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Any omissions are purely accidential.

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Deutschsprachige Zusammenfassung / German Summary

Kapitel 1:

Entrepreneurship ist ein Phänomen, welches zurzeit viel Aufmerksamkeit erfährt. Nach Daten des Global Entrepreneurship Monitors arbeiten im Moment ca. 4,1 Prozent der deutschen Bevölkerung zwischen 18 und 64 Jahren aktiv an der Gründung eines eigenen Unternehmens oder haben ein solches Vorhaben in den letzten 3,5 Jahren erfolgreich abgeschlossen (Brixy et al., 2009). Im Vergleich zu anderen innovationsbasierten Volkswirtschaften rangiert Deutschland mit dieser Quote allerdings nur auf Platz 15 von 20. Zudem lässt sich in Deutschland ein ungünstiges Verhältnis zwischen Gründungen zur Verwertung einer Geschäftsidee und Gründungen aus Mangel an anderen Erwerbsalternativen beobachten. Während in Deutschland jeder Gründung aus Mangel an Erwerbsalternativen zwei Gründungen zur Verwertung einer Geschäftsidee gegenüberstehen, beträgt dieses Verhältnis in Großbritannien 1:5, in den Niederlanden 1:12 und in Dänemark 1:31 (Sternberg et al. 2007; Minniti et al., 2005).

Diese aufgeführten Zahlen sind von Bedeutung, weil gerade Opportunitäten basiertes und innovatives Entrepreneurship als wichtige Triebkraft für die wirtschaftliche Entwicklung und die Schaffung von Arbeitsplätzen gilt. Die Forschung schreibt insbesondere zwei Mechanismen in diesem Prozess besondere Bedeutung zu. Zum einen wird durch Entrepreneurship neu entstandenes Wissen verwertet und in der Gesellschaft diffundiert (Acs & Plummer, 2005). Zum anderen argumentiert man, dass neue Unternehmen, welche häufig als Indikator für Entrepreneurship genutzt werden, bestehende Unternehmen herausfordern und dabei den wirtschaftlichen Strukturwandel vorantreiben und zur Sicherung von Effizienz auf Märkten beitragen. Auf diesem indirekten Weg verbessert Entrepreneurship die Wettbewerbsfähigkeit der Volkswirtschaft und trägt zur Schaffung von Arbeitsplätzen und Wirtschaftswachstum bei (Audretsch & Keilbach, 2004; Fritsch & Mueller, 2004).

Die vorliegende Arbeit widmet sich dem Thema Entrepreneurship im Allgemeinen und dem Thema innovatives, auf Opportunitäten basierendes Entrepreneurship im Besonderen. Der Fokus der Arbeit liegt dabei auf zwei in der Entrepreneurshipforschung wichtigen Konzepten: Human- und Sozialkapital. Die Arbeit geht folgenden Fragen nach:

1. Wie entsteht Human- und Sozialkapital (Kapitel 2 und 3)?
2. Wie nutzen Entrepreneure Human- und Sozialkapital im Gründungsprozess (Kapitel 3, 4 und 5)?

3. Welchen Effekt hat diese Nutzung auf unternehmerischen Erfolg (Kapitel 4 und 5)?

Wichtige Teile der vorliegenden Arbeit entstanden im Rahmen der „Thüringer Gründer Studie“ (TGS). Dieses interdisziplinäre Forschungsprojekt von Psychologen und Ökonomen an der Friedrich-Schiller-Universität Jena und der Fachhochschule Jena startete im September 2006 unter dem Projekttitel „Erfolg und Misserfolg innovativer Unternehmensgründungen – Eine prozessorientierte Analyse innovativer Unternehmensgründungen“. Als analytischer Rahmen der TGS wurde eine Prozessperspektive zu Grunde gelegt, da unternehmerisches Handeln nur anhand einer prozessualen Herangehensweise zu verstehen ist. Um diesen Prozess in seinen einzelnen Schritten zu erfassen, wurden sowohl 1) potentielle Gründer in der Vorgründungsphase, 2) werdende Gründer in der Gründungsphase, sowie 3) erfolgreiche und gescheiterte Gründer in der Nachgründungsphase befragt.

Mit diesem für Deutschland bisher einmaligem Studiendesign ist es möglich, die unternehmerische Entwicklung über verschiedene Phasen des Gründungsprozesses hinweg abzubilden und phasenspezifische Einflussfaktoren dieser Entwicklung zu untersuchen. Der Fragebogen (für die Teildatensätze der werdenden Gründer und der erfolgreichen/gescheiterten Gründer) enthält Fragen zum persönlichen Hintergrund des Gründers, seiner Motivation und Ziele, seiner Ausbildung und Berufserfahrung. Die Fragen zum Gründungsprojekt bzw. Unternehmen beziehen sich zum überwiegenden Teil auf die im Gründungsprozess durchgeführten Aktivitäten, der Finanzierung des Unternehmens, beanspruchte Fördermaßnahmen und des wirtschaftlichen Erfolges der Gründung. Um diese Daten zu erheben, führte das Mitarbeiterteam der TGS von Januar 2008 bis Juni 2009 persönliche Interviews mit circa 1000 Entrepreneuren durch. Der Datensatz der werdenden Gründer bildet die Grundlage der empirischen Analyse im Kapitel 3. In Kapitel 4 und 5 hingegen findet der Datensatz der erfolgreichen bzw. gescheiterten Gründer Verwendung. Die empirische Arbeit in Kapitel 2 beruht auf einer Kombination des GEM-Datensatzes für Westdeutschland und Regionaldaten.

Kapitel 2

Kapitel 2, welches auf einem Arbeitspapier mit Prof. Dr. Uwe Cantner, Prof. Dr. Rolf Sternberg, Dr. Udo Brixy und Martin Obschonka als Koautor basiert, stellt das Sozialkapitalkonzept in den Mittelpunkt der Analyse. Sozialkapitaltheoretische Ansätze argumentieren, dass dem sozialen Umfeld eines Gründers eine entscheidende Rolle bei der Gründung eines Unternehmens zukommt (Davidsson & Honig, 2003). Auf der individuellen Ebene ist Sozialkapital definiert als „the sum of

the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or a social unit“ (Nahapiet & Goshal, 1998). Im Kapitel 2 wird zum einen der Einfluss des Sozialkapitals auf die individuelle Entscheidung ein Gründungsprojekt zu starten untersucht. Zum anderen findet eine Analyse der Rolle von regionalen Charakteristika in der Ausbildung dieses individuellen Sozialkapitals statt.

Ein wachsender Zweig der Entrepreneurshipliteratur befasst sich mit der regionalen Dimension von Entrepreneurship. Der überwiegende der Analysen in diesem Bereich wird ausschließlich auf der regionalen Ebene durchgeführt, d.h. regionale Charakteristika werden mit z.B. regionalen Gründungsraten korreliert. Daher ist unser Wissen über den Einfluss von regionalen Charakteristika auf die individuelle Gründungsentscheidung begrenzt. Eine Analyse der relevanten Literatur lässt vermuten, dass regionale Faktoren nicht nur einem direkten Effekt haben, sondern dass ihr Einfluss über proximalere Faktoren auf der individuellen Ebene vermittelt wird. In Kapitel 2 wird argumentiert, dass individuelles Sozialkapital und die Wahrnehmung von Gründungsopportunitäten derartige Transmissionspfade darstellen. Durch die Kombination von Daten zum individuellen Gründungsverhalten (aus dem Global Entrepreneurship Monitor) und regionalen Charakteristika auf Kreisebene (hier wurden Daten des Instituts für Arbeitsmarkts- und Berufsforschung und des statistischen Bundesamtes verwendet) ist es möglich diese Hypothesen zu testen. Eine Mehrebenenanalyse (Individuen eingebettet in Regionen) zeigt, dass regionale Charakteristika wie eine hohe Präsenz der Kreativen Klasse positiv mit höherem individuellen Sozialkapital und wahrgenommenen Gründungsopportunitäten korreliert ist, welche wiederum bedeutende Prädiktoren in der individuellen Entscheidung ein Gründungsprojekt zu starten waren.

Kapitel 3

In Kapitel 3 liegt der Forschungsschwerpunkt auf dem Humankapital der Gründer. Im Allgemeinen wird Humankapital in zwei verschiedene Kategorien unterteilt. Die erste beinhaltet *Kenntnisse*, die durch die Ausbildung erworben wurde. In der zweiten finden sich die eher informellen und durch Erfahrungslernen erworbenen *Fähigkeiten*. Auf letzten Punkt fokussiert sich Kapitel 3.

Der Aufbau eines neuen Unternehmens ist oft gekennzeichnet durch die geschickte Kombination unterschiedlicher und zuvor unverknüpfter Ressourcen und Ideen. Betrachten wir als Beispiel den Gründer eines Softwareunternehmens. Dieser muss zwar kein Programmier-Experte sein. Eine gewisse Erfahrung in der Programmierung wäre jedoch gewiss von Nutzen, um die Qualität der

Programmcodes seiner Mitarbeiter beurteilen zu können. Um die Software erfolgreich zu vertreiben wäre es von Vorteil auf Erfahrungen im Bereich Marketing zurückgreifen zu können. Um Kapital bei Banken einzuwerben oder qualifizierte Arbeitskräfte zu gewinnen, sind wiederum andere Fähigkeiten von Bedeutung. Diese Überlegungen fasst Lazear (2005) in seiner „jack-of-all-trades theory" zusammen. Auf Basis eines formalen Modells argumentiert Lazear, dass ein Gründer Fähigkeiten in einer Vielzahl von Bereichen aufweisen muss, um Unternehmer zu sein. Das Kapitel 3 dieser Arbeit erweitert diesen Ansatz, um die Erfolgswirksamkeit der beschriebenen Erfahrungsbreite. Hier zeigen Zähldatenmodelle, dass die Erfahrungsbreite mit der Anzahl der im Gründungsprozess durchgeführten Aktivitäten positiv korreliert.

Zudem liegt ein weiterer Schwerpunkt der Analyse auf den möglichen Quellen der Erfahrungsbreite eines Gründers. In der Literatur werden hierzu die Investitions- sowie die Austattungshypothese intensiv diskutiert. Gemäß der Investitionshypothese investieren Personen *bewusst* in Erfahrungsbreite – zum Beispiel durch die Wahl eines breiten Universitätskurrikulums oder die Arbeit in kleinen und jungen Unternehmen. Die Austattungshypothese argumentiert, dass Gründer nicht bewusst in Erfahrungsbreite investieren, sondern bestimmte Persönlichkeitseigenschaften und frühe Kompetenzen diesen Prozess der Humankapitalakkumulation entscheidend beeinflussen. Eine empirische Analyse der möglichen Quellen dieser Erfahrungsbreite verwirft weder die Austattungshypothese noch die Investitionshypothese. Es scheint, dass Gründer ihre Erfahrungsbreite zum Teil mit bewussten Investitionen steigern, aber auch dass dieser Prozess von Persönlichkeitsfaktoren wie eines geringen Neurotizismus und einer bereits vorhandenen Breite von frühen Interessen im Alter von 14-15 Jahren bestimmt wird.

Kapitel 4

In Kapitel 4 rückt das Humankapital des Gründungsteams in den Fokus der Analyse. Dieses Kapitel basiert auf einem Arbeitspapier, welches in Koautorenschaft mit Prof. Dr. Uwe Cantner und Maximilian Göthner entstanden ist. Die zentrale Forschungsfrage dieses Kapitels ist, ob heterogene Gründungsteams erfolgreicher als homogen zusammengesetzte Teams sind oder genau das Gegenteil zutrifft. In der wissenschaftlichen Literatur existieren hierzu zwei Denkschulen, die auch die theoretische Basis für dieses Kapitels liefern. Auf der einen Seite argumentieren Forscher der „Cognitive Ressource Diversity Perspective", dass heterogene Gründungsteams qualitativ bessere und innovativere

Entscheidungen treffen und insofern effektiver komplexe Probleme lösen können. Die zugrunde liegende Annahme ist, dass in heterogenen Gründerteams verschiedene Fähigkeiten, Wissen und Perspektiven der einzelnen Teammitglieder die kognitiven Fähigkeiten des Teams als Ganzes erhöhen. Auf der anderen Seite geben Befürworter des „Similarity Attraction Paradigms“ zu bedenken, dass Heterogenität im Team einen negativen Einfluss auf Teamprozesse und schlussendlich den Teamerfolg haben kann. Es wird argumentiert, dass die Ähnlichkeit der Teammitglieder ausschlaggebend für die Qualität und Effizienz ihrer Zusammenarbeit ist. Je ähnlicher sich Teammitglieder sind (z.B. hinsichtlich Alter, Geschlecht und Bildung), desto stärker fühlen sie sich zur Gruppe ihrer Mitgründer zugehörig. Das daraus resultierende Zusammengehörigkeitsgefühl in homogenen Teams wird als positiv für Teamprozesses und Teamerfolg angesehen. Das Fehlen eines solchen Zusammenhalts und Verständnisses in heterogeneren Teams kann der Auslöser für negative Konfliktsituationen sein. Des weiteren können hier Arbeitsabläufe und damit auch der Teamerfolg unter dem Nichtvorhandensein eines gemeinsamen „Vokabulars“ leiden.

Zusammenfassend lässt sich sagen, dass Heterogenität im Gründungsteam sowohl positive als auch negative Auswirkungen auf die Entwicklung eines neugegründeten Unternehmens haben kann und insofern für Gründungsteams sowohl eine Chance als auch eine Herausforderung darstellt. Dieses Kapitel fokussiert auf die spezielle Form der funktionalen Heterogenität, d.h. die Unterschiedlichkeit des Erfahrungshintergrundes der Teammitglieder in verschiedenen Arbeitsbereichen. Hierbei wird argumentiert, dass zwei Dimensionen funktionaler Heterogenität, *Erfahrungsbreite* und *Erfahrungsdisparität*, existieren und sich empirisch voneinander trennen lassen.

In der empirischen Analyse stützt eine explorative Faktorenanalyse diesen Ansatz. Varietät und Diversität des Erfahrungshintergrundes der Teammitglieder bilden den Faktor *Erfahrungsbreite*, während Unterschiede und Nicht-Redundanzen in der Struktur des Erfahrungshintergrundes der Teammitglieder den Faktor *Erfahrungsdisparität* formen. Beide Heterogenitätsdimensionen sind zudem nur schwach miteinander korreliert. Das Arbeitspapier untersucht ihren Einfluss auf den wirtschaftlichen Erfolg von Neugründungen einerseits und auf deren innovativen Erfolg andererseits.

Logistische Regressionen zeigen, dass insbesondere eine geringe *Erfahrungsdisparität* im Gründungsteam die Überlebenswahrscheinlichkeit des neugegründeten Unternehmens in den ersten zwei Jahren erhöht. Ferner zeigen Zähldatenmodelle einen positiven Einfluss der *Erfahrungsbreite* im Team auf das

Beschäftigungswachstum in den ersten drei Jahren der Firma. Diese Ergebnisse legen den Schluss nahe, dass der Einfluss von Heterogenität möglicherweise nicht zeitstabil und zudem von den zu erreichenden Zielen des Gründungsteams abhängig ist. Auf kurze Sicht und zur Erreichung eines elementaren Zieles, wie das Fortbestehen der Gründung, hat *Erfahrungsdisparität* einen negativen Einfluss: Hier zählt also der Zusammenhalt im Team, der wiederum bei Teammitgliedern mit ähnlichem Hintergrund und einer gemeinsamen fachlichen Sprache eher gegeben sein sollte. Auf lange Frist und zur Erreichung von Wachstumszielen treten die Vorteile einer geringen *Erfahrungsdisparität* in den Hintergrund. Ausschlaggebend für das langfristige Wachstum einer Neugründung ist die *Erfahrungsbreite* im Team.

Bezüglich des innovativen Erfolges neu gegründeter Unternehmen (gemessen an der Anzahl der Patentanmeldungen in den ersten vier Geschäftsjahren) sind beide Dimensionen der Heterogenität im Team erfolgsrelevant. Zum einen hat die *Erfahrungsdisparität* einen eindeutig negativen Einfluss auf die Patentierungsaktivitäten des Unternehmens. Zum anderen konnte ein umgedreht U-förmiger Zusammenhang zwischen *Erfahrungsbreite* und der Anzahl angemeldeter Patente nachgewiesen werden. Ab einem gewissen Punkt beeinflusst also eine steigende *Erfahrungsbreite* im Team den Innovationserfolg negativ. Grund hierfür ist vermutlich, dass der breitere Erfahrungshintergrund heterogener Teams mit einem größeren Potential zum Finden verschiedenster Lösungsmöglichkeiten für ein bestimmtes technisches Problem einhergeht. Die Kehrseite von einer Vielzahl potentieller Lösungen ist allerdings das Fehlen eines gemeinsamen Ansatzpunktes. Dies kann die Kompetenzen von Teams zur Lösung von technischen Problemen überfordern. Die Konsequenz ist, dass diese Teams, statt Innovationen hervorzubringen, zu einem routinierten Problemlösungsverhalten zurückkehren.

