- Markman, G. D., Baron, R. A., & Balkin, D. B. (2005). Are perseverance and self-efficacy costless? Assessing entrepreneurs' regretful thinking. *Journal of Organizational Behavior*, 26(1), 1-19.
- Martin, B. C., McNally, J. J., & Kay, M. J. (2013). Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. *Journal of Business Venturing*, 28(2), 211-224.
- Marvel, M. R., Davis, J. L., & Sproul, C. R. (2016). Human capital and entrepreneurship research: A critical review and future directions. *Entrepreneurship: Theory & Practice*, 40(3), 599-626.
- Mason, C. (1991). Spatial variations in enterprise: The geography of new firm formation. In R. Burrows (Ed.), *Deciphering the Enterprise Culture. Entrepreneurship, Petty Capitalism and the Restructuring of Britain*. Routledge: London and New York.
- Masten, A. S., Desjardins, C. D., McCormick, C. M., Sally, I., Kuo, C., & Long, J. D. (2010). The significance of childhood competence and problems for adult success in work: A developmental cascade analysis. *Development and Psychopathology*, 22(03), 679-694.
- Mattern, N., & Schau, C. (2002). Gender differences in science attitude-achievement relationships over time among white middle-school students. *Journal of Research in Science Teaching*, 39(4), 324-340.
- Matthews, C. H., & Moser, S. B. (1996). A longitudinal investigation of the impact of family background and gender on interest in small firm ownership. *Journal of Small Business Management*, 34(2), 29-42.
- McAdams, D. P., & Pals, J. L. (2006). A new big five: Fundamental principles for an integrative science of personality. *American Psychologist*, 61, 204-217.
- McCrae, R. R., & Costa, P. T., Jr. (2008). The five-factor theory of personality. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of Personality: Theory and Research 3<sup>rd</sup> ed.* (pp. 159-181). NY: Guilford Press.

- McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality*, *60*(2), 175-215.
- Mesmer-Magnus, J. R., & DeChurch, L. A. (2009). Information sharing and team performance: A meta-analysis. *Journal of Applied Psychology*, *94*(2), 535-546.
- Menzies, T. V., Diochon, M., & Gasse, Y. (2004). Examining venture-related myths concerning women entrepreneurs. *Journal of Developmental Entrepreneurship*, *9*(2), 89-107.
- Mian, S. A. (1996). Assessing value-added contributions of university technology business incubators to tenant firms. *Research policy*, *25*(3), 325-335.
- Milgram, R., & Hong, E. (1999). Multipotential abilities and vocational interests in gifted adolescents: Fact or fiction? *International Journal of Psychology*, *34*(2), 81-93.
- Mincer, J., 1974. *Schooling, Experience and Earnings*. New York: Columbia University Press.
- Minniti, M. (2009). Gender issues in entrepreneurship. *Foundations and Trends® in Entrepreneurship*, *5*(7-8), 497-621.
- Minniti, M., & Nardone, C. (2007). Being in someone else's shoes: The role of gender in nascent entrepreneurship. *Small Business Economics*, *28*(2-3), 223-238.
- Moog, P., Werner, A., Houweling, S., & Backes-Gellner, U. (2015). The impact of skills, working time allocation and peer effects on the entrepreneurial intentions of scientists. *Journal of Technology Transfer*, *40*(3), 493-511.
- Mueller, S. L. (2004). Gender gaps in potential for entrepreneurship across countries and cultures. *Journal of Developmental Entrepreneurship*, *9*(3), 199-220.
- Munson, W. W., & Savickas, M. L. (1998). Relation between leisure and career development of college students. *Journal of Vocational Behavior*, *53*(2), 243-253.
- Nauta, M. M., & Kokaly, M. L. (2001). Assessing role model influences on students' academic and vocational decisions. *Journal of Career Assessment*, *9*(1), 81-99.
- Ng, T. W. H., Sorensen, K. L., Eby, L. T., & Feldman, D. C. (2007). Determinants of job mobility: A theoretical integration and extension. *Journal of Occupational and Organizational Psychology*, *80*, 363-386.
- Oberschachtsiek, D. (2009). *What makes a "Jack-of-all-Trades"?* University of Lueneburg IAB Discussion Paper.