Kapitel 5

In diesem Kapitel rückt das Konzept Sozialkapital wieder in den Mittelpunkt der Analyse. Im Gegensatz zu Kapitel 2, welches den regionalen Quellen des Sozialkapitals und dessen Einfluss auf die Entscheidung ein Gründungsprojekt zu starten gewidmet war, wird in Kapitel 5 die Nutzung des Sozialkapitals im Gründungsprozess und die Erfolgswirksamkeit dieser Nutzung analysiert. Dabei wird konkret auf mögliche Unterschiede zwischen Team- und Einzelgründungen eingegangen. Basis des Kapitels 5 bildet ein Arbeitspapier, welches zusammen mit Prof. Dr. Uwe Cantner geschrieben wurde.

Sozialkapitaltheoretische Ansätze argumentieren, dass dem sozialen Umfeld eines Gründers eine wichtige Rolle für den Erfolg eines Unternehmens zukommt. Die Nutzung von Sozialkapital im Gründungsprozess, d.h. mit anderen Worten das Zurückgreifen auf Rat, Hilfe und Unterstützung aus dem sozialen Netzwerk der Gründer in verschiedensten Bereichen, ermöglicht es den Gründern, beispielsweise Zugriff auf fehlende Ressourcen oder wichtige Informationen zu erlangen.

Es ist Konsens in der Literatur, dass insbesondere Gründungsteams aufgrund der höheren Anzahl ihrer Kontakte mehr Sozialkapital nutzen als Einzelgründer (Davidsson & Honig, 2003). Diese Logik wird häufig angeführt, um den größeren wirtschaftlichen Erfolg von Teamgründungen zu erklären. Im Arbeitspapier dagegen wird argumentiert, dass dieses Erklärungsmuster nur einen Teil des Team-Sozialkapital-Mechanismus beschreibt. In einem Gründungsteam bündeln die einzelnen Mitglieder ihre oftmals unterschiedlichen Fähigkeiten und Ressourcen. Dadurch sind sie in der Lage, mehr Aktivitäten im Gründungsprozess selber durchzuführen und sind so weniger auf die Nutzung von Sozialkapital angewiesen.

In der empirischen Auswertung der Unternehmerbefragung unterstützen logistische Analysen diese Argumentation. Einerseits korreliert die Größe des Gründungsteams positiv mit der Nutzung von Sozialkapital im Gründungsprozess. Andererseits verringert sich die Wahrscheinlichkeit der Sozialkapitalnutzung mit steigender Humankapitalausstattung im Gründungsteam, gemessen anhand der Varietät im Erfahrungshintergrund der Teammitglieder in verschiedenen Arbeitsbereichen.

Bezüglich des Einflusses der Sozialkapitalnutzung im Gründungsprozess auf den späteren unternehmerischen Erfolg von Neugründungen unterscheiden sich Einzel- und Teamgründungen voneinander. Für Einzelgründer zeigen Zähldatenmodelle (negative binomiale Regressionen), dass ausschließlich die Nutzung von Sozialkapital aus dem Bekanntenkreis (weak ties) direkt mit unternehmerischem Erfolg des Unternehmens – gemessen am Beschäftigungswachstum in den ersten drei Geschäftsjahren – zusammenhängt. Demgegenüber hat die Nutzung von Sozialkapital aus dem engsten Familien- und Freundeskreis (strong ties) keinen messbaren Einfluss auf den wirtschaftlichen Erfolg des Unternehmens. Zusammengefasst profitieren die Gründer insbesondere von nicht-redundanten, neuen Informationen bzw. Ratschlägen über Märkte, Kunden und Finanzierungsquellen, die sie aus ihrem Bekanntenkreise erhalten. Rat, Hilfe und Unterstützung aus dem engsten Familien- und Freundeskreis scheint

hingegen nicht die Qualität aufzuweisen, welche die Gründer im Gründungsprozess benötigen.

Bezüglich Gründungsteams zeigen Zähldatenmodelle, dass die Nutzung von Sozialkapital keinen direkten, dafür aber einen indirekten Effekt auf den Erfolg des gegründeten Unternehmens hat. Dieser Effekt wird moderiert durch das bereits im Gründungsteam vorhandene Vorwissen. Je größer die Varietät im Erfahrungshintergrund – und damit die absorptive Kapazität im Gründungsteam – ist, desto leichter fällt es den Teammitgliedern, Informationen und Ratschläge aus ihrem sozialen Umfeld auf Qualität und Nützlichkeit zu prüfen, diese schließlich in die eigene Wissensbasis zu integrieren und im Gründungsprozess gewinnbringend anzuwenden. Zusammengefasst profitieren Gründungsteams mit einer hohen funktionalen Heterogenität im besonderen Maße von der Nutzung des Sozialkapitals (wieder vor allem aus dem Bekanntenkreis). Paradoxerweise nutzen aber gerade diese Teams seltener Sozialkapital, da sie viele Aufgaben im Gründungsprozess ohne Hilfe aus ihrem Umfeld lösen können.

1. Introduction

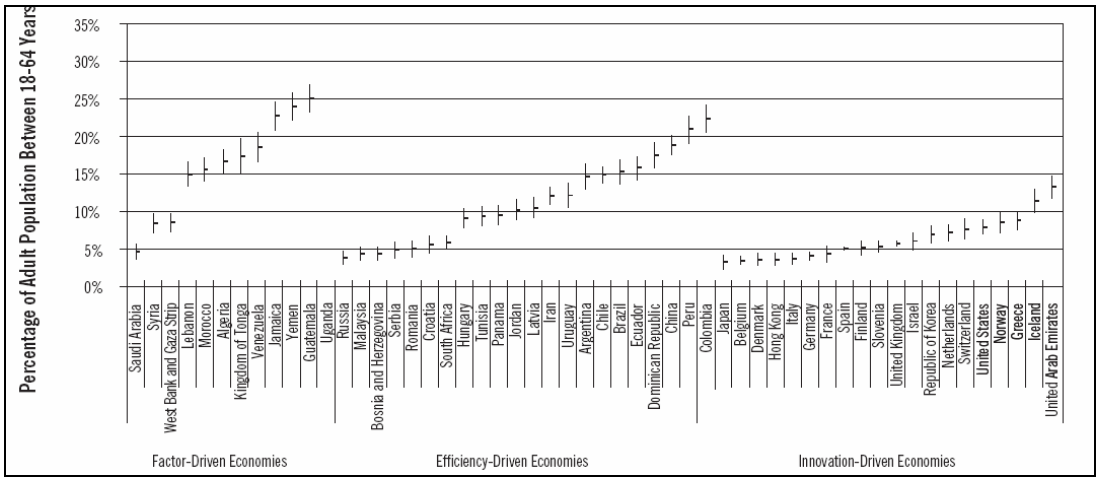
This dissertation is a compilation of papers on entrepreneurship which investigate related research questions. The unifying element of the different parts is the focus on two important concepts in entrepreneurship research, namely human capital and social capital. Briefly, the four main chapters deal with the origins of human and social capital, its use in different stages of the entrepreneurial process and its impact on entrepreneurial success. In doing so, I aim to contribute to the understanding of the main individual and group characteristics in entrepreneurship. In order to establish a basis for the four main chapters, this introductory chapter defines and discusses important terms. Section 1.1 clarifies the terms entrepreneurship and entrepreneurial process. Section 1.2 introduces main approaches in entrepreneurship research and discusses the concepts of human capital and social capital. Finally, Section 1.3 is dedicated to an overview of the four main chapters.

1.1 Entrepreneurship and the Entrepreneurial Process

Entrepreneurship is a phenomenon that occurs over time and space. According to data from the Global Entrepreneurship Monitor (GEM), 4.1 per cent of the adult population are currently trying to set up a company or have accomplished the founding of a company within the last 3.5 years (Brixy et al., 2009).[1] Compared to other innovation-based economies (see right part of Figure 1-1), Germany has significantly less entrepreneurial activity (Rank 15 out of 20). Furthermore, Germany suffers from an unfavourable composition of entrepreneurial activity, as the ratio of opportunity- to necessity-driven start-ups is comparatively low: 2:1 in Germany compared to for example, 5:1 in the UK, 12:1 in the Netherlands, and 31:1 in Denmark (Sternberg et al., 2007; Minniti et al., 2005).[2]

[1] The underlying concept of this figure is the Total Entrepreneurship Activity (TEA). The TEA can be split up into two parts, the nascent entrepreneurs and founders of new businesses (Reynolds et al. 2005).

[2] According to the GEM concept a necessity entrepreneur is defined as an individual who is engaged in entrepreneurship because of a lack of alternatives to earn a living, while an opportunity entrepreneur engages in entrepreneurship because he plans to realise a promising business idea (Reynolds et al. 2005).



Note: Vertical bars mark the 95% confidence interval of TEA, horizontal line mark the mean of TEA.
Source: Bosma & Levie (2009) GEM Global Report.

Figure 1-1: Total Entrepreneurial Activity (TEA) for 54 Nations in 2009, by Phase of Economic Development

Although (opportunity driven) entrepreneurship in Germany seems to be a rather rare event, it is widely acknowledged that entrepreneurship is a key driver for economic development. One of the most famous examples of the substantial impact of entrepreneurship is the printing press. This revolutionary innovation was introduced by Johannes Gutenberg around 1450 in Mainz after a long period of perfection of the printing mechanism. During this time Gutenberg's effort was largely financed by what we would today call venture capitalists. After its introduction, the printing technology rapidly diffused as former employees of printers set up printing shops in other cities in Germany and Western Europe (Barbier, 2006). The most obvious effect of the printing press was a massive increase in the production of books at reduced unit costs ultimately fostering the transfer and recombination of knowledge in society "dwarfing in scale anything which had occurred since the invention of writing" (Roberts, 1996, p.20). However, it has been proven to be difficult to evaluate the impact of the printing press on aggregate economic statistics such as productive growth and knowledge spillovers. At the city level, Dittmar (2010) analysed the link between the adoption of the printing press and population growth. He shows that cities which adopted the printing press early had a significant growth advantage between 1500 and 1800 over late adopters.

The above-described process of how new knowledge which is created but left uncommercialised through incumbent organisation (Gutenberg opened up only one printing shop) serves as the base for entrepreneurial opportunities is at the heart of the recently proposed "Theory of Knowledge Spillover Entrepreneurship" by Audretsch & Keilbach (2007). Individual entrepreneurial activity picking up these uncommercialised opportunities then serves as conduit for the diffusion and

exploitation of knowledge (e.g. Acs & Plummer, 2005). Other scholars highlight the importance of entrepreneurship for both economic growth and employment growth. It is argued that new ventures – which are often used as an indicator for entrepreneurial activity – challenge incumbents, thereby amplifying structural change and securing market efficiency. In this indirect way entrepreneurship leads to an improved overall competitiveness of the economy and subsequent growth (Andersson & Noseleit, in press; Audretsch & Keilbach, 2004a; Fritsch & Mueller, 2004). To sum up with the words of Sarasvathy (2004, p.708): "Entrepreneurship creates value in society that is disproportionate to its role within the economy, and that persists over longer periods of history than any other functional area in business. In other words, entrepreneurship creates positive externalities in benefits that accrue beyond the spatial, temporary, and popular contexts in which it occurs".

Despite its economic importance different views exist within the scientific community regarding what constitutes entrepreneurship (e.g. Gartner, 1990). However, Hébert and Link (1989) were able to condense the manifoldness of entrepreneurial definitions into three major intellectual branches: the German tradition based on the work of Thünen (1826) and Schumpeter (1934), the Chicago tradition building on Knight (1921) and Schultz (1980), and the Austrian tradition originating from the work of Mises (1949) and Kirzner (1973). In a nutshell, according to these branches entrepreneurship involves the introduction of new combinations onto the market (Schumpeter, 1934), the taking of risks (Knight, 1921), and the discovery and exploitation of profitable opportunities (Kirzner, 1973). More recently, approaches have focus on entrepreneurship as the creation of new ventures (Gartner, 1988), or the creation of economic value (Davidsson et al., 2001), which also can occur within existing organisations. In this thesis I adapt and combine both approaches. Consequently, I define entrepreneurship as the creation of economic value by emerging ventures. Note that this includes the economic effects of "failed" as well as "successful" ventures.

To justify such a narrow view of entrepreneurship I have to briefly return to the above-described mechanisms of how entrepreneurship impacts economic well-being, namely by 1) introducing and diffusing innovations and 2) securing market efficiency and amplifying structural change by challenging incumbents. According to these mechanisms, clearly not every emerging venture contributes to economic welfare. There is substantial empirical evidence that in particular the minority of high-quality start-ups which are often based on an opportunity and founded by well-educated entrepreneurs contribute most to economic welfare (e.g. Mueller, 2006a; Mueller, 2007). As Shane (2003, p.142) argues, most start-ups are, however, rather

“wage-substitution businesses that have more in common with self-employment” and do not contribute to economic welfare.

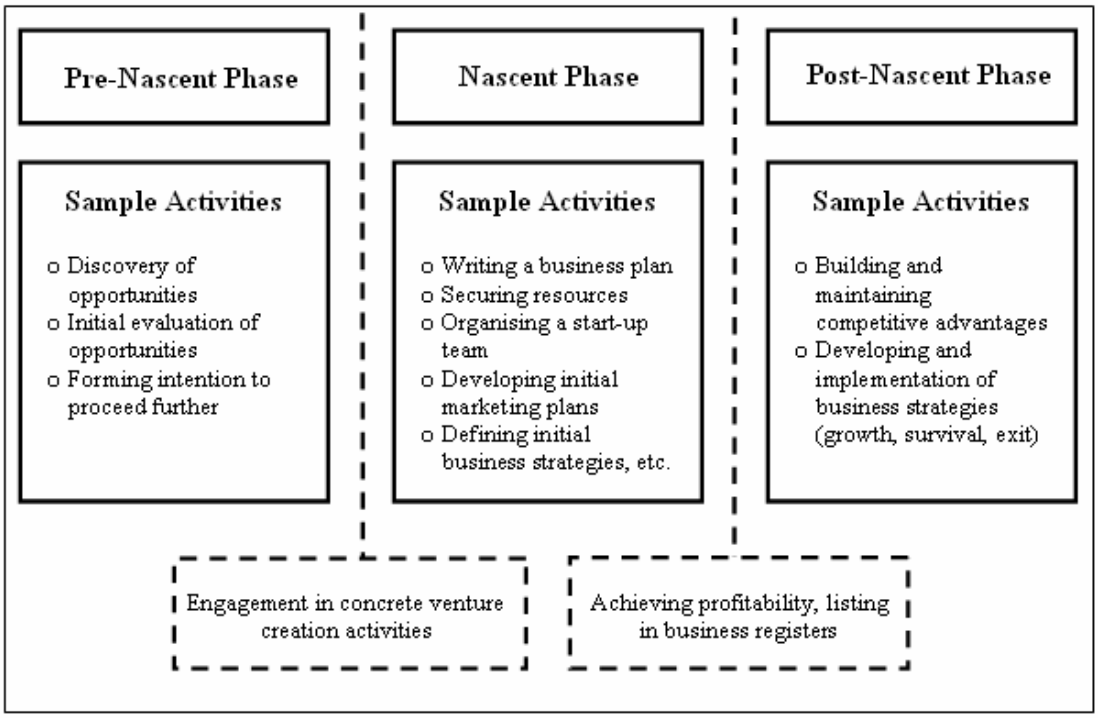
One argument against the application of this narrow view of entrepreneurship is that this definition is heavily influenced by economic outcomes rather than the intention to capture and study entrepreneurship as a societal phenomenon (Davidsson, 2008). However, in my point of view the research community should also take into account the policy response associated with a wide definition of entrepreneurship. In the last two decades supporting entrepreneurs and entrepreneurship became a focus of public policy (Hart, 2003; Shane, 2009) accompanied by an increase of publicly funded support schemes (see Kösters, 2009, for an overview of these schemes for Germany and in particular Thuringia). If only a minority of entrepreneurial activity contributes to economic welfare, it is hard to justify the spending of public money for supporting almost any kind of entrepreneurship and self-employment. To put it differently and in less stark terms, the author of this thesis is more concerned about the *quality* of entrepreneurship than the quantity of entrepreneurship in society.

A central aspect of entrepreneurship is its procedural nature. I agree with Baron (2007), noting that the intention to start a venture develops gradually over time in a person. According to my experience of 150 face-to-face interviews with entrepreneurs, they also find it hard to assess when they decided to transform this intention to concrete action and when the company was actually up and running. Thus, entrepreneurship can be understood as a continuous process that evolves over time. Another reason for applying a process perspective is that at different stages of the entrepreneurial process different factors might have a substantial impact. For example, Davidsson and Honig (2003) found that human capital was an important predictor for the decision to become a nascent entrepreneur, but less important for making progress in the venture creation process, and not important for business success. For these reasons the process perspective has become a central theme in entrepreneurship research (e.g. Baron, 2007; Shane, 2003; Shane & Venkataraman, 2000).