- Oberschachtsiek, D. (2012). The experience of the founder and self-employment duration: A comparative advantage approach. *Small Business Economics*, *39*(1), 1-17.
- Oberschachtsiek, D. (2013). *Human Capital Diversity and Entrepreneurship: Results from the Regional Individual Skill Dispersion Nexus on Self-employment Activity*. University of Lueneburg Working Paper Series in Economics.
- Obschonka, M. (2016). Adolescent pathways to entrepreneurship. *Child Development Perspectives*, *10*(3), 196-201.
- Obschonka, M., Goethner, M., Silbereisen, R. K., & Cantner, U. (2012). Social identity and the transition to entrepreneurship: The role of group identification with workplace peers. *Journal of Vocational Behavior*, *80*(1), 137-147.

- Obschonka, M., Hakkarainen, K., Lonka, K., & Salmela-Aro, K. (2016). Entrepreneurship as a twenty-first century skill: Entrepreneurial alertness and intention in the transition to adulthood. *Small Business Economics*, 1-15.
- Obschonka, M., Schmitt-Rodermund, E., & Terracciano, A. (2014). Personality and the Gender Gap in Self-Employment: A Multi-Nation Study. *PLoS One*, 9(8), e103805.
- Obschonka, M., & Silbereisen, R. K. (2012). Entrepreneurship from a developmental science perspective. Editorial for the Special Issue "Entrepreneurial development: Person and context." *International Journal of Developmental Science*, 6(3), 107-115.
- Obschonka, M., Silbereisen, R. K., & Schmitt-Rodermund, E. (2010). Entrepreneurial intention as developmental outcome. *Journal of Vocational Behavior*, 77(1), 63-72.
- Obschonka, M., Silbereisen, R. K., & Schmitt-Rodermund, E. (2011). Successful entrepreneurship as developmental outcome. *European Psychologist*, 16(3), 174-186.
- Obschonka, M., Silbereisen, R. K., & Schmitt-Rodermund, E. (2012). Explaining entrepreneurial behavior: Dispositional personality traits, growth of personal entrepreneurial resources, and business idea generation. *Career Development Quarterly*, 60(2), 178-190.
- Obschonka, M. & Stuetzer, M. (2017). Integrating psychological approaches to entrepreneurship: The Entrepreneurial Personality System (EPS). *Small Business Economics*, 1-29.
- Obschonka, M., Stuetzer, M., Gosling, S. D., Rentfrow, P. J., Lamb, M. E., Potter, J., & Audretsch, D. B. (2015). Entrepreneurial regions: Do macro-psychological cultural characteristics of regions help solve the "Knowledge Paradox" of economics? *PloS One*, 10(6), e0129332.
- Oosterbeek, H., van Praag, M., & Ijsselstein, A. (2008). The impact of entrepreneurship education on entrepreneurship competencies and intentions: An evaluation of the Junior Achievement Student Mini-Company Program. *European Economic Review*, 54(3), 442-454.
- Official Statistics of Finland (OSF). (2013). *Employment of students* [e-publication]. Helsinki, Finland: Statistics Finland. Retrieved from [http://www.stat.fi/til/opty/index\\_en.html](http://www.stat.fi/til/opty/index_en.html).
- O'Neill, J., & Polachek, S. (1993). Why the gender gap in wages narrowed in the 1980s. *Journal of Labor Economics*, 11(1), 205-228.
- Orazem, P., Yu, L., & Jolly, R. (2010). *Bachelor's Degrees and Business Start-ups: A Reexamination of Lazear's Theory of Entrepreneurship*. Iowa State University Working Paper.
- Organization for Economic Cooperation and Development (2004). *Women's Entrepreneurship: Issues and Policies*. Paris: OECD Publishing.
- Orser, B., & Hogarth-Scott, S. (2002). Opting for growth: Gender dimensions of choosing enterprise development. *Canadian Journal of Administrative Sciences*, 19(3), 284-300.
- Orser, B. J., Riding, A. L., & Manley, K. (2006). Women entrepreneurs and financial capital. *Entrepreneurship Theory and Practice*, 30(5), 643-665.
- Paglin, M., & Rufolo, A. M. (1990). Heterogeneous human capital, occupational choice, and male-female earnings differences. *Journal of Labor Economics*, 8(1), 123-144.



- Parker, S. C. (2009). Why do small firms produce the entrepreneurs? *Journal of Socio-Economics*, 38(3), 484-494.
- Parker, S. (2004). *The Economics of Self-Employment and Entrepreneurship*. Cambridge, UK: Cambridge University Press.
- Parker, S. C., & Van Praag, C. M. (2006). Schooling, capital constraints, and entrepreneurial performance: The endogenous triangle. *Journal of Business & Economic Statistics*, 24(4), 416-431.
- Paternoster, R., Brame, R., Mazerolle, P., & Piquero, A. (1998). Using the correct statistical test for the equality of regression coefficients. *Criminology*, 36(4), 859-866.
- Peltonen, J., & Arenius, P. (2016, January). Work experience diversity, cognitive ability, and first entry into entrepreneurship. *Academy of Management Proceedings*, Vol. 2016, No. 1.
- Peterman, N. E., & Kennedy, J. (2003). Enterprise education: Influencing students' perceptions of entrepreneurship. *Entrepreneurship Theory and Practice*, 28(2), 129-144.
- Petridou, E., Sarri, A., & Kyrgidou, L. P. (2009). Entrepreneurship education in higher educational institutions: The gender dimension. *Gender in Management: An International Journal*, 24(4), 286-309.
- Pfeifer, C. (2011). Risk aversion and sorting into public sector employment. *German Economic Review*, 12(1), 85-99.
- Polachek, S. W. (1978). Sex differences in college major. *ILR Review*, 31(4), 498-508.
- Polachek, S. W. (1981). Occupational self-selection: A human capital approach to sex differences in occupational structure. *The Review of Economics and Statistics*, 60-69.
- Ranta, M., Dietrich, J., & Salmela-Aro, K. (2013). Career and romantic relationship goals and concerns during emerging adulthood. *Emerging Adulthood*, 2(1), 17-26.
- Rauch, A., & Frese, M. (2007). Born to be an entrepreneur? Revisiting the personality approach to entrepreneurship. In: R. J. Baum, M. Frese, & R. A. Baron (Eds.), *Psychology of Entrepreneurship* (pp. 41-65). Mahwah, NJ: Erlbaum.
- Reuber, A. R., & Fischer, E. M. (1994). Entrepreneurs' experience, expertise, and the performance of technology-based firms. *IEEE Transactions on Engineering Management*, 41(4), 365-374.
- Riding, A. L., & Swift, C. S. (1990). Women business owners and terms of credit: Some empirical findings of the Canadian experience. *Journal of Business Venturing*, 5(5), 327-340.
- Robb, A. (2013). *Access to Capital among Young Firms, Minority-Owned Firms, Women-Owned Firms and High-Tech Firms*. Office of Advocacy. Washington, DC: US Small Business Administration.
- 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.
- Roccas, S., Sagiv, L., Schwartz, S. H., & Knafo, A. (2002). The big five personality factors and personal values. *Personality and Social Psychology Bulletin*, 28(6), 789-801.

- Romanelli, E., & Schoonhoven, K. (2001). The local origins of new firms. In K. Schoonhoven & E. Romanelli (Eds.), *The Entrepreneurship Dynamic: Origins of Entrepreneurship and the Evolution of Industries*. Stanford: Stanford University Press.
- Rosenthal, T. L., & Bandura, A. (1978). Psychological modelling: Theory and practice. In S. L. Garfield & A. E. Bergin (Eds.), *Handbook of Psychotherapy and Behaviour Change: An Empirical Analysis* (pp. 621-658). New York: Wiley.
- Rosti, L., & Chelli, F. (2005). Gender discrimination, entrepreneurial talent and self-employment. *Small Business Economics*, 24(2), 131-142.
- Rotter, J. B., Chance, J. E., & Phares, E. J. (1972). *Applications of a Social Learning Theory of Personality*. New York, NY: Holt, Rinehart & Winston.
- Ryota, B., & Kazuyuki, M. (2013). *Entrepreneurship and Human Capital: Empirical Study Using a Survey of Entrepreneurs in Japan*. RIETI Discussion Paper Series 13-E-049.