Within the entrepreneurship literature, there exist different definitions and models of the entrepreneurial process. Davidsson (2008) defines the entrepreneurial process as all cognitive and behavioural steps from the initial conception of a rough business idea, or first behaviour towards the realisation of a new business activity until the process is either terminated or has led to an up-and-running business venture with regular sales. Other scholars propose sequences of events moving gradually from the emergence of opportunities through an active decision by

nascent entrepreneurs to start new ventures and then to actual exploitation of opportunities and subsequent growth of the companies they create (e.g. Shane, 2003; Baron, 2007; Bygrave, 1989). I accept this latter approach as a working horse for this thesis, because it encompasses not only the early stages but also the intended effects of entrepreneurship as discussed above.

It is useful to structure the entrepreneurial process in phases to sort the variety of process activities into a meaningful grid. Referring to Baron (2007), Figure 1-2 proposes three major phases of the entrepreneurial process: the pre-nascent phase, the period prior to first concrete founding/gestation activities of the entrepreneur; nascent phase which encompasses concrete gestation activities related to the venture founding; and the post-nascent phase, a period that includes activities of the entrepreneur after the venture is set-up and running and the intended effect of the entrepreneurial activity for the entrepreneur and the economy. Before I turn to a more detailed discussion of the different phases and their relevance for this thesis, please note that the boundaries between these phases are not solid and firm as they appear at first sight. Many activities – which I will discuss in the paragraph below – allocated to one phase can spill over into another.



Note: Adapted with minor changes from Baron (2007).

Figure 1-2: Process Model of Entrepreneurship

The pre-nascent phase often includes actions dedicated to the discovery and initial evaluation of the entrepreneurial opportunity. Thereby an opportunity is

defined as “those situations in which new goods, services, raw materials, and organising methods can be introduced and sold at greater than their cost of production” (Shane & Venkataraman, 2003, p.220). It is often argued that some individuals discover profitable opportunities mainly because they possess 1) prior information not available to others (Venkataraman, 1997), and 2) apply cognitive processes that enable some individuals to see the new means-ends relationship and its economic potential (Baron, 2006). While some individuals are passively alert to entrepreneurial opportunities (Kirzner, 1973), there is empirical evidence that other entrepreneurs discover opportunities after actively searching for them (Fiet et al., 2004).

The active engagement of the entrepreneurial individual in concrete start-up activities in order to exploit the profitable business opportunity demarks the transition to the nascent phase. This sub-phase of the entrepreneurial process is a process by itself – often referred to as the venture creation process or start-up process (Gartner & Carter, 2004), while the individuals who are actively trying to set-up the new venture are called nascent entrepreneurs (Reynolds & White, 1992). In order to exploit the business opportunity the nascent entrepreneurs engage in concrete activities such as the writing of a business plan, organising a start-up team, securing resources, and developing marketing plans.

There are different views in the scientific community regarding what constitute the transition between the nascent and the post-nascent phase. While some use the entrepreneur’s perception of whether their business is up-and-running (e.g. Lichtenstein et al., 2007), most researchers rely on the accomplishment of specific activities such as achieving first sales or positive cash-flows (e.g. Davidsson & Honig, 2003), hiring employees (e.g. Fritsch & Mueller, 2004), gaining legitimacy through a listing in an official register, or combinations of accomplished activities (e.g. Brush et al., 2008a). In this thesis, I use the combined criteria of achieving profitability and listing in an official register as the boundary between the nascent and the post-nascent phase. This choice is for two reasons. First, reaching profitability is a major goal for business founders and proves the viability of the opportunity. Second, the listing of the start-up in an official register can be regarded as a necessary condition to do business on a larger scale in Germany.

In the post-nascent phase the entrepreneur shifts his attention from developing and implementing initial plans to running a functioning company (Baron, 2007). Main activities in this phase are the refinement of the business model to achieve and maintain competitive advantages (e.g. Porter, 1990; Barney, 1991) as well as the development and implementation of strategies to achieve desired

outcomes such as growth, survival or even exit by selling the company (e.g. Baron, 2007). The economic effects of the entrepreneurial engagement of the individual also become more manifest at this stage. At the individual level the founders may enjoy higher income streams as their firms grow in terms of sales, employment, and most importantly profits. At the level of the economy the effects are more widespread, ultimately leading to knowledge diffusion and economic growth. Also failed start-up attempts contribute to these goals, because they still managed to challenge incumbent firms and the knowledge generated by the business founders and employers in the (pre-)nascent phase can be productively used in some other form.

Note again that I do not suggest that the boundaries between the phases are impenetrable. Many of the allocated activities can spill over between the phases. For example, the building of the firm's competitive advantage might already start in the nascent phase, the securing of resources is also important in the post-nascent phase, and the evaluation of the business opportunity is arguably not limited to the pre-nascent phase but is likely to continue as the entrepreneurial process proceeds. The main criterion for allocating these activities into a specific phase is their relative importance in this phase compared to the other phases. The suggested process model will also assist in structuring this thesis, as the four main chapters can be easily allocated to different sub-phases. I will return to this issue in Section 1.4, where I provide an overview of the four main chapters.

The dashed boundaries between the three sub-stages in Figure 1-2 already suggest that not every individual will make the full transition from the pre-nascent phase to the nascent phase and post-nascent phase. It is not uncommon that individuals who have the intention to engage in entrepreneurship never convert these intentions into concrete steps. Also nascent entrepreneurs can quite their efforts to create a new venture before it is up-and running (e.g. Brixy et al., 2008). In order to get an impression of the drop-out rates, I present in the following paragraph some preliminary analyses from two datasets which were created within the Thuringian Founder Study. Note that the main parts of this thesis are based on the Thuringian Founder Study.

The transition between the pre-nascent phase and the nascent phase can be analysed with a representative dataset of scientists at Thuringian universities and research institutes (for more information on this dataset, see Obschonka et al., 2010). In the first wave the scientists (T1) were asked about their intention to start-up. After 18 months in a follow-up wave, roughly 25% of the scientists who had an intention of starting-up had actually engaged in concrete venture creation activities,

while 75% had not converted their intention into concrete behaviour. The transition between the nascent phase and the post-nascent phase can be studied with the convenient sample of high-potential nascent projects in Thuringia (for detailed information see Chapter 3). The respective entrepreneurs were engaged in concrete venture creation activities at the time of the first interview (T1). Of those nascent entrepreneurs who participated in the follow-up wave after 12 months, 35% were classified as up-and-running businesses, while 13% had abandoned the start-up project and 52% were still in the nascent phase. To summarise, the more entrepreneurship becomes manifest, the more individuals drop out of the entrepreneurial process (for a variety of reasons). Given the importance of entrepreneurship in society discussed above, it is thus of central interest to understand the factors driving entrepreneurial behaviour along the process. This thesis aims to contribute to this emerging field of research by investigating success factors at the three different sub-phases.

1.2 Approaches and Concepts in Entrepreneurship

Entrepreneurship is still an emerging field in science with multidisciplinary academic underpinnings such as finance, sociology, law, business and management, economics, psychology, and economic geography. The present thesis also has a multidisciplinary character as the four main chapters draw from ideas of three main approaches. On this account, I will briefly describe the psychological, economic, and economic geography approach to entrepreneurship in Section 1.2.1. As will become evident, the common feature of these three approaches is their attention to two important concepts, namely human and social capital. Thus, in Section 1.2.2 these two concepts are introduced and discussed in more detail.

1.2.1 Three Main Approaches to Entrepreneurship

Within the discipline of psychology, the trait approach is one of the oldest approaches to entrepreneurship. A central theme in the trait approach is the investigation of personality traits and their effect on entrepreneurial career choice and entrepreneurial success (e.g. McClelland, 1961; Brockhaus, 1980). However, early research on individual differences in personality traits has been heavily criticised, mainly because of the lack of a theoretical framework on how personality traits affect entrepreneurial behaviour and limited cross-situational consistency of personality traits (Gartner, 1988; Low & MacMillan, 1988; Rauch & Frese, 2007). Recent trait research tries to remedy these problems by focussing on traits which

are more proximal to entrepreneurial behaviour (e.g. passion) and explicitly modelling transfer mechanisms through which traits affect entrepreneurial decisions and actions. Such mechanisms include the formulation of business strategies (e.g. Baum & Locke, 2004) and the accumulation of human capital (e.g. Rauch & Frese, 2007; Obschonka et al., 2010). Beside the trait approach, the study of entrepreneurial cognition has also attracted the attention of entrepreneurship research (e.g. Baron, 2006; Sarasvathy, 2001).

The second approach to entrepreneurship to be presented is the economic approach. Today the field of economics is more than the study of equilibrium outcomes in competitive markets with omniscient agents. In particular the sub-branch of evolutionary economics deals with structural change, complex interdependencies, and actors with bounded rationality (e.g. Hogson, 1993; Nelson & Winter, 1982). As entrepreneurship arises from information asymmetries between actors (Venkataraman, 1997) and creates disequilibria (Schumpeter, 1934), the economics of entrepreneurship is not an oxymoron (Parker, 2004). The field of economics has mainly contributed to our understanding of the determinants of occupational choice and the effects of entrepreneurship at the firm and societal level. The rise of the economic approach to entrepreneurship is partly connected with the decline of trait approach above discussed as research attention has shifted perspective mainly towards resources such as the amount of human and social capital individuals contribute to emerging ventures (e.g. Colombo & Grilli, 2009; Mosey & Wright, 2007; Samuelsson & Davidsson, 2009; Schultz, 1980).

The third main approach to entrepreneurship is economic geography, wherein an emerging stream of literature deals with the regional dimension of entrepreneurship (see Sternberg, 2009, for a recent overview). As is true for human behaviour in general, individuals' entrepreneurial activity is embedded in the wider social and spatial sphere. Likewise, entrepreneurship is often referred to as a "regional event" (Feldman, 2001) and there is empirical evidence suggesting that regional characteristics are important determinants of entrepreneurial activity (e.g. Armington & Acs, 2002; Reynolds, 2007a; Fritsch & Falck, 2007; Wagner & Sternberg, 2004). There are two main reasons why regional characteristics are important for entrepreneurship. First, opportunities often emanate from a recombination of existing knowledge. In particular, the tacit component of knowledge (Polanyi, 1966) does not travel well and can be best transferred by face-to-face contact (Gertler, 2003). Moreover, there is ample empirical evidence that knowledge spillovers are impaired by increasing geographical distance (e.g. Audretsch & Feldman, 1996). Thus, opportunities are a function of the idiosyncratic existing

regional industry and research structure (Stam, 2007). Second, individuals generally start businesses where they actually work and live (Haug, 1995). Therefore, their human capital and social networks are also shaped by regional characteristics such as the availability of tertiary education and the existence of entrepreneurial role models (e.g. Mueller, 2006b; Andersson & Koster, 2010). Taken together, the fact that potential entrepreneurs as well as the business opportunities are tied to and shaped by the region emphasises the importance of the regional dimension of entrepreneurship.

1.2.2 Human Capital

Traditional human capital theory relates an employee's human capital with subsequent earnings in paid employment. According to Becker (1964) human capital is the skills and knowledge which are acquired by individuals mainly through schooling and on-the-job training. The main argument is that through these investments individuals improve their productivity at work, resulting in higher wages. Later, this theory was extended to entrepreneurs and small-business owners (Schultz, 1980; Brüderl et al., 1992), arguing that investments in knowledge and skills also pay off in entrepreneurship in terms of venture survival, venture growth and profitability. The impact of human capital on the entrepreneurial process is manifold (for an overview see Unger et al., 2009), because knowledge and skills are important for several activities in the different sub-phases of the entrepreneurial process.

At early stages of the entrepreneurial process human, capital increases the capability of individuals to discover opportunities. This argument is based upon Venkataraman's (1997, p.122) view that an individual's prior experience creates a "knowledge corridor" enabling the recognition of opportunities. However, as individuals have different sets of expertise and experience, they find themselves in different knowledge corridors to discover specific opportunities not visible to other people (Shane, 2000). Applying this perspective, Westhead et al. (2005) find that founders with prior business experience discovered more opportunities than novice entrepreneurs. There is also empirical evidence showing that human capital impacts the approach of how entrepreneurs exploit opportunities (Chandler & Hanks, 1994; Shane, 2000).

Human capital is also useful to acquiring other resources such as financial capital. Because the future entrepreneurial performance is difficult to predict and the true entrepreneurial ability of the founders is not easy to observe, potential investors choose to observe alternative signals of an individual's entrepreneurial ability when

making funding decisions (e.g. Gimmon & Levie, 2010). Such signals that potential investors evaluate include prior management experience, prior start-up experience, educational attainment, and functional heterogeneity in the case of team start-ups (Kaplan & Strömberg, 2004; Zacharakis & Shepherd, 2005). A number of empirical studies support the notion that entrepreneurs who successfully signal these endowments attract more financial capital (e.g. Gimmon & Levie, 2010; Zimmerman, 2008).

Another link between human capital and entrepreneurship deals with entrepreneurial learning. It is argued that in particular prior knowledge is critical for learning and integrating new knowledge (Cohen & Levinthal, 1990; Hayton & Zahra, 2005) as well as to adapt to new situations (Weick, 1996), which is often necessary in entrepreneurship given the high degree of uncertainty entrepreneurs typically face.

Finally, human capital is also beneficial in the development and implementation of successful business strategies (Frese et al., 2007). In two influential papers, Baum and his co-authors provide empirical evidence on how specific skills such as managerial and entrepreneurial skills affect the formulation of business strategies which in turn influence venture growth (Baum et al., 2001; Baum & Locke, 2004).

1.2.3 Social Capital

Social capital originally developed in sociology, and deals in general with the embeddedness of individuals in social relations and the possible benefits and drawbacks associated with these relations (Bourdieu, 1986; Coleman, 1988; Granovetter, 1973). While there are various definitions of social capital in the literature (for an overview see Adler and Kwon, 2002), I follow the integrative approach of Nahapiet and Goshal (1998). They define social capital at the individual level “as the sum of the actual and potential resources embedded within, available through and derived from the network of relationships possessed by an individual or a social unit” (Nahapiet & Goshal, 1998, p.243). Social capital is multidimensional, encompassing a structural, a relational, and a cognitive dimension (Nahapiet & Goshal, 1998). While the structural dimension is concerned with the properties of the social network such as the density and the connectivity among actors (Burt, 1992), the relational aspect of social capital refers to the quality and kind of interpersonal relationships (Granovetter, 1992). The cognitive dimension of social capital captures shared representations and systems of meaning that individuals have with one another.

Another distinction in social capital literature is that between bridging and bonding social capital (Putnam, 2000). Bridging social capital refers to links between individuals and organisations representing different expertise, views of the world, and cultural habits (e.g. Samuelsson & Davidsson, 2009). In contrast, bonding social capital refers to the positive (but sometimes negative) effects of cohesion and trust between actors enabling collective actions (Putnam, 2000). In a closely related classification of social capital, theorists distinguish between weak and strong ties (Granovetter, 1973). Thereby, weak ties describe loose relationships to actors providing non-redundant information (e.g. Davidsson & Honig, 2003) whereas strong ties refer to close relations to a limited set of actors featuring trust and its positive by-products (e.g. Samuelsson & Davidsson, 2009).

Because of its multidimensionality, social capital is often viewed as a fuzzy concept defying precise quantification and measurement. It is beyond the scope of this introduction to fully review the numerous measurement approaches, but in general researchers agree that at the individual level social capital can be studied best by investigating social network characteristics and resource flows from these networks (e.g. Lin, 2001; Hoang & Antocic, 2003).

Social capital is regarded to be conducive along the entrepreneurial process in two ways above all. First, social capital helps entrepreneurs to overcome the substantial resource constraints they face in the nascent and post-nascent phase. For example, analysing cases in the computer training and air pollution consulting industry, Baker et al. (2003) find strong evidence that founders extensively used their pre-existing networks to assess resources in the venture creation process. Furthermore scholars highlight the importance of social capital in providing access to novel information and trusted feedback to individuals concerning business strategies (Uzzi, 1997), in product development (Lechner & Dowling, 2003), and in coming into contact with potential investors (Shane & Cable, 2002).

By means of trusted feedback and providing access to novel information social capital might also facilitate the discovery of profitable business opportunities (Elfring & Hulsink, 2003; Arenius & DeClerck, 2005). In a similar vein, Davidsson and Honig (2003, p. 309) argue that social capital assists individuals “by exposing them to new and different ideas […] in effect, providing them with a wider frame of reference both supportive and nurturing to the new potential idea or venture”.

1.3 Scope and Structure of this Thesis

1.3.1 Structure

The previous sections discussed the procedural nature of entrepreneurship (Section 1.1), three main approaches to entrepreneurship, as well as their mutual attention to the concepts of human and social capital (Section 1.2). The thesis mirrors this structure. It builds on ideas from psychology, economics, and economic geography while focussing on human and social capital. To be more precise, I investigate the origins of human and social capital, its use in different stages of the entrepreneurial process and its impact on entrepreneurial success.

The thesis consists of four papers that all analyse different parts of this agenda. The four main chapters are based on working papers that were either presented at workshops of the doctoral training group "The Economics of Innovative Change" (DFG-GK-1411) in Jena or at national as well as international conferences.[3] A more specific overview of the structure is provided in Table 1. Note that only Chapter 2 investigates the transition between different sub-phases (pre-nascent to nascent phase) of the entrepreneurial process. Chapter 3 solely focusses on the nascent phase. In contrast, Chapters 4 and 5 study the effect of specific issues in the nascent phase on entrepreneurial performance in the post-nascent phase. While the separate investigation of the different sub phases of the entrepreneurial process is a limitation of the analysis, the choice of this research framework was governed by data and time constraints.

Regarding the two main concepts of this thesis, human capital is the central topic in Chapters 3 and 4. Thereby, Chapter 3 studies the origins of a specific aspect of human capital, namely the balance of skills and their performance effects in the nascent phase. The paper presented in Chapter 4 focuses on human capital in entrepreneurial teams. Specifically, the venture performance advantages and disadvantages of functional heterogeneity in the post-nascent phase are investigated. Chapters 2 and 5 are mainly dedicated to social capital. In Chapter 2 the role of regional characteristics in the formation of individual social capital as well as the subsequent impact of social capital on the decision to engage in concrete venture creation is studied. Chapter 5 sheds light on the use of social capital in the nascent phase and its performance implications in the post-nascent phase. As discussed in more detail below the performance effect of social capital is partly contingent on human capital.

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[3] These conferences include the G-Forum (12. G-Forum – Interdisziplinäre Jahreskonferenz zur Gründungsforschung, November 6–7, 2008, Dortmund), EMAEE (Sixth European Meeting on Applied Evolutionary Economics, May 21–23, 2009, Jena), BCERC (Babson College Research Entrepreneurship Conference, June 4–6, 2009, Babson: MA), ERSA (50th European Congress of the Regional Science Association International, August 19–23, 2010, Jönköping: Sweden), EEA (25th Annual Congress of the European Economic Association, August 23–26, 2010, Glasgow: UK), and the GEM Research Conference (4th GEM Research Conference, September 30–October 2, 2010 in London: UK).

Table 1-1: Overview of Chapters Regarding Focus, Approach, and Sub-phase of the Entrepreneurial Process and Content

Chapter	Focus and Approach	Sub-phase(s) of the entrepreneurial process	Content
Chapter 2: "Investigating the Black Box between Regions and Individual Entrepreneurship"	○ Focus on social capital and opportunity ○ Combining ideas from economic geography and economics	○ Pre-nascent phase and transition to nascent phase	○ Regional determinants of social capital at the individual level and perceived founding opportunities ○ Impact of social capital and perceived opportunity perception on individual's decision to engage in concrete venture creation activities
Chapter 3: "Balanced Skills among Nascent Entrepreneurs"	○ Focus on human capital ○ Combining ideas from psychology and economics	○ Nascent phase	○ Origins of balanced skills ○ Impact of balanced skills on making progress within the nascent phase
Chapter 4: "Disentangling the Effect of New Venture Team Functional Heterogeneity on New Venture Performance"	○ Focus on human capital ○ Combining ideas from social psychology and economics	○ Nascent phase and post-nascent phase	○ Disentangling of a new venture team's functional heterogeneity in the nascent phase into a productive and destructive dimension (scope and disparity) ○ Impact of both dimensions on new venture performance in the post-nascent phase
Chapter 5: "The Use and Effect of Social Capital in New Venture Creation – Solo Entrepreneurs vs. New Venture Teams"	○ Focus on social capital and partly on human capital ○ Economic approach	○ Nascent phase and post-nascent phase	○ Social capital use in the nascent phase and its impact on new venture performance in the post-nascent phase ○ Investigating differences between solo start-ups and team start-ups

Each chapter of this thesis can be read independently. The following overview provides the essence of the four chapters and thus might be a helpful tool for the selective reader.

1.3.2 Examining the Black Box between Regions and Individual Entrepreneurship

Social capital is one central topic of Chapter 2. More precisely, I investigate the role of regional characteristics in the formation of social capital as well as the impact of social capital on the transition from the pre-nascent to the nascent phase.[4]

Introduction

An emerging stream of literature deals with the regional dimension of entrepreneurship (e.g. Fritsch & Mueller, 2004; Fritsch & Falck, 2007; Sternberg, 2009). Entrepreneurs quite often start businesses near their workplace or residence. Thus, their endowment with human and social capital is closely related with regional characteristics such as entrepreneurial climate and the educational system. Moreover, the underlying business opportunities are also shaped by regional characteristics as they often originate from a recombination of the regional knowledge stock. Furthermore, the impact of entrepreneurship on economic growth and employment is best documented at the regional level.

Despite the growing attention on the regional dimension in entrepreneurship, there is no consensus on *which* regional characteristics are particularly important for entrepreneurial activity (for a recent review see Sternberg, 2009). One possible explanation for this unsatisfactory result is associated with the appropriate level of analysis. Much research is conducted exclusively at the regional level, linking regional characteristics with regional start-up rates. However, regional characteristics, although of particular importance, should not be causal as such, but should operate via more proximal predictors that are most likely located on the personal level (e.g. Tamásy, 2006). Only a small, albeit growing number of studies combine regional-level data with individual-level data providing promising first results (Bergmann & Sternberg, 2007; Mueller, 2006b; Sternberg & Wagner, 2005; Tamásy, 2006).

Chapter 2 tries to contribute to this discussion by introducing a specific model focussing on *pathways* through which regional characteristics, and in particular the regional opportunity structure, actually affect individual entrepreneurship. Grounded in well-established theory, I argue that individuals' social capital as well as perceived founding opportunities are such pathways impacting individuals' decision to engage in concrete venture creation activity.

[4] Chapter 2 is based on a working paper written in conjunction with Uwe Cantner, Martin Obschonka, Rolf Sternberg, and Udo Brixy.

Main Hypotheses

The basic hypothesis is that a favourable objective regional opportunity structure is associated with a higher propensity for individuals to engage in entrepreneurship (H1). Regarding the pathways, I argue that a favourable regional opportunity structure is associated with perceived opportunities at the individual level (H2a) as well as with a higher level of individual social capital (H2b). In turn, individuals' perceived founding opportunity (H3a) and the higher level of individual social capital (H3b) are hypothesised to be associated with individuals' engagement in concrete venture creation activity.

Data and Methodology

In this chapter I combine regional-level data with individual-level data. Individual-level data are taken from the adult population surveys of the GEM project in western Germany covering seven years (2002–2006; 2008–2009).[5] These data are linked with archival regional-level data characterising the socio-economic environment of the respondents. Thereby, regional-level data are drawn from various sources and are at the district level (NUTS3; *Kreise*). The most important source is the German Social Insurance Statistics as described in Fritsch and Brixy (2004), which cover all employers and employees who are subject to obligatory social insurance. I analyse this combined data set by applying a multi-level random-effects model with varying intercepts.

Results, Implications and Contribution

Contrary to Hypothesis 1, I do not find evidence for a direct link between a favourable regional opportunity structure (as indicated by a high share of the creative class, a higher start-up rate, strong presence of small businesses and higher growth of regional gross domestic product (GDP)) and individuals' engagement in concrete venture creation activities. However, individuals perceive more often perceive founding opportunities and report a higher level of social capital in a favourable regional opportunity structure (supporting H2a and H2b). Anon, social capital and perceived founding opportunities are strong predictors for the individual decision to become a nascent entrepreneur (supporting H3a and H3b).

The results of the analysis point at the importance of one specific indicator of the regional opportunity structure, namely the share of the creative class. According to Florida (2004), members of the creative class are engaged in creative and innovative tasks in their job. Therefore, they are regarded as being a key driver for

[5] In 2007 Germany did not conduct a GEM adult population survey.

regional development by creating knowledge. The results of Chapter 5 suggest that the knowledge created by the creative class indeed serves as the foundation of business opportunities. Moreover, creative people are attracted to places that are characterised by a climate of tolerance and diversity of people's backgrounds, origins, and lifestyles (Fritsch & Stuetzer, 2007). Such an environment provides the opportunity to easily form "looser social networks with weaker ties" (Florida, 2004, p.273). Although I do not consider tie strength in the analysis, the results of the present analysis support the more general notion that a greater presence of creative people stimulates network ties.

Chapter 2 contributes to the existing entrepreneurship literature in two ways. First, I propose and test a theoretical model on how regional characteristics impact individual entrepreneurial activity. Second, this chapter sheds some light on the less researched area of the origins of social capital. Regarding potential policy implications, Chapter 2 does not offer any short-term solutions for regional development. However, investing in people, attracting members of the creative class, and supporting an environment open to diverse ideas might pay off in the longer run.

1.3.3 Balanced Skills among Nascent Entrepreneurs

Chapter 3 turns the attention to the second main concept of this thesis: human capital. To be more precise, this chapters analyses one specific part of an entrepreneur's human capital, namely skills.

Introduction

Literature emphasises that entrepreneurs often combine different resources such as physical capital, people and ideas in order to introduce new products or services onto the market (Baker et al., 2003). In order to put together those various resources, one might argue that the entrepreneur must be sufficiently skilled in a number of areas. The notion of entrepreneurs being jack-of-all-trades is at the heart of Lazear's (2005) theory. Considering the case of the founder of a software company, it is not necessary that the entrepreneur is the best programmer, but he might need some knowledge in programming to supervise the output of his employees. To sell the software some experience in marketing and sales would be also appropriated. To overcome resource constraints he must be able to raise funds and hire qualified personnel for the new venture. One might argue that all of the above-mentioned entrepreneurial tasks are critical for founding and running a company. However, I expect that those individuals with more balanced skills –

conceptualised as having prior work experience in a number of fields such as marketing and R&D – should be the more successful entrepreneurs than their less balanced skilled counterparts.

This chapter examines the effects and origins of balanced skills among nascent entrepreneurs. Although this study builds upon prior work (Lazear 2005, Silva 2007), it extends this research in two ways. First, I extend Lazear's jack-of-all-trades theory to formally model performance effects of balanced skills. Second, I examine potential sources of balanced skills. There are two competing explanatory models explaining variation in the skill set of individuals. On the one hand, the investment hypothesis states that individuals *intentionally* invest in a balanced skill set by engaging in different industries and working in diverse jobs to acquire skills for starting up a business (Lazear, 2005). On the other hand, the endowment hypothesis questions the intentionality of skill acquisition among entrepreneurs. Instead, scholars posit that some individuals are *innately endowed* with a high level of multiple skills, enabling them to have many roles in the labour market – including entrepreneurship (Silva, 2007).

Main Hypotheses

Turning first to the performance effect of balanced skills, I hypothesise that balanced skills are related to making progress in the nascent phase (H1). In the second part of the chapter I examine potential sources of balanced skills among nascent entrepreneurs. Regarding the investment hypothesis I argue that work and schooling experience fostering the acquisition of various experiences are sources of balanced skills. Thus, I hypothesise that prior entrepreneurial experience (H2a), prior managerial experience (H2b), prior work experience in small and young firms (H2c), and variety in university curricula (H2d) are associated with a balanced skill set. Concerning the endowment hypothesis I investigate the impact of personality traits and the personal development of the nascent entrepreneur in adolescence on balanced skills. I hypothesise, that higher openness to experience (H3a), higher extraversion (H3b), lower agreeableness (H3c), and a higher variety of early interests during adolescence (H4) is associated with a balanced skill set.

Data and Methodology

The data for the respective analysis is provided by the Thuringian Founder Study (*Thüringer Gründer Studie*). This is an interdisciplinary research project that looks at the success and failure of innovative new ventures in the German federal state of Thuringia. One part of this study represents a sample of 100 high-potential

nascent projects. These projects were identified via a multitude of sources such as elevator pitches and technology transfer offices at universities. In a nutshell: the evaluation criteria to create the final data set included the human capital of entrepreneurs, the sophistication of the project, and the growth friendliness of the respective industry. My colleagues and I conducted face-to-face interviews with the solo entrepreneur or the lead entrepreneur (in case of a team start-up). In this chapter I analyse the first wave of data, which are cross-sectional per definition. the indicator for balanced skills I use the number of functional areas (such as marketing and R&D) in which the nascent entrepreneur had work experience prior to the first concrete venture creation activities. Similar measures have been successfully used in previous research studying the jack-of-all-trades hypothesis (e.g. Lazear, 2005).

Results, Implications and Contribution

By employing count data models I find support for the hypothesis that balanced skills are an important factor for progressing in the nascent phase, as indicated by the number of gestation activities initiated (H1). In regards to the origins of a balanced skill set, I discovered that work and schooling experience foster the acquisition of various experiences, which supports the investment hypothesis. Managerial and start-up experience, work experience in young and small firms, as well as varied university curricula are associated with a balanced skill set of nascent entrepreneurs (H2a-d). However, there is also empirical evidence for the endowment hypothesis, suggesting that a balanced skill set is deeply rooted in the personal development of the nascent entrepreneurs. The central framework in developmental psychology is that past interests and actions are reflected in future choices (Holland & Nichols, 1964). Applying this framework, I identify that nascent entrepreneurs who had more varied early interests in adolescence also enjoyed a more balanced skill set prior to the start of the venture creation process (H4). With respect to the big-five personality dimensions, I only find lower agreeableness to be associated with a balanced skill set (H3c).

Comparing fit statistics and the predictive ability of the investment hypothesis and the endowment hypothesis, the latter seems to slightly outperform the former. These results raise doubts on the generalisability of Silva's (2007) conclusion that a balanced skill set is purely attributable to an innate ability. On the contrary and as Lazear (2005) originally suggested, conscious human capital investment in a balanced skill set by work and schooling experience fostering the acquisition of various experience seems to play an important role. Referring to this, this study speaks in favour of including elements of interdisciplinary cooperation in

entrepreneurship education and training. In this way, prospective entrepreneurs would be better prepared for setting up businesses.

Chapter 3 makes three important contributions to entrepreneurship research. First, it theoretically and formally models performance effects of balanced skills, and thus extends Lazear's (2005) original model. Second, this research contributes to human capital theory by investigating the origins of entrepreneurial skills. In doing so, and this is third contribution of this chapter, I combine ideas from psychology and economics in order to provide a more holistic view on human capital.

1.3.4 Disentangling the Effect of New Venture Team Functional Heterogeneity on New Venture Performance

Chapter 4 shifts the attention from the individual entrepreneur to the entrepreneurial team. This shift is justified because high-potential start-ups are more often created by groups of people than by individuals (Cooper & Bruno, 1977) and seem to outperform solo ventures (e.g. Chandler et al., 2005, Ucsbasaran et al., 2003). Similar to the chapter on balanced skills, I focus in Chapter 4 on human capital in the nascent phase. However, a team's human capital is then related with entrepreneurial success in the post-nascent phase. This approach builds upon the proposition that new ventures are imprinted at the nascent phase by the characteristics of the new venture team and that this imprinting has a long-lasting effect on venture strategy and performance.[6]

Introduction

The apparent success of entrepreneurial teams can be attributed to the logic that particularly "high technology industries might require more skills than an individual would be likely to have, necessitating that individuals combine their abilities in teams in order to start an organization successfully" (Gartner 1985, p. 703). However, functional heterogeneity in teams can have detrimental effects such as communication problems and conflicts between the team members. Although team composition has long been part of the analytical scope of organisational research (e.g., Murray, 1989), its impact on entrepreneurial team performance is still not well understood. Previous research examining the performance benefits and drawbacks of functional heterogeneity in teams has been decidedly equivocal, reporting positive relationships in some cases and negative or null relationships in other cases (e.g., Bantel & Jackson, 1989; Pelled et al., 1999). Given this conflicting

[6] Chapter 4 is based on a working paper co-authored with Uwe Cantner and Maximilian Göthner.

pattern of empirical evidence, scholars have recently begun to question the simplistic "heterogeneity-promotes-or-hinders-performance" assumption (Liao et al., 2009; Bunderson & Sutcliffe, 2002).

Chapter 4 aims to contribute to this discussion. It is my contention that the ambiguity of findings in prior research can in part be attributed to the measurement of functional heterogeneity in entrepreneurial teams employing a uni-dimensional approach and relying on heterogeneity indices which measure an uninformative net-effect of heterogeneity condensing possible productive and destructive influences. Building on two established schools of thought, namely the cognitive resource perspective (Hambrick & Mason, 1984; Wiersema & Bantel, 1992) and similarity/attraction theories (Byrne, 1971; Tajfel & Turner, 1986), I propose the existence of two separate dimensions of functional heterogeneity. The first dimension, namely *knowledge scope*, relates to the cognitive diversity perspective. *Knowledge scope* shall capture the positive effects of functional heterogeneity within a team ascribed to a broader skill base and expertise the team may draw on, which stem from job experience in several functional areas. The second dimension, *knowledge disparity*, relates to similarity/attraction theories. It shall capture the negative effect of functional heterogeneity ascribed to communication problems, group thinking and affective conflicts that the team suffers from stemming from team members' non-overlapping functional background patterns.