- Salmela-Aro, K. (2015). *Finnish Educational Transition (FinEdu) Studies*. Retrieved from <https://www.jyu.fi/ytk/laitokset/psykologia/en/old-research/programsand-projects/finedu>.
- Sarasvathy, S. D. (2001). Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review*, 26(2), 243-263.
- Scherer, R. F., Adams, J. S., Carley, S. S., & Wiebe, F. A. (1989). Role model performance effects on development of entrepreneurial career preference. *Entrepreneurship Theory and Practice*, 13(3), 53-71.
- Schjoedt, L. (2009). Entrepreneurial job characteristics: An examination of their effect on entrepreneurial satisfaction. *Entrepreneurship Theory and Practice*, 33(3), 619-644.
- Schmitt-Rodermund, E. (2004). Pathways to successful entrepreneurship: Parenting, personality, early entrepreneurial competence, and interests. *Journal of Vocational Behavior*, 65, 498-518.
- Schmitt-Rodermund, E. (2007). The long way to entrepreneurship: Personality, parenting, early interests, and competencies as precursors for entrepreneurial activity among the "Termites". *Approaches to Positive Youth Development*, 205-224.
- Schmitt-Rodermund, E., & Vondracek, F. W. (1999). Breadth of interests, exploration, and identity development in adolescence. *Journal of Vocational Behavior*, 55(3), 298-317.
- Schoon, I. (2001). Teenage job aspirations and career attainment in adulthood: A 17-year follow-up study of teenagers who aspired to become scientists, health professionals, or engineers. *International Journal of Behavioral Development*, 25(2), 124-132.
- Schoon, I., & Duckworth, K. (2012). Who becomes an entrepreneur?: Early life experiences as predictors of entrepreneurship. *Developmental Psychology*, 48(6), 1719-1726.
- Schulenberg, J. E., Vondracek, F. W., & Crouter, A. C. (1984). The influence of the family on vocational development. *Journal of Marriage and the Family*, 46(1), 129-143.
- Schultz, T. W. (1980). Investment in entrepreneurial ability. *Scandinavian Journal of Economics*, 82(4), 437-448.
- Schumpeter, J. A. (1934). *The Theory of Economic Development*, Cambridge (MA): Cambridge University Press, first published in German: *Die Theorie der Wirtschaftlichen Entwicklung*. Berlin 1911: Duncker & Humblot.

- Seibert, S. E., & Kraimer, M. L. (2001). The five-factor model of personality and career success. *Journal of Vocational Behavior*, 58(1), 1-21.
- Sell, B. C. (2013, June). Educational mismatches and entry into entrepreneurship. Paper presented at the *DRUID13 Conference*.
- Senyard, J., Baker, T., Steffens, P., & Davidsson, P. (2014). Bricolage as a path to innovativeness for resource-constrained new firms. *Journal of Product Innovation Management*, 31(2), 211-230.
- Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science*, 11(4), 448-469.
- Shane, S. A. (2003). *A General Theory of Entrepreneurship: The Individual-Opportunity Nexus*. Cheltenham: Edward Elgar.
- Shane, S., Nicolaou, N., Cherkas, L., & Spector, T. D. (2010). Genetics, the big five, and the tendency to be self-employed. *Journal of Applied Psychology*, 95(6), 1154-1162.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *The Academy of Management Review* VO-25, 25(1), 217-226.
- Shaw, K. L. (1996). An empirical analysis of risk aversion and income growth. *Journal of Labor Economics*, 14(4), 626-653.
- Shepherd, D. A. (2003). Learning from business failure: Propositions of grief recovery for the self-employed. *Academy of Management Review*, 28(2), 318-328.
- Silva, O. (2007). The jack-of-all-trades entrepreneur: Innate talent or acquired skill? *Economics Letters*, 97, 118-123.
- Singh, G., & DeNoble, A. (2003). Views on self-employment and personality: An exploratory study. *Journal of Developmental Entrepreneurship*, 8(3), 265-281.
- Sonnentag, S. (1998). Expertise in professional software design: A process study. *Journal of Applied Psychology*, 83, 703-716.