Main Hypotheses

Turning first to the entrepreneurial performance of functional heterogeneity, I hypothesise that a start-up team's knowledge scope is positively related to the new firm's entrepreneurial performance (H1a). In contrast, I argue a start-up team's knowledge disparity is negatively related to the new firm's entrepreneurial performance (H1b). Besides entrepreneurial performance, I also investigate the effect of functional heterogeneity on new ventures' innovative performance. Following prior research I argue that there exists an inverse U-shaped relationship between knowledge scope and the innovative performance of the new firm (H2a). In contrast, I expect start-up team's knowledge disparity to be negatively related to the new firm's innovative performance (H2b).

Data and Methodology

As in the previous chapter, I use data from the Thuringian Founder Study. However in Chapter 4, I analyse a sample of already established companies. Briefly, the analysed dataset represents a random sample of start-ups in innovative

industries comprising ‘advanced technology’ and ‘technology-oriented services’ according to ZEW classification (Grupp et al., 2000). My colleagues and I conducted structured face-to-face interviews with either the solo entrepreneur or with the lead entrepreneur of team start-ups, resulting in a response rate of 24.5% (n=639). Given the focus of this chapter on team start-ups, solo-started ventures were dropped from the analysis. Based on work from the field of ecology and product diversity (Hill, 1973), I then develop four new measures of heterogeneity to separately model both functional heterogeneity dimensions using information on the prior functional background of the new venture team members.

Results, Implications, and Contribution

Employing a principal component analysis on the four new measures, I indeed find support for the contention that functional heterogeneity can be separated into two dimensions. Knowledge scope captures in general the breadth of the team’s knowledge base, whereas knowledge disparity captures divergences in the knowledge base of the different team members.

The main result deals with the differential impact of *knowledge scope* and *knowledge disparity* on new venture performance. Looking first at the entrepreneurial performance, I find that higher levels of *knowledge disparity* significantly reduced the survival chances of the newly founded business. However, *knowledge scope* had no impact on surviving. I interpret this result to mean that the new venture team especially needs cohesion, trust and a shared language to accomplish a basic and short-term goal like survival. To accomplish subsequent venture growth the advantages of low *knowledge disparity* levels diminish. Regressions on the number of employees in the third business year as dependent variable clearly show that knowledge disparity does not affect this performance indicator. The same analysis, however, reveals that *knowledge scope* has a strong and positive impact on the number of employees. Taken together, the respective hypotheses (H1a and H1b) were partially supported.

Concerning team start-ups’ innovative performance, the results are in line with previous findings indicating a direct impact of functional heterogeneity (e.g., Bantel & Jackson, 1989; Hambrick et al., 1996). More precisely, I find evidence for the postulated inverse U-shaped relationship between *knowledge scope* and the number of patents applied for in the first four business years (H2a). As hypothesised, entrepreneurial teams’ innovative success is highest at a moderate level of *knowledge scope*. Furthermore, high values of *knowledge disparity* relate to lower levels of innovative team performance (H2b).

Taken together, the results suggest that the impact of heterogeneity is task dependent. The two heterogeneity dimensions *knowledge scope* and *knowledge disparity* differ in their impact on the three indicators *survival status*, *number of employees*, and *number of patent applications*. This result complements the findings of Hambrick et al. (1996), Pelled et al. (1999), and Bowers et al. (2000), who were among to first to find the impact of team heterogeneity might differ according to the task. I believe that Chapter 4 will make three important contributions to entrepreneurship research. First, it links the concept of entrepreneurial teams to venture performance. Second, in this way, the research contributes to the development of less individualistic-orientated theories of the entrepreneurial process. Therefore and third, I develop new promising measurement tools of heterogeneity.

1.3.5 The Use and Effect of Social Capital in New Venture Creation – Solo Entrepreneurs vs. New Venture Teams

Chapter 5 returns the attention to the concept of social capital. While Chapter 2 was devoted to the regional dimension of social capital as well as the impact of social capital on the decision to engage in concrete venture creation activities, Chapter 5 sheds light on the use of social capital during the nascent phase and its subsequent impact on new venture success in the post-nascent phase.[7]

Chapter 5 closes the circle of the previous three main chapters in two ways. First, whereas in the previous chapters either the solo entrepreneur or the new venture team were at the centre of attention, I investigate in this chapter possible differences between both start-up modes. Second, I also consider human capital in this chapter. As discussed in more detail below, the performance impact of social capital is partly contingent on the variety of human capital.

Introduction

Chapter 5 investigates the actual use of social capital (as indicated by receiving advice or support from a third party) by solo entrepreneurs and entrepreneurial teams in the nascent phase. A review of the literature revealed that teams are regarded as having more social capital than solo entrepreneurs. This argument has been sometimes explicitly (Davidsson & Honig, 2003) but more often implicitly (e.g. Colombo & Grilli, 2005; van Gelderen et al., 2005) made in a considerable number of studies, suggesting that belonging to a start-up team is an

[7] Chapter 5 is based on a working paper written in conjunction with Uwe Cantner.

indicator for social capital. However, I argue that there are two mechanisms by which the decision to launch a start-up in a team format as opposed to a solo format influences the actual use of social capital. On the one hand, a team has more contacts to exploit, which increases the probability of actually using social capital. On the other hand, in a team, the members combine often different skills and abilities, enabling them to complete more venture creation activities in-house. The actual use of social capital in the nascent phase may thus actually decrease.

The second part of Chapter 5 deals with the impact of social capital use in the nascent phase on subsequent new venture performance, measured by the number of employees in the third business year. First, I investigate the direct impact of social capital use on performance. Second, I examine the moderating role of human capital variety on the link between social capital use and performance. It is argued that entrepreneurs with a pronounced human capital variety have a higher level of "absorptive capacity" to tap a broad array of relevant information (Cohen & Levinthal, 1990). Following Hayton and Zahra (2005), I propose that entrepreneurs with more human capital variety should be more able to rate new information on their usefulness, and incorporate this new information more easily into their existing knowledge stock, ultimately leading to superior new venture performance.

Main Hypotheses

Regarding the use of social capital, I hypothesise that solo entrepreneurs and entrepreneurial teams differ in the degree of actually using social capital in the nascent phase (H1). Concerning the direct link between social capital and subsequent new venture performance, I hypothesise that overall social capital (H2), weak tie use (H3) as well as strong tie use (H4) is positively related to new venture performance. With respect to the indirect link between social capital and performance, I further hypothesise that the relationship between overall social capital (H5) as well as weak ties use (H6) in the nascent phase is stronger for solo entrepreneurs and entrepreneurial teams with a higher level of human capital variety.

Data and Methodology

The econometric analysis in Chapter 5 is based on the same dataset as in Chapter 4 with the distinction that I also use data of the solo-started ventures. Recall that the dataset analysed represents a random sample of start-ups in innovative industries comprising 'advanced technology' and 'technology-oriented services' according to the ZEW classification (Grupp et al., 2000).

To measure social capital use, I apply a new method – the resource generator (van der Gaag & Snijders, 2004). Thereby, I distinguish between different types of social capital, such as "weak ties" (assistance from the circle of the entrepreneur's acquaintances), "strong ties" (assistance from the circle of closest friends and family members), and overall social capital use.

Results, Implications and Contribution

Contrary to Hypothesis 1, the results suggest that entrepreneurial teams and solo entrepreneurs do not differ significantly in their degree of use of social capital. However, there are pronounced differences in how they employ social capital in the venture creation process. In particular, I find a substitutive relationship between overall social capital use and human capital in solo start-ups, while no such clear relationship was found for team start-ups. I also find that, for these firms, team size increases the probability of social capital use, whereas the human capital variety of the team decreases the probability of using social capital.

Differences also exist in the effect of social capital use on venture performance. For solo start-ups as hypothesised (H3), weak tie use is a strong predictor of employment. However, the use of strong ties and overall social capital use had no effect on employment (H2 and H4). No moderating effect of human capital variety on the link between social capital use and performance was found (H5 and H6).

For team start-ups, I determine no direct effect of social capital use (H1-H3). Further tests indicate that, for teams, human capital variety positively moderates the effect of social capital use (H5 and H6) on new venture performance. Teams with a pronounced variety in their knowledge base profited from the use of social capital. One plausible interpretation of this result is that teams with a diverse knowledge base have advantages in comparison to less well-equipped teams. They can better evaluate information from outside concerning their usefulness and integrate this information into their knowledge base, thereby facilitating the entrepreneurial learning process.

The results of this analysis further suggest that solo start-ups and team start-ups differ beyond the pure number of entrepreneurs. Although the difference in the results of the interaction term between human capital and social capital variables is only indirect evidence, I argue that one of the key characteristics which differentiate solo entrepreneurs from entrepreneurial teams is the learning process (Politis, 2005). This process seems to be more complex for teams, emphasising the role of collective work and information sharing in the learning process.

2. Investigating the Black Box between Regions and Individual Entrepreneurship

2.1 Introduction

It is widely acknowledged that entrepreneurship is a key driver for economic development. For example, entrepreneurship is regarded as an important mechanism for the diffusion and exploitation of knowledge (e.g. Acs & Plummer, 2005). Other scholars highlight the importance of entrepreneurship for economic growth. It is argued that new ventures – which are often used as indicators for entrepreneurial activity – challenge incumbents, thereby amplifying structural change and securing market efficiency. In this indirect way entrepreneurship leads to an improved overall competitiveness of the economy and subsequent growth (Andersson & Noseleit, in press, Audretsch & Keilbach, 2004b, Fritsch & Mueller, 2004).

Within the scientific community different views exist regarding what constitutes entrepreneurship (e.g. Gartner, 1990). It involves the creation and introduction of new combinations into the market (Schumpeter, 1934) and the identification and exploitation of profitable opportunities (Kirzner, 1973). More recent approaches focus on entrepreneurship, as or the creation, of economic value (Davidsson et al. 2001, Shane & Venkataraman, 2000) In this chapter I, however, follow Gartner (1988) in his view of entrepreneurship as the creation of new ventures.

One young but emerging stream in the literature on entrepreneurship deals with the regional dimension of entrepreneurship. As is true for human behaviour and development in general (Bronfenbrenner, 1979), individuals' entrepreneurial behaviour is embedded in the wider social and spatial sphere. Likewise, entrepreneurship is often referred to be as a "regional event" (Feldman, 2001) and there is empirical evidence suggesting that regional characteristics are important determinants of the entrepreneurial activity (e.g. Armington & Acs, 2002; Reynolds, 2007a; Fritsch & Falck, 2007; Wagner & Sternberg, 2004). For example, studying demand side effects, past research revealed a link between income level in the region (Reynolds et al., 1995) and regional population growth (Acs & Armington, 2004) on the one hand and regional start-up rates on the other. Such a link was also found for supply side effects, for example for the effects of innovativeness of the region (Fritsch & Falck, 2007) and of human capital (Sorenson & Audia, 2000). Despite the growing attention on regional effects in entrepreneurial research, there is no consensus *which* regional characteristics are particularly important for

entrepreneurial activity (for a recent review see Sternberg, 2009). One possible explanation for this insufficient result is that regional determinants of entrepreneurial activity are to be seen as regionally specific (Sternberg & Wagner, 2005). In its extreme this argument devaluates cross-regional comparisons and puts the specific region of interest in the centre of the analysis. Another possible explanation is associated with the appropriate level of analysis. We might gain a better understanding about possible mechanisms of how regional characteristics impact entrepreneurial behaviour by combining aggregated data at the regional level with individual level data. There is a small, but growing, number of studies employing this approach with results (e.g. Bergmann & Sternberg, 2007; Mueller, 2006b; Sternberg & Wagner, 2005; Tamásy, 2006) pointing to the relevance of regional factors in explaining individuals' entrepreneurial engagement.

An often stated research need in understanding the effect of the region is the investigation of the *pathways* through which the region actually affects individual entrepreneurship. Even regional characteristics shown to be of particular importance should not be causal as such, but should operate via more proximal predictors that are most likely located on the personal level (e.g. Sternberg, 2009). As past analyses, however, usually investigated correlations between regional characteristics and regional start-up rates, our knowledge of pathways between the region and entrepreneurial behaviour is very limited. One notable exception from this research frame is the study by Tamásy (2006), who takes a first look into this "black box". Analysing GEM data from ten different German regions she concludes that "the geographical environment influences start-up activity mainly indirectly via entrepreneurial attitudes, while the direct impact is less important" (p.374). What is still missing, however, is (theory-driven) empirical evidence of 1) which regional characteristics via 2) which pathways indirectly impact individual entrepreneurial behaviour. Answering these questions would not only enrich our understanding *how* the region operates but also provide knowledge for policy interventions.

In view of these research gaps, this chapter seeks to investigate the link between the objective regional opportunity structure (captured by regional data) and individuals' engagement in different stages in the venture creation process (intention to start a business and engagement in nascent entrepreneurship). I further investigate pathways through which a favourable regional environment could affect individual new venture creation activity. As possible pathways I suggest different factors at the individual level, namely the individual perception of the regional opportunity structure as well as individuals' social capital. For my empirical analyses I combine regional-level data (drawn from different sources, e.g. German Social

Insurance Statistics) and individual-level data (drawn from the German data of the Global Entrepreneurship Monitor (GEM)).

The remainder of this chapter is organised as follows. In the next section, the conceptual model of the effect of regional characteristics on individual entrepreneurship and related hypotheses is set out. Section 2.3 is dedicated to the presentation of the data and the variables used. The results of my empirical analysis are presented in Section 2.4. Section 2.5 discusses the findings, while Section 2.6 concludes.

2.2 Model

My theoretical model, depicted in Figure 2-1, brings together arguments from region-focused (e.g., Sternberg, 2009) and individual-focused (e.g., Davidsson & Honig, 2003) entrepreneurship research. It comprises a set of five hypotheses that together deal with the pathways through which the region characteristics are thought to impact individual new venture creation. At the heart of my approach is the contention that the objective opportunity structure in the region, measured by regional-level variables on the socio-economic environment becomes effective by truly individual determinants such as a person's perception of founding opportunities and social capital. In a nutshell, I argue that a favourable regional opportunity structure stimulates a person's engagement in new venture creation because it affects the person's social capital and opportunity recognition which, in turn, are among the more direct causes of his or her entrepreneurial behaviour. Whereas such path models have been studied with increasing attention in individual-focused entrepreneurship research, particularly in studies investigating the mechanism behind the personality-entrepreneurship nexus (Baum & Locke, 2004; Obschonka, Silbereisen, & Schmitt-Rodermund, 2010, in press), research on regional dimensions of entrepreneurship have rarely applied this method. In the following I present the set of hypotheses in detail.

My analytical starting point is the well-documented fact that large and persistent differences in start-up rates exist between regions (for an overview see Sternberg, 2009). Scholars in entrepreneurship, regional economics and economic geography often attribute these differences to variations in regional characteristics such as cultural attitudes towards entrepreneurship (e.g. Davidsson & Wiklund, 1997; Mueller, 2006b; Fritsch & Mueller, 2007), business founding opportunities (e.g. Boschma & Fritsch, 2009; Florida, 2004) and the economic context (e.g. Bosma et al., 2008; Fritsch & Falck, 2007, Sorenson & Stuart, 2001).