- Sorenson, O., & Stuart, T. E. (2008). Entrepreneurship: A field of dreams? *Academy of Management Annals*, 2(1), 517-543.
- Sortheix, F. M., Chow, A., & Salmela-Aro, K. (2015). Work values and the transition to work life: A longitudinal study. *Journal of Vocational Behavior*, 89, 162-171.
- Spanjer, A., & van Witteloostuijn, A. (2016). The entrepreneur's experiential diversity and entrepreneurial performance. *Small Business Economics*, 1-21.
- Spiegel, O., Abbassi, P., Schlagwein, D., & Fischbach, K. (2013, May). Going it all alone in web entrepreneurship?: A comparison of single founders vs. co-founders. *Proceedings of the 2013 Annual Conference on Computers and People Research*, 21-32.
- StataCorp (2011). *Stata Statistical Software: Release 12*. College Station, TX: StataCorp LP.
- Statistics Finland. (1989). *Classification of Socioeconomic Status*. Handbooks 17.
- Statistics Finland. (2010). *Education 2009*. Retrieved from: [http://tilastokeskus.fi/til/lop/2009/lop\\_2009\\_2010-06-11\\_tie\\_001\\_en.html](http://tilastokeskus.fi/til/lop/2009/lop_2009_2010-06-11_tie_001_en.html).
- Stenard, B. S., & Sauermann, H. (2016). Educational mismatch, work outcomes, and entry into entrepreneurship. *Organization Science*, 27(4), 801-824.
- Strohmeier, R. (2003, June). Gender differences in self-employment: Does education matter? Paper presented at the *ICSB, 48th World Conference Belfast*.

- Strohmeyer, R. (2007). *Gender Gap and Segregation in Enterprise Creation: On the Role of Field of Study and Apprenticeship Training*. German Council for Social and Economic Data (RatSWD).
- Strohmeyer, R., & Leicht, R. (2000). Small training firms: A breeding ground for self-employment? *International Journal of Sociology*, 30(4), 59-89.
- Strohmeyer, R., & Tonoyan, V. (2005). Bridging the gender gap in employment growth: On the role of innovativeness and occupational segregation. *The International Journal of Entrepreneurship and Innovation*, 6(4), 259-273.
- Strohmeyer, R., Tonoyan, V. & Jennings, J. E. (2014, June): Jacks and jills of all trades: Implications for firm innovativeness. Paper presented at *Diana International Research Conference*.
- Stuetzer, M. (2011). *Human Capital and Social Capital in the Entrepreneurial Process*. PhD thesis: Friedrich Schiller University Jena.
- Stuetzer, M., Audretsch, D. B., Obschonka, M., Gosling, S. D., Rentfrow, P. J., & Potter, J. (2017). Entrepreneurship culture, knowledge spillovers and the growth of regions. *Regional Studies*, 1-11.
- Stuetzer, M., Goethner, M., & Cantner, U. (2012). Do balanced skills help nascent entrepreneurs to make progress in the venture creation process? *Economics Letters*, 117(1), 186-188.
- Stuetzer, M., Obschonka, M., Audretsch, D. B., Wyrwich, M., Rentfrow, P. J., Coombes, M., Shaw-Taylor, L. & Satchell, M. (2016). Industry structure, entrepreneurship, and culture: An empirical analysis using historical coalfields. *European Economic Review*, 86, 52-72.
- Stuetzer, M., Obschonka, M., Davidsson, P., & Schmitt-Rodermund, E. (2013a). Where do entrepreneurial skills come from? *Applied Economics Letters*, 20(12), 1183-1186.
- Stuetzer, M., Obschonka, M., & Schmitt-Rodermund, E. (2013b). Balanced skills among nascent entrepreneurs. *Small Business Economics*, 41(1), 93-114.
- Super, D. E. (1984). Leisure: What it is and might be. *Journal of Career Development*, 11(1), 71-80.
- Taylor, A., & Greve, H. (2006). Superman or the Fantastic Four? Knowledge combination and experience in innovative teams. *Academy of Management Journal*, 49(4), 723-740.
- Tegtmeier, S., Kurczewska, A., & Halberstadt, J. (2016). Are women graduates jacquelines-of-all-trades? Challenging Lazear's view on entrepreneurship. *Small Business Economics*, 47(1), 77-94.