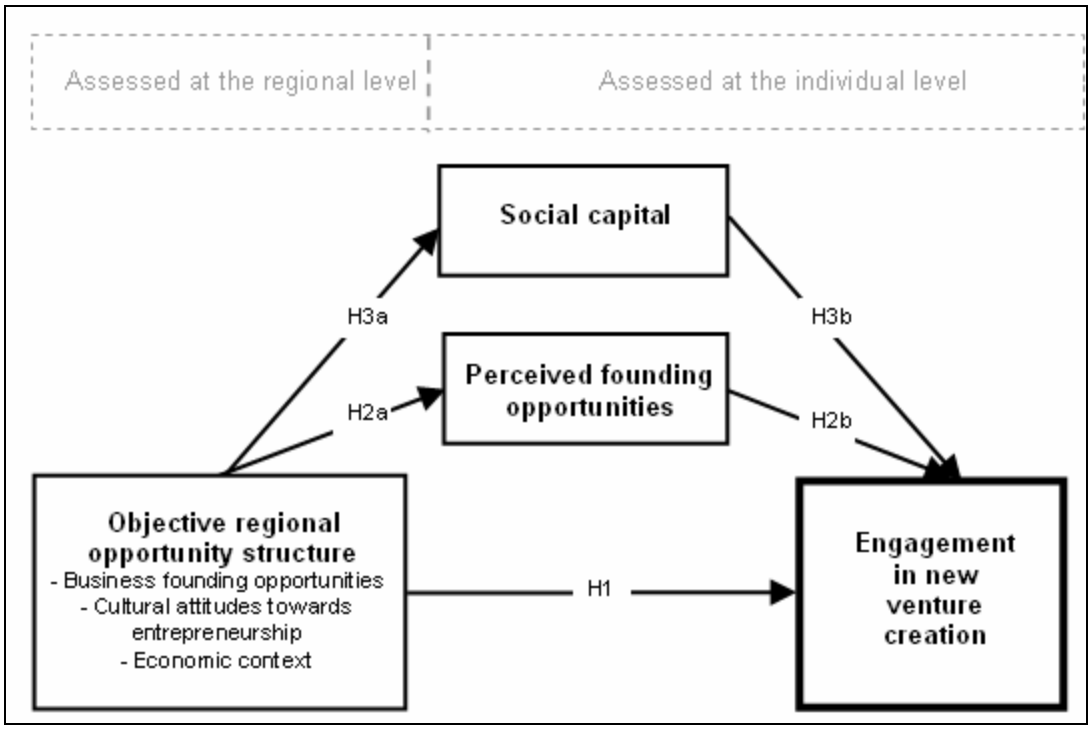

Figure 2-1: Hypothesised Path Model

I collectively define this set of regional conditions as the "objective regional opportunity structure". This definition is reminiscent of other regional entrepreneurship models: most prominently Audretsch's and Keilbach's (2004a) "Entrepreneurship capital". Here, entrepreneurship capital is defined as a regional milieu of agents and institutions that is conducive for new venture creation. Accordingly, entrepreneurship capital has a substantial overlap with my concept of the "general regional opportunity structure"; in particular it is closely related to the domain of cultural attitudes towards entrepreneurship. However, my approach extends this line of thinking by including also business founding opportunities and the economic framework. This allows a more comprehensive view into the black box between regional conditions and individual new venture creation engagement, instead of investigating specific regional characteristics in isolation.

Referring to prior research, my basic contention is that a favourable objective regional opportunity structure stimulates new venture creation. There are several lines of reasoning. First, it has been argued that better access to infrastructure, a skilled labour pool (Krugman, 1991), financial capital (Sorenson & Stuart, 2001) as well as access to customers (Bosma et al., 2008) enhance entrepreneurial activity – an argument often related to agglomeration effects. Second, there is evidence for persistence in regional start-up rates (e.g. Fritsch & Mueller, 2007) suggesting that regional entrepreneurial activity in itself is path dependent (Andersson & Koster, 2010). For example, Mueller (2006b) reports that individuals have stronger

entrepreneurial aspirations within regions with a pronounced entrepreneurial environment (as indicated by higher start-up rates and the presence of small and young companies). Third, in an emerging stream of literature, scholars argue that new venture creation is facilitated by the presence of the "creative class" in the region (Florida, 2004). According to Florida, members of the creative class are engaged in creative and innovative tasks in their job. Therefore they are regarded as being key drivers for regional development by creating knowledge and exploiting these innovative opportunities by founding new businesses. Empirical analyses indeed report a positive correlation between the proportion of creative people in a region and entrepreneurial activity (even controlled for agglomeration effects) in the United States, Germany and other European countries (Boschma & Fritsch, 2009; Fritsch & Stuetzer, 2009; Lee et al., 2004). Taking the aforementioned arguments together, I argue that a favourable opportunity structure (measured at the regional level) has a positive impact on entrepreneurial activity (measured at the individual level). This should apply even when controlling for other structural factors of the region (e.g. unemployment rate or population seize) as well as for respondents' socio-demographic and human capital characteristics.

H1: A favourable objective opportunity structure in the region is associated with a higher likelihood of individuals to engage in new venture creation.

Recent studies point to the relevance of indirect effects of regional characteristics on entrepreneurial behaviour (e.g. Andersson & Koster, 2010; Bosma & Schutjens, 2010). Following this stream of research, I develop four hypotheses on indirect effects of the region. I expect that each of these hypotheses should hold, even when controlling for structural factors of the region and for respondents' socio-demographics and human capital.

The first two hypotheses on indirect effects deal with the perception of regional characteristics by the potential founders (e.g. Sternberg & Rocha, 2007; Bosma & Schutjens, 2010). I deem in particular the *perception of founding opportunities* as one important intervening variable which represents a pathway in the region-entrepreneurial behaviour link. In my understanding, the term founding opportunities comprises more than the concrete business opportunity. It also includes the individual perception of the other two domains of the general opportunity structure above described: cultural attitudes towards entrepreneurship and the economic context. In general, studies have found strong correlations between perceptual variables and entrepreneurial activity (e.g. Grilo & Irigoyen,

2006; Arenius & Minniti, 2005). This notion is also underlined by psychological research indicating that one important channel through which the environment affects human cognitions and behaviour is the subjective perception of this environment (Lazarus & Folkman, 1984; Pinquart & Silbereisen, 2004). However, at this point I should also note that I do not study inter-individual differences in the perceptions of the same objective regional characteristics (why do some individuals indeed perceive a stimulating environment to be positive, whereas others do not), but this goes clearly beyond the scope as this paper and the data on which this paper is based on does not include such psychological data. I instead argue (in a more general way) that favourable regions, in principal, stimulate the perception of opportunities.

I argue that a stimulating region (as indicated by objective regional characteristics) "naturally" provides opportunities for individuals to engage in entrepreneurship (Shane et al., 2003) – or at least provides the breeding ground as well as means for the "creation of the opportunity as part of the implementation of the entrepreneurial process" (Sarasvathy, 2001, p. 249). More precisely, first, an objective regional opportunity structure leads to the perception of founding opportunities simply because there are more business opportunities available. Second, there are indications that cultural attitude towards entrepreneurship stimulates the perception of founding opportunities. This view is based on Etzioni's (1987) "legitimation" approach. He argues that higher societal legitimation of entrepreneurship (e.g. the relevance of entrepreneurship as a career option in the education system, tax incentives for start-ups) positively affects individual attitudes towards entrepreneurship. Empirical support for this line of reasoning is presented by Jackson and Rodkey (1994), who find a negative correlation of the local presence of large employers on individual entrepreneurial attitudes. Individuals lacking entrepreneurial attitudes will be arguably less likely to perceive or search for founding opportunities, because it is not part of their individual mind-set. Third, the economic framework might also impact the perception of founding opportunities. Microeconomic models on vocational choice claim that people become entrepreneurs when they expect to earn more than in paid employment (e.g. Lazear, 2005). Accordingly, higher or growing regional purchasing power should make entrepreneurial activity more lucrative, ultimately fostering the individual perception of founding opportunities (e.g. Bosma & Schutjens, 2010; Bergmann, 2005).

Taking these arguments together, I expect a favourable regional opportunity structure (measured at the regional level) to have a positive effect on the individual perception of founding opportunities. Thus, I hypothesize:

H2a: A favourable objective opportunity structure in the region is associated with higher levels of individual's perceived founding opportunities.

In the next step I relate the perception of founding opportunities with individual engagement in new venture creation activity. As a person's entrepreneurial activity can be seen to be the extension of perceived opportunities (Shane & Venkataraman, 2000), I assume that individuals who perceive more opportunities within the region than others should be, at least to a certain degree, more likely to engage in entrepreneurial activity. This assumption refers to the motivational aspect of perceived opportunities for entrepreneurial behaviour as, for example, described by Shane et al. (2003). Past research indeed showed that the perception of opportunities triggers the engagement in nascent entrepreneurship (e.g. Arenius & Minniti, 2005; Tamásy, 2006).

H2b: A higher level of an individual's perception of founding opportunities within the region is associated with a higher likelihood of an individual to engage in new venture creation.

Besides the perception of opportunities within the region, I also deem *individual social capital* to be another relevant path in the region-entrepreneurial behaviour link. According to the human ecology theory (Bronfenbrenner, 1979), the wider social context in which human behaviour and development is embedded (e.g., the cultural context) affects the individual via more narrow contexts (e.g., social relationships and interactions). In adapting this view to the field of entrepreneurship, I argue that regional characteristics are consequential for a person's social networks, which, in turn, affect their entrepreneurial behaviour. This leads me to the concept of social capital, which has received growing attention in past research on nascent entrepreneurship (Davdisson & Honig, 2003).

Social capital, originally developed in sociology, deals in general with the embeddedness of individuals in social relations and the possibly related benefits and drawbacks (Bourdieu, 1983; Coleman, 1988; Granovetter, 1973). While there are various definitions of social capital in the literature (for an overview see Adler and Kwon, 2002), I follow the integrative approach of Nahapiet and Goshal (1998). They define social capital at the individual level "as the sum of the actual and potential resources embedded within, available through and derived from the network of relationships possessed by an individual or a social unit" (Nahapiet &

Goshal, 1998, p.243). Social capital is multidimensional, encompassing a structural, a relational and a cognitive dimension (Nahapiet & Goshal, 1998). While the structural dimension is concerned about the properties of the social network such as the density and the connectivity among actors (Burt, 1992), the relational aspect of social capital refers to the quality and kind of interpersonal relationships (Granovetter, 1992). The cognitive dimension of social capital captures the representations and systems of meaning that individuals share with one another. Other classifications in social capital literature distinguish between bridging and bonding social capital (Putnam, 2000) or weak and strong ties (Granovetter, 1973). Because of its multidimensionality social capital is often viewed as a fuzzy concept defying precise quantification and measurement. It is beyond the scope of this chapter to fully review the numerous measurement approaches, but in general researchers agree that at the individual level and regarding entrepreneurship social capital can be studied best by investigating social network characteristics (e.g. Lin, 2001; Hoang & Antocic, 2003; Kim & Aldrich, 2005).

Besides the rich literature on the effects of social capital mainly following the seminal work of Putnam et al. (1993), there is also some evidence on factors facilitating individuals' social capital formation (e.g. Glaeser et al., 2002). A person's social capital is not an "inherent" disposition but prone to change by external and internal circumstances. For example, becoming a member of a business circle may broaden one's social capital stock within a relatively short time. In the following, I argue that also regional characteristics might play a role in social capital formation as they may influence the accumulation process of social capital investments leading to variance in the social capital stock or network characteristics.

On one side, there is indication to assume that a stimulating region provides the individual with means and opportunities relevant for social capital accumulation. For example, a region with a good communication and transport infrastructure offers the opportunity for making contact to a variety of people, which supports the formation of social networks rich in structural holes (Burt, 1992). In contrast, a remote region might facilitate closure in social networks (Coleman, 1990) as the opportunity of making contact to others decreases. Empirical evidence also suggests that community size affects network closure (Allcott et al., 2007) and the social capital stock (Putnam, 2000). Literature on cluster formation and cluster success provides further insights into how the objective regional opportunity structure affects social capital and social networks. Investigating the rise of the Silicon Valley cluster, Saxenian (1994) pointed to the relevance of a variety of regional institutions such as trade associations and specialised consulting and

venture-capital firms in establishing network contacts for individuals and firms. She describes a decentralised and fluid environment which supports the formation and maintenance of relationships, the exchange of information and the establishing of business contacts. In contrast to the flourishing Silicon Valley cluster, the case of Cambridge provides a negative example of the impact of regional characteristics on social networks. Garnsey & Hefferman (2005) point to the detrimental effects of the concentration of competence in vertically integrated companies in Cambridge's instrumentation and electronics sector where network closure took place. With the decline of these sectors in the 1980s their social networks depreciated. Finally, Florida (2004) in his creative class theory points attention towards the stimulating impact of regional characteristics such as a climate of tolerance and diversity of people's backgrounds, origins and lifestyles. Such an environment provides the opportunity for individuals to easily form "looser networks with weaker ties" (Florida, 2004, p.273)[8], as informal obstacles for interacting with other people are rather weak.

On the other hand, there is also an indication that regions with a favourable opportunity structure may also, at least to a certain degree, alter individuals' social behaviour and attitudes (e.g. Bosma & Schutjens, 2010). This view is in line with related research in psychology and sociology showing that one's work environment alters one's behaviour in both work- and non-work life domains, and also one's attitudes (Kohn & Schooler, 1982). For example, regions with a favourable opportunity structure, in contrast to less favourable regions, usually offer more high-quality jobs, which, in today's post-industrialised, knowledge-based society, often require proactive social behaviour and networking (Audretsch, 2007). The ability to interact with others is seen as a key competence in such high-quality jobs and workers are often expected to be open, interactive, and social in order to succeed in these jobs (Nedelkoska, 2010). In other words, individuals have to adapt to these work-related requirements. In sum, one may thus argue that regions with a favourable regional opportunity structure alter individuals' social behaviour towards being more open and active in social life (in work and outside of work), which, in turn, may contribute to an increase in an individual's social capital stock.

Taking together the arguments on the connection between the region and individuals' social capital presented above it seems feasible to assume that a

[8] An environment which values ethnical and cultural diversity arguably does not facilitate the creation of social capital in Putnam's (2000) and Coleman's (1990) view of networks with closure. Empirical evidence points to a negative impact of ethnic heterogeneity on trust and civic norms (Knack & Keefer, 1997).

favourable opportunity structure (measured at the regional level) has a positive effect on the formation of individual social capital. Thus, I hypothesise:

H3a: A favourable objective regional opportunity structure is associated with higher levels of individual's social capital.

Recall that I define social capital as the sum of actual and potential resources in networks of relationships (Nahapiet & Goshal, 1998). Social capital is regarded to be conducive for new venture creation as it helps individuals to overcome the substantial resource constraints they face in the venture creation process. For example, analysing cases in the computer training and air pollution consulting industry, Baker et al. (2003) find strong evidence that founders extensively used their pre-existing networks to assess resources in the venture creation process. Furthermore, scholars highlight the importance of social capital in providing access to novel information and trusted feedback to individuals concerning business strategies (Uzzi, 1997), in product development (Lechner & Dowling, 2003) and coming into contact with potential investors (Shane & Cable, 2002). By means of trusted feedback and providing access to novel information, social capital might also facilitate the discovery and refinement of profitable business opportunities (Elfring & Hulsink, 2003; Arenius & DeClerck, 2005; Davidsson and Honig, 2003). In addition, social capital may also have a "demonstration" effect on the individual due to the provision of role models. Contacts with such role models may enhance specific learning processes that in turn influence vocational choice-making (Delmar & Gunnarsson, 2000; Lent et al., 1994). Taken together, I argue that individual social capital should be beneficial for new venture creation by providing role models, by assisting in the development of the business idea and by overcoming resource constraints which might otherwise hamper the new venture creation process. Hence, I expect:

H3b: A higher level of an individual's social capital is associated with a higher likelihood of an individual to engage in new venture creation.

2.3 Dataset and Methods

In order to test the hypotheses I consider different levels of analysis at the same time, which is the recommended strategy for studying entrepreneurship (Davidsson & Wiklund, 2001; Low & MacMillan, 1988). More specifically, my empirical analysis combines regional-level data with individual-level data, thereby

drawing from different data sources. I should note at this point that I use cross-sectional data to test the model. Arguably, relying on longitudinal data would be the ultimate method to investigate causal mechanisms. However, datasets featuring both a large number of observations per region and a longitudinal design to study entrepreneurial behaviour were not available to me (to my knowledge they do not even exist). Nevertheless, I contribute to the long-neglected research field on pathways through which the region may affect individual entrepreneurial behaviour by drawing from representative cross-sectional data. This also means that my results must be interpreted as correlative rather than strictly causal in nature.

2.3.1 Individual-level Data

Dataset and Main Dependent Variables

At the individual level I use data from the adult population surveys of the Global Entrepreneurship Monitor (GEM) project in western Germany covering seven years (2002–2006; 2008–2009)[9]. I focus on the western part of Germany, because even 20 years after German reunification considerable differences regarding entrepreneurship exist between the former separated parts of Germany (Fritsch, 2004) which can skew important results. A detailed description of the GEM methodology and data can be found in Reynolds et al. (2005). As Table 2-1 shows, the number of people randomly interviewed exceeds considerably the minimum level of 2,000 in every year. So, for Germany, GEM data, though originally designed to study country differences, also provides the opportunity for inter-regional (sub-national level) analyses as demonstrated by other studies (e.g. Bergmann & Sternberg, 2007).

Table 2-1: Overview of the Number of Interviews of the GEM (West Germany)

Year	Total interviews used in West Germany	Nascent entrepreneurs
2002	8,662	315
2003	4,396	179
2004	4,386	185
2005	5,233	209
2006	3,272	109
2008	3,856	114
2009	4,762	128
Total	**34,549**	**1,239**

I am interested in the new venture creation activity of the participating individuals. Thus and following GEM concepts, I use individuals' engagement in

[9] In 2007 Germany did not conduct a GEM adult population survey.

nascent entrepreneurship as an indicator for individuals' venture creation activity. Corresponding to standard GEM definition, nascent entrepreneurs are individuals who 1) have taken some action in the past year to create a venture, 2) expect to own at least a share of the new firm, and 3) have not paid salaries and wages for more than three months (Reynolds et al., 2005).