- Thomas, D. (1990). Intra-household resource allocation: An inferential approach. *Journal of Human Resources*, 25(4), 635-664.
- Tonoyan, V., Strohmeyer, R., & Woywode, M. (2009, March). Why do women choose to become entrepreneurs less often than men? A jack-of-all-trades perspective of human capital. Paper presented at *Interdisciplinary European Conference on Entrepreneurship Research*.
- Tuominen-Soini, H., & Salmela-Aro, K. (2014). Schoolwork engagement and burnout among Finnish high school students and young adults: Profiles, progressions, and educational outcomes. *Developmental Psychology*, 50(3), 649-662.

- Tuominen-Soini, H., Salmela-Aro, K., & Niemivirta, M. (2011). Stability and change in achievement goal orientations: A person-centered approach. *Contemporary Educational Psychology, 36*(2), 82-100.
- Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing, 26*(3), 341-358.
- Uzzi, B. (1997). Social structure and competition in interfirm networks: The Paradox of embeddedness. *Administrative Science Quarterly, 42*(1), 35-67.
- Van der Sluis, J., Van Praag, M., & Vijverberg, W. (2008). Education and entrepreneurship selection and performance: A review of the empirical literature. *Journal of Economic Surveys, 22*(5), 795-841.
- Venkataraman, S. (1997). The distinctive domain of entrepreneurship research. *Advances in Entrepreneurship, Firm Emergence and Growth, 3*(1), 119-138.
- Verheul, I., Stel, A. V., & Thurik, R. (2006). Explaining female and male entrepreneurship at the country level. *Entrepreneurship and Regional Development, 18*(2), 151-183.
- Verheul, I., & Thurik, R. (2001). Start-up capital: "Does gender matter?" *Small Business Economics, 16*(4), 329-346.
- Wagner, J. (2003). Testing Lazear's jack-of-all-trades view of entrepreneurship with German micro data. *Applied Economics Letters, 10*(11), 687-689.
- Wagner, J. (2005a). *Der Noth gehorchend, nicht dem eignen Trieb-Nascent Necessity and Opportunity Entrepreneurs in Germany: Evidence from the Regional Entrepreneurship Monitor (REM)*. IZA Working Paper.
- Wagner, J. (2005b). *Nascent and Infant Entrepreneurs in Germany: Evidence from the Regional Entrepreneurship Monitor (REM)*. University of Lueneburg Working Paper.
- Wagner, J. (2006). Are nascent entrepreneurs "Jacks-of-all-trades"? A test of Lazear's theory of entrepreneurship with German data. *Applied Economics, 38*(20), 2415-2419.
- Wagner, J. (2007). What a difference a Y makes-female and male nascent entrepreneurs in Germany. *Small Business Economics, 28*(1), 1-21.
- Wennekers, S., Uhlaner, L., & Thurik, R. (2002). Entrepreneurship and its conditions: A macro perspective. *International Journal of Entrepreneurship Education, 1*(1), 25-64.
- Wilson, F., Kickul, J., & Marlino, D. (2007). Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: Implications for entrepreneurship education. *Entrepreneurship Theory and Practice, 31*(3), 387-406.
- Winteler, A., Sierwald, W., & Schiefele, U. (1988). Interesse, Leistung und Wissen: Die Erfassung von Studieninteresse und seine Bedeutung für Studienleistung und fachbezogenes Wissen. *Empirische Pädagogik, 2*, 227-250.
- World Bank (2012). Gender differences in employment and why they matter. In *World Development Report 2012*, 198-253.
- Wyrwich, M., Stuetzer, M., & Sternberg, R. (2016). Entrepreneurial role models, fear of failure, and institutional approval of entrepreneurship: A tale of two regions. *Small Business Economics, 46*(3), 467-492.
- Zhao, H., & Seibert, S. E. (2006). The big five personality dimensions and entrepreneurial status: A meta-analytical review. *Journal of Applied Psychology, 91*(2), 259-71.

- 
- Zhao, H., Seibert, S. E., & Lumpkin, G. T. (2010). The relationship of personality to entrepreneurial intentions and performance: A meta-analytic review. *Journal of Management*, 36(2), 381-404.