Individual-level Predictors and Individual-level Controls

Table 2-2 provides a detailed overview of all individual-level variables. In the conceptual model I regard individual social capital and individual perceived founding opportunities within the region as important predictors of an individual's engagement in new venture creation activity. The measurement of social capital is an art in itself where different approaches are debated controversially in the scientific community (e.g. Glaeser et al., 2000; van der Gaag & Snijders, 2005). At the individual level, social capital is often assessed with various characteristics of the ego-centred network of the individual. Unfortunately, the GEM dataset does not contain such detailed information on individual social networks. Instead, I rely on the quite simple social capital indicator of whether or not the participants personally knew other entrepreneurs (*knowing entrepreneurs*). Similar measures of connectedness to networks of entrepreneurs are often used in empirical studies with reasonable results (e.g. Davidsson & Honig, 2003; Parker & Belghitar, 2006). Thus, I am confident that this indicator captures important aspects of social capital.

An individual's perception of founding opportunities is measured with a tailor-made GEM question of whether or not the participant *perceived* good *founding opportunities* in the area where they live.

The rich dataset offers the opportunity to control for an array of other factors explaining individuals' engagement in new venture creation. Individuals' human capital is arguably one of the most researched factors. Note that I did not use human capital as a pathway between regional characteristics and individual behaviour, because the GEM dataset lacks detailed information on individual entrepreneurial ability. However, I use human capital variables as controls in the models. Following prior research on new venture creation I, thus, use *years of schooling* and *entrepreneurial experience* (e.g. Davidsson & Honig, 2003) as well as *perceived entrepreneurial skills* as indicators for human capital (e.g. Arenius & Minniti, 2005).

Also following past research I additionally control for the effect of *gender*, *age*, *fear of failure* and *household income* (e.g. Arenius & Minniti, 2005; Davidsson & Honig, 2003; Tamásy, 2006).

Table 2-2: Individual-level Variables – GEM Waves 2002–2006; 2008–2009 for West Germany

Variable	Definition	Mean	Overall/ between variation
Dependent variable			
Nascent entrepreneur	Dummy: 1=The participant is currently involved in setting up a business; 0=otherwise.	0.04	0.19 / 0.03
Level 1 predictors			
Perceived founding opportunities	Dummy: 1=The participants saw good opportunities to start-up in the next sixth months in the area they live; 0=otherwise.	0.24	0.43 / 0.10
Knowing other entrepreneurs	Dummy: 1=The participants personally knew someone who had started a business within the last two years; 0=otherwise.	0.41	0.49 / 0.09
Level 1 controls			
Perceived entrepreneurial skills	Dummy: 1=Participants believed to have the knowledge, skills and experience required to start a new business.	0.46	0.50 / 0.08
Entrepreneurial experience	Dummy: 1=Participant is currently self-employed; 0=otherwise.	0.12	0.33 / 0.04
Years of schooling	The measure of educational attainment is based on the harmonised categorical classification of participants' educational degree and vocational attainment. I recoded this information into years of schooling to obtain a more continuous indicator for human capital. The categories of educational attainment and the respective years of schooling are: 1=no school leaving certificate (7 years); 2=primary or secondary school without vocational training (8 years); 3=primary or secondary school with vocational training (10 years); secondary school without general qualification (11 years); secondary school with general qualification (13 years); post secondary degree (18 years).	12.31	3.10 / 1.75
Age	Age of respondents in years.	42.44	12.7 / 1.75
Gender	Dummy: 1=female; 0=male.	0.54	0.50 / 0.06
Fear of failure	Dummy: 1=Participants stated the fear of failure would prevent them from starting-up.	0.42	0.49 / 0.08
Household income	Categorical variable: 1= less than 500 euros; 2= 500 to less than 1,000 euros; 3= 1,000 euros to less than 1,500 euros; 4= 1,500 euros to less than 2,000 euros; 5= 1,000 euros to less than 2,500 euros; 6= 2,500 euros to less than 3,000 euros; 7= 3,000 euros to less than 3,500 euros; 8= 3,500 euros to less than 4,000 euros; 9= 4,000 euros or more.	5.59	2.22 / 0.40

2.3.2 Regional-level Data

Dataset

The individual-level data are linked with archival regional-level data characterising the socio-economic environment of the respondents. Regional-level data (Table 2-3 provides detailed description and descriptive statistics) are drawn from various sources and are at the district level (NUTS3; *Kreise*). The most important source is the German Social Insurance Statistics as described in Fritsch

and Brixy (2004) covering all employers and employees who are subject to obligatory social insurance. Other sources of regional-level data are the Federal Statistical Office, the Regional Accounts of the German states and the Federal Office for Building and Regional Planning. The choice of the district as the level of analysis needs some discussion. Arguably, NUTS3 regions are not functional units and the relevant regional dimension for many entrepreneurs is of a smaller size, such as municipalities. Using a more fine-grained spatial dimension in the analysis would thus probably yield more precise results. However, data for many regional characteristics are only available at the district level, forcing me to use this more rough-grained spatial dimension in the analysis.

Table 2-3: Regional-level Variables – Various Sources, 2002–2006; 2008–2009 for West German NUTS3 Regions

Variable	Definition	Mean	Overall / between / within variation
Level 2 predictors			
Share of creative class	Share of employees in super-creative occupations in percent. I adopt an updated version of Florida's (2004) original list of creative occupations. Fritsch & Rusakova (2010) provide a list of the respective occupations. Source: Social Insurance Statistics.	4.13	1.96 / 1.95 / 0.22
Start-up rate	Number of start-ups per 1,000 employees. Source: Social Insurance Statistics.	8.36	2.30 / 2.21 / 0.63
GDP	GDP per capita in euros. Source: Federal Statistical Office.	26,389	10,127 / 10,079 / 1,109
GDP growth	Average 5-year growth of the GDP per capita (in percent). Source: Federal Statistical Office.	7.39	4.66 / 3.47 / 3.12
Level 2 controls			
Unemployment rate	Unemployment rate in percent. Source: Federal Statistical Office.	7.74	2.91 / 2.65 / 1.22
Change of unemployment	Percentage change in unemployment. Source: Federal Statistical Office.	1.69	14.38 / 2.53 / 14.15
Population size	Number of inhabitants. Source: Federal Statistical Office.	201,162	172,900 / 173,101 / 3,012
Population density	Number of inhabitants per square metre.	568.43	690.51 / 691.32 / 11.30
Settlement structure	Classification of German planning regions according to core cities and their population density. Categorical variable: 1=agglomeration areas; 2=urban areas; 3=rural areas. Source and further detailed information: Federal Office for Building and Regional Planning.	1.84	0.74 / 0.74 / 0

Regional-level Predictors and Regional-level Controls

As discussed in Section 2-2, I regard the set of cultural attitudes towards entrepreneurship, the presence of business founding opportunities and the economic framework as the 'objective regional opportunity structure' individuals are facing. According to this definition, the objective regional opportunity structure is

multifaceted and many of its elements are hard to quantify. In many cases, as stated below, I thus do not directly measure the objective regional opportunity structure, but instead rely on indicators reflecting these regional conditions. While I hope future research will provide more precise quantification of the regional opportunity structure, I am confident that the indicators used in the present study capture this phenomenon to a large degree.

First, I use the *share of the creative class* among the regional workforce as an indicator for the presence of business founding opportunities and cultural attitudes towards entrepreneurship. It is argued that members of the creative class are important actors in the knowledge creation process and thus help to create opportunities which can be exploited by entrepreneurial activities (e.g. Florida, 2004; Boschma & Fritsch, 2009). Furthermore, recent research has shown that creative people prefer places that are characterised by a climate of tolerance and diversity (e.g. Fritsch & Stuetzer, 2009; Boschma & Fritsch, 2009).[10] These attitudes are arguably also conducive for new venture creation, since entrepreneurship often involves the introduction of new means-ends relationships as well as the displacement of existing ones. Thus, I expect a strong or weak regional attitude towards entrepreneurship to be reflected by a higher or lower proportion of the creative class in the region, respectively.

As a second indicator for cultural attitudes towards entrepreneurship and the presence of founding opportunities I use the regional *start-up rate*.[11] All things being equal, I expect start-up rates to be ceteris paribus higher in regions with more pronounced entrepreneurial attitudes and profitable business opportunities, but lower in those regions lacking these attributes. In this sense, I regard start-up rates as a direct manifestation of these two categories of the objective regional opportunity structure.[12] In a related approach, Audretsch and Keilbach (2004a) use a

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[10] As members of the creative class are attracted to open and diverse places, one might argue that it is better to use a direct indicator for the quality of places such as the regional proportion of bohemians and the regional proportion of foreign-born people (Boschma & Fritsch, 2009). However, especially the proportion of bohemians is highly correlated (Spearman's rank correlation coefficient > 0.8) with the share of creative class. Furthermore it can be argued that creative people are one of the factors that make a regional climate open and diverse. Accordingly, and to avoid multicollinearity among regional level variables, I use the share of creative class as an indicator for cultural attitudes towards entrepreneurship.

[11] I use the establishment file of the social insurance statistics to compute start-ups at the regional level. Note that in this database start-ups are only taken into account if they employed at least one person that is subject to compulsory social insurance. This operationalisation of start-up activity deviates from GEM concepts such as Total Entrepreneurship Activity and arguably underestimates the level of entrepreneurial activity, because of the exclusion of entrepreneurs without employees and its focus on latter of the entrepreneurial process. However, we use this data source because of its complete coverage providing me with a sufficient number of observations in all districts.

[12] One might argue that a stock variable (objective regional opportunity structure) is not accurately measured with a flow variable (start-up rate). However, this approach is often used to measure firms' knowledge stock with R&D expenditures, as well as physical capital stocks with past investments.

similar measure as an indicator for regions' endowment with entrepreneurship capital.

Third, I use per capita *GDP* and per capita *GDP growth* as indicators for the economic context. Employing these two indicators is consistent with prior work (e.g. Audretsch & Fritsch, 1994; Armington & Acs, 2002) and follows Krugman's (1991) view that new economic activity is more likely to be located in regions where production convexities yield highest returns.

At the regional level I control for several other factors which might impact new venture creation and the dependent variables of the individual mind-set (social capital and perceived founding opportunities). Following prior research I control for the absolute *unemployment rate* and the *change in unemployment*, *population size* and *population density* (e.g. Audretsch & Fritsch, 1994; Fritsch & Mueller, 2007). I also take into account that NUTS3 regions (German *Kreise*) are embedded in higher-order spatial units. As a catch-all variable I thus use the *settlement structure* of the respective planning region.

2.3.3 Methods

The dataset combines individual data for participants of the GEM survey and regional data for districts in western Germany suggesting the use of multilevel analysis methods. Multilevel methods have several advantages compared to single level designs. Regarding entrepreneurship, it most importantly allows higher-level contexts to be explicitly taken into account when studying individual entrepreneurial decisions (Autio & Wennberg, 2010).

Since my dependent variable is dichotomous in nature, I apply a random-effects model for binary responses. I further allow the intercept and in the last part of the analysis the slope to vary across regions. I will return to this point in the results section. Taken together this can be formalised at the individual level (level 1) as

$$log\left(\frac{\pi_{ij}}{1-\pi_{ij}}\right) = \beta_{0j} + \beta_{pj}\{Level\_1\_predictors\} + \beta_{cj}\{Level\_1\_controls\} + r_{ij}\,, \qquad (2\text{-}1)$$

where at the regional level (level 2)

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\{Level\_2\_predictors_{t-1}\} + \gamma_{02}\{Level\_2\_controls_{t-1}\} + \mu_{0j}\,, \text{ and} \qquad (2\text{-}2a)$$

$$\beta_{pj} = \gamma_{p0} + \gamma_{p1}\{Level\_2\_predictors_{t-1}\} + \gamma_{p2}\{Level\_2\_controls_{t-1}\} + \mu_{pj}\,. \qquad (2\text{-}2b)$$

Thereby π_{ij} denotes the probability of individual *i* to be a nascent entrepreneur in a region *j*, γ_{00} is the mean of the intercepts across regions, γ_{p0} is the mean of the slopes across regions, γ_{01}, γ_{02}, γ_{p1} and γ_{p2} are regional-level regression (level 2) coefficients, and β_{pj} and β_{cj} are individual-level (level 1) regression

coefficients. The random part of the equation is represented by the combination of the individual-level residuals r_{ij} and the regional-level residuals μ_{0j}, μ_{pj}. To summarise in other words, regional characteristics might impact the individual-level regression by a varying individual-level intercept across regions and by varying individual-level coefficients across regions. In order to limit endogeneity problems, all regional-level predictors and controls are lagged one year as indicated by the subscript t-1. This means that for example the decision of an individual who indicated in the 2004 GEM wave to be a nascent entrepreneur is explained with regional-level data relating to 2003.

In conducting the analysis I follow recommendations by Hox (2010). Accordingly, I first analyse an intercept-only model. This is useful because it gives an estimate of the intra-class correlation in the data and provides the benchmark values for evaluating the model fit. Second, I add the individual-level variables (Equation 1) to determine the size of the individual-level effects on engagement in nascent entrepreneurship. It further allows me to check whether variance across regions remains unexplained even after the introduction of level 1 variables. Such unexplained variance is a precondition of including in a third step regional level variables (Equation 2-2a) into the regression. This random intercept model allows the intercept in the individual-level regression to vary between the regions. Besides, apart from varying intercepts also the slopes of the individual explanatory variables might differ between the regions. Thus, in a fourth step I test in a random coefficient model whether any of the slopes have a significant variance component between the regions (Equation 2-2b). One concern about using multilevel methods lies in the existence of a sufficient number of level 1 and level 2 units. Various rules of thumbs have been proposed in the literature, recommending a minimum of 15–30 observations per unit at each level (e.g. Bryk & Raudenbush, 1992; Hox, 2010). However, recent evidence from simulation studies on binary outcomes suggests that regression results are unbiased even in the extreme scenario of an average of five observations at level 1 (Clarke, 2008). Despite missing observations in some variables, the dataset is characterised by a minimum of four observations per NUTS3 region, while the average number of observations in the 326 NUTS3 regions is 52. Thus, the richness of the dataset strengthens my confidence in the robustness of the results.

My objective is to examine possible pathways, namely perceived founding opportunities and social capital (level 1 variables), through which regional characteristics (level 2 variables) affect an individual's transition to nascent entrepreneurship. Because techniques and software for multilevel analysis are still

evolving, I am not able to apply a hard mediation test for my hypotheses. Instead I employ a three-step test strategy. First, I estimate the direct effect of regional opportunity structure on individuals' nascent entrepreneurship status (Hypothesis 1) without considering the individual-level predictors of perceived founding opportunities and social capital. In a second step I examine the influence of regional opportunity structure on the individual social capital and individual perceived founding opportunities (Hypotheses 2a and 3a), both level-1 variables. Third and finally, I test whether individual social capital and individual opportunity perception are associated with individuals' nascent entrepreneurship status (Hypotheses 2b and 3b) by estimating a full model including all level 1 and level 2 explanatory and control variables. If individual perceived founding opportunities and individual social capital are pathways between the regional opportunity structure and individual new venture creation activity, 1) indicators of the regional opportunity structure should be associated with these two individual-level predictors, which in turn 2) should be associated with the individual nascent entrepreneurship state.

2.4 Results

2.4.1 Descriptive Results

Table 2-2 and 2-3 present descriptive statistics and Table 2-4 and Table 2-5 correlations for all variables included in this chapter. The individual-level data are taken from a representative population survey. The respondents have on average an *age* of 42 years, and regarding educational attainment 12.3 *years of schooling*. 41 per cent of the individuals indicate *knowing entrepreneurs*. Although 24 per cent of the participants *perceived founding opportunities* and 46 per cent believe that they have the necessary *entrepreneurial skills* to start a business, new venture creation is a rather rare phenomenon in Western Germany as only 4% of the participating individuals indicate to be *nascent entrepreneurs*. Aggregating the individual-level data to the regional level reveals substantive regional differences (between variations) for the nascent entrepreneurship state (0.03) and the two important variables, *perceived founding opportunities* (0.09) and *knowing entrepreneurs* (0.10).

Table 2-4: Correlations of Individual-level Variables

Variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1)	Nascent entrepreneur	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2)	Perceived founding opportunities	**.12**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(3)	Knowing other entrepreneurs	**.14**	**.18**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4)	Perceived entrepreneurial skills	**.19**	**.15**	**.26**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5)	Entrepreneurial experience	**.25**	**.09**	**.17**	**.36**	-	-	-	-	-	-	-	-	-	-	-	-	-
(6)	Years of schooling	**.05**	**.14**	**.13**	**.16**	**.09**	-	-	-	-	-	-	-	-	-	-	-	-
(7)	Age	**-.04**	**-.02**	**-.11**	**.10**	**.06**	**.01**	-	-	-	-	-	-	-	-	-	-	-
(8)	Gender	**-.06**	**-.13**	**-.14**	**-.19**	**-.08**	**-.09**	**.02**	-	-	-	-	-	-	-	-	-	-
(9)	Fear of failure	**-.11**	**-.13**	**-.12**	**-.24**	**-.17**	**-.12**	**-.03**	**.12**	-	-	-	-	-	-	-	-	-
(10)	Household income	**.03**	**.13**	**.14**	**.18**	**.15**	**.30**	**.08**	**-.11**	**-.11**	-	-	-	-	-	-	-	-
(11)	Time dummy 2002	.00	.00	**-.03**	**-.10**	.01	**-.07**	**.02**	-.01	-.01	-.00	-	-	-	-	-	-	-
(12)	Time dummy 2003	.01	**-.03**	**.03**	**.02**	.00	**-.02**	**-.03**	.00	.00	**-.02**	**-.22**	-	-	-	-	-	-
(13)	Time dummy 2004	**.01**	**-.04**	**.03**	.01	.01	-.00	**-.04**	.00	.00	**-.02**	**-.22**	**-.15**	-	-	-	-	-
(14)	Time dummy 2005	.01	-.01	**.02**	**.04**	.00	**.02**	**-.03**	-.01	-.01	**.01**	**-.24**	**-.16**	**-.16**	-	-	-	-
(15)	Time dummy 2006	-.00	.00	-.00	.01	**-.02**	-.00	**.03**	**.02**	**.02**	.00	**-.19**	**-.12**	**-.12**	**-.14**	-	-	-
(16)	Time dummy 2008	**-.01**	**.05**	**-.02**	.00	**-.01**	.01	**.08**	**.04**	**.04**	**.02**	**-.20**	**-.14**	**-.13**	**-.15**	**-.11**	-	-
(17)	Time dummy 2009	**-.02**	**.02**	**-.01**	**.05**	.01	**.09**	**-.03**	**-.04**	**-.03**	**.01**	**-.23**	**-.15**	**-.15**	**-.17**	**-.13**	**-.14**	-

Note: Correlation coefficients displayed in bold are significant at the 5% level.

Table 2-5: Correlations of Regional-level Variables

Variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	Share of creative class	-	-	-	-	-	-	-	-
(2)	Start-up rate	**-.37**	-	-	-	-	-	-	-
(3)	GDP	**.63**	**-.61**	-	-	-	-	-	-
(4)	GDP growth	**-.10**	**-.22**	**.15**	-	-	-	-	-
(5)	Unemployment rate	**.09**	**-.12**	**.11**	**-.22**	-	-	-	-
(6)	Change of unemployment	.03	**-.09**	-.00	**.05**	-.00	-	-	-
(7)	Population size	**.31**	**-.06**	**.17**	**-.23**	**.10**	**.05**	-	-
(8)	Population density	**.55**	**-.32**	**.56**	-.01	**.45**	**.07**	**.42**	-
(9)	Settlement structure	**-.36**	**-.04**	**-.07**	**.28**	**-.10**	**-.06**	**-.41**	**-.38**

Note: Correlation coefficients displayed in bold are significant at the 5% level.

While turning to regional-level variables, recall that they indicate regional conditions of the year prior to the individual observation. Regarding the indicators of the regional opportunity structure, the average *share of creative class* in the region is 4 per cent, and the *start-up rate* is approximately 8 per 1,000 employees. On average the *GDP* per capita in Western German districts amounts to 26,389 euros, while *GDP growth* amounted to 7.39 per cent over the past five years. Since most of the regional-level variables represent stocks rather than flows they exhibit low within variation over the time span. Regarding the regional level variables, one concern is that some of these variables are highly correlated. Multicollinearity can result in unstable estimates of the coefficients and overestimation of the standard errors. However, examining the variance inflation factor (VIF) of each variable in each regression (max = 3.8; mean VIF = 2.1) indicates no presence of multicollinearity allowing, me to safely proceed with the analysis.

2.4.2 Regression Analysis and Results

The analysis first examines the direct impact of regional opportunity structure on individuals' nascent entrepreneurship state (Table 2-6). In Model 1 I estimate an intercept-only model in order to investigate whether significant between-region variance exists in the dependent variable (Hox, 2010). This model without any predictors yields an intra-class correlation of 0.014, meaning that 1.4% of the total variance in the dependent variable nascent entrepreneurship state can be explained by between region variations. This result suggests that the *direct* effect of regional level factors is practically unimportant, though a likelihood ratio test ($\chi^2 = 9.77$, $p < 0.01$) indicates that they are statistically significant. In Model 2 I include all individual-level variables with the exception of perceived founding opportunities and social capital into the regression and find several significant estimates. *Perceived entrepreneurial skills* (odds ratio (OR) = 4.75, $p < 0.01$), *entrepreneurial experience*

Table 2-6: Objective Regional Characteristics and Individual Engagement in New Venture Creation

Test of Hypothesis 1 (Region→Nascent entrepreneurship)	Dependent variable: Engagement in nascent entrepreneurship					
	Model 1 intercept only		Model 2 level 1 variables		Model 3 random intercept	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
Individual-level predictors						
Perceived founding opportunities	----		----		----	
Knowing other entrepreneurs	----		----		----	
Individual-level controls						
Perceived entrepreneurial skills	----		1.559***	4.752	1.558***	4.752
Entrepreneurial experience	----		1.306***	3.693	1.310***	3.705
Years of schooling	----		0.029**	1.029	0.028**	1.028
Age	----		-0.035***	0.965	-0.035***	0.966
Gender	----		-0.162***	0.851	-0.160***	0.852
Fear of failure	----		-0.706***	0.494	-0.705***	0.494
Household income	----		-0.060***	0.942	-0.059***	0.943
Regional-level predictors						
GDP	----		----		0.000	1.000
GDP growth	----		----		0.014	1.014
Start-up rate	----		----		0.014	1.014
Share of creative class	----		----		0.013	1.013
Regional-level controls						
Unemployment rate	----		----		0.021	1.021
Change of unemployment	----		----		0.001	1.001
Population size	----		----		0.000	1.000
Population density	----		----		-0.000	1.000
Settlement structure	----		----		-0.009	0.991
Time dummies			YES		YES	
Intercept	-3.328***		-2.962***		-3.465***	
Wald χ^2	----		1,058***		1,061***	
$\Delta\chi^2$	----		4,054***		186***	
AIC	10,674		6,506		6,520	
Intra-class correlation	0.014		0.004		0.002	
Likelihood ratio test vs. logistic regression	9.77***		0.00		0.00	
Likelihood ratio test of random intercept in Model 3	----		----		4.40	
Pseudo R^2	----		0.279		0.280	
Cases	34,549		34,549		34,549	
Cases with missing data	0		15,402		15,402	
N	34,549		19,147		19,147	

Notes: Multilevel logistic regression; *** (**,*) denotes a significance level of 1% (5%, 10%). $\Delta\chi 2$ = chi-square model comparison test based on deviance statistics. Variables displayed in bold are at the centre of the analysis in this set of models.

(OR = 3.69, p < 0.01) and more *years of schooling* (OR = 1.03, p < 0.01) significantly raise the odds of being a nascent entrepreneur. On the other hand, the odds being a nascent entrepreneur are significantly lower for women (OR = 0.85, p < 0.05) and for individuals with higher *age* (OR = 0.96, p < 0.01), higher *household income* (OR = 0.94, p < 0.01) and pronounced *fear of failure* (OR = 0.49, p < 0.01). The inclusion of the individual-level variables explained 27.9 per cent of the variance[13] and substantially reduces the intra-class correlation. In addition, a

[13] In computing the Pseudo R2 in a multilevel setting I follow recommendations of Snijders & Bosker (1999). According to them R2 is calculated by dividing the variance of the predicted residuals of the

likelihood ratio test (χ^2 = 0.00, n.s.) indicates that no significant part of the variance which resides in the regional structure is now left unexplained. In other words the results suggest that there is no need to test a random intercept model with regional-level variables. However, for the sake of completeness I include in Model 3 the regional-level predictors and controls into the regression (Pseudo R^2 = 0.280), allowing the intercept to vary across regions. None of the indicators of the regional opportunity structure has a positive and significant impact on the odds of being a nascent entrepreneur forcing me to reject H1.[14] The results suggest that regional characteristics do not have a *direct* impact on the individual entrepreneurial behaviour. Note, that I cannot test a random coefficient model, because I do not include the two individual-level predictors (social capital and perceived founding opportunities) in this first step of the analysis.[15]

In the remainder of this section I investigate the *indirect* impact of regional characteristics via *pathways* (individual opportunity perception and individual social capital) on individual entrepreneurial behaviour. As described in Section 2.2, the second step of the analysis deals with the hypothesised link of regional characteristics on individual perceived founding opportunities (H2a) and individual social capital (H3a). As both variables are now dependent variables (instead of individual-level predictors), I do not test a random coefficient model. I start with the analysis of perceived founding opportunities, whose results are show in Table 2-7. Again, Model 1 estimates an intercept-only model to assess the between region variance in the dependent variable. The results suggest a significant (χ^2 =307.14, $p < 0.01$) intra-class correlation of 4.9%, which only slightly decreases when I consider in Model 2 (Pseudo R^2 = 0.140) the individual-level controls. In Model 3 I regard the impact of the regional-level variables in a random intercept setting, leading to a significant improvement of the models explanatory power (Pseudo R^2 = 0.175). A higher *GDP* per capita (OR = 1.00, $p < 0.01$) and a higher *share of the creative class* (OR = 1.07, $p < 0.01$) significantly raise the likelihood of an individual perceiving founding opportunities. However, I find no correlation for either *GDP growth* (OR = 0.99, n.s.) or *start-up rate* (OR = 1.02, n.s.) with opportunity perception. Weighting this evidence, I still conclude Hypothesis 2a to be supported.

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estimated model by the sum of 1) the variance of predicted residuals of the estimated model, 2) the level-2 variance, and 3) the level-1 variance, which is equal to π2/3 in a logistic model.

[14] Using a standard logistic regression model with regional clustered standard errors instead of the multi-level model confirms these results, which are available from the author upon request.

[15] According to the set of equations describing the multi-level setting in Section 2.3.3, varying individual level regression coefficients are only allowed for level 1 predictors. In contrast, the coefficients of the level 1 controls are fixed and do not include a region specific random part.

Table 2-7: Objective Regional Characteristics and Individual Perceived Founding Opportunities

Test of Hypotheses 2a (Region → Founding opportunities)	Dependent variable: Individual perceived founding opportunities					
	Model 1 intercept only		Model 2 level 1 variables		Model 3 random intercept	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
Individual-level predictors						
Perceived founding opportunities	----		----		----	
Knowing other entrepreneurs	----		----		----	
Individual-level controls						
Perceived entrepreneurial skills	----		0.414***	1.545	0.435***	1.545
Entrepreneurial experience	----		0.085*	1.116	0.110**	1.116
Years of schooling	----		0.055***	1.055	0.053***	1.055
Age	----		-0.007***	0.992	-0.008***	0.992
Gender	----		-0.367***	0.682	-0.382***	0.682
Fear of failure	----		-0.440***	0.644	-0.440***	0.644
Household income	----		0.073***	1.071	0.068***	1.071
Regional-level predictors						
GDP	----		----	1.000	0.000***	1.000
GDP growth	----		----	0.992	-0.008	0.992
Start-up rate	----		----	1.017	0.017	1.017
Share of creative class	----		----	1.067	0.065***	1.067
Regional-level controls						
Unemployment rate	----		----	0.917	-0.086***	0.917
Change of unemployment	----		----	0.999	-0.001	0.999
Population size	----		----	1.000	0.000	1.000
Population density	----		----	1.000	0.000*	1.000
Settlement structure	----		----	0.902	-0.103***	0.902
Time dummies			YES		YES	
Intercept	-1.251***		-1.913***		-1.798***	
Wald χ^2	----		830***		1,147***	
$\Delta\chi^2$	----		5,678***		168***	
AIC	23,394		17,864		17,593	
Intra-class correlation	0.049		0.038		0.007	
Likelihood ratio test vs. logistic regression	307.14***		156.74***		6.98***	
Likelihood ratio test of random intercept in Model 3	----		----		166.16***	
Pseudo R^2	----		0.149		0.175	
Cases	34,549		34,549		34,549	
Cases with missing data	13,208		17,561		17,561	
N	21,341		16,988		16,988	

Notes: Multilevel logistic regression; *** (**,*) denotes a significance level of 1% (5%, 10%). $\Delta\chi2$ = chi-square model comparison test based on deviance statistics. Variables displayed in bold are at the centre of the analysis in this set of models.

In Table 2-8 I present results for the test of Hypothesis 3a, stating that a favourable regional opportunity structure is associated with a higher level of individual social capital. The intercept-only model (Model 1) reveals that the intra-class correlation is low (0.4%) but significant ($\chi^2 = 11.16$, $p < 0.01$). This result holds true even after considering the individual-level controls in Model 2 (Pseudo R^2 = 0.185). Thus, in Model 3 I include the regional-level predictors and controls in the regression (random intercept model), which leads to only a marginal improvement in explained variance (Pseudo R^2 = 0.187). Among the regional predictors only a higher *share of the creative class* (OR = 1.03, $p < 0.05$) raises significantly the odds

Table 2-8: Objective Regional Characteristics and Individual Social Capital

Test of Hypotheses 3a (Region → Social capital)	Dependent variable: Individual social capital					
	Model 1 intercept only		Model 2 level 1 variables		Model 3 random intercept	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
Individual-level predictors						
Perceived founding opportunities	----		----		----	
Knowing other entrepreneurs	----		----		----	
Individual-level controls						
Perceived entrepreneurial skills	----		0.855***	2.350	0.861***	2.365
Entrepreneurial experience	----		0.444***	1.559	0.444***	1.560
Years of schooling	----		0.042***	1.043	0.044***	1.045
Age	----		-0.027***	0.974	-0.027***	0.974
Gender	----		-0.356***	0.700	-0.357***	0.700
Fear of failure	----		-0.151***	0.860	-0.151***	0.860
Household income	----		0.080***	1.083	0.081***	1.085
Regional-level predictors						
GDP	----		----		-0.000	1.000
GDP growth	----		----		0.006	1.001
Start-up rate	----		----		0.015	1.015
Share of creative class	----		----		0.026**	1.026
Regional-level controls						
Unemployment rate	----		----		0.018**	1.018
Change of unemployment	----		----		0.002	1.002
Population size	----		----		0.000**	1.000
Population density	----		----		-0.000**	1.000
Settlement structure	----		----		0.053*	1.055
Time dummies			YES		YES	
Intercept	-0.355***		-0.381***		-1.140***	
Wald χ^2	----		1,983***		2,023***	
$\Delta\chi^2$	----		9,478***		18**	
AIC	33,214		23,796		23,763	
Intra-class correlation	0.004		0.002		0.000	
Likelihood ratio test vs. logistic regression	11.16***		2.25**		0.43	
Likelihood ratio test of random intercept in Model 3	----		----		16.48*	
Pseudo R^2	----		0.175		0.187	
Cases	34,549		34,549		34,549	
Cases with missing data	10,068		15,438		15,438	
N	24,481		19,111		19,111	

Notes: Multilevel logistic regression; *** (**,*) denotes a significance level of 1% (5%, 10%). $\Delta\chi 2$ = chi-square model comparison test based on deviance statistics. Variables displayed in bold are at the centre of the analysis in this set of models.

of an individual to have social capital as indicated by personally knowing other entrepreneur. In contrast, the regional *start-up rate* (OR = 1.01, n.s.), absolute *GDP* per capita (OR = 1, n.s.), and *GDP growth* (OR = 1.01, n.s.) are not correlated with individual social capital. Weighting this mixed evidence, I thus conclude the respective Hypothesis 3a to be only partially supported.

The third step of the analysis is the test of whether or not individual *perceived founding opportunities* and *social capital* are positively associated with the decision to become a nascent entrepreneur. In order to test the respective Hypotheses 3a and 3b I replicate the analysis in step 1 (Table 2-9) but include opportunity perception and individual social capital as additional predictors.

Table 2-9: Objective Regional Characteristics, Individual Perceived Founding Opportunities, Individual Social Capital, and Individual Engagement in New Venture Creation

Test of Hypotheses 2b and 3b (Founding opportunities, Social capital → Nascent entrepreneurship)	Dependent variable: Engagement in nascent entrepreneurship							
	Model 1 intercept only		Model 2 level 1 variables		Model 3 random intercept		Model 4 random coefficient	
	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio	Coefficient	Odds ratio
Individual-level predictors								
Perceived founding opportunities	----		0.642***	1.900	0.649***	1.914	0.650***	1.915
Knowing other entrepreneurs	----		0.736***	2.087	0.732***	2.078	0.752***	2.122
Individual-level controls								
Perceived entrepreneurial skills	----		1.325***	3.764	1.324***	3.758	1.325***	3.761
Entrepreneurial experience	----		1.206***	3.340	1.208***	3.348	1.209***	3.351
Years of schooling	----		0.012	1.013	0.012	1.013	0.013	1.013
Age	----		-0.029***	0.971	-0.029***	0.971	-0.029***	0.971
Gender	----		-0.035	0.965	-0.003	0.968	-0.032	0.968
Fear of failure	----		-0.565***	0.569	-0.565***	0.568	-0.568***	0.567
Household income	----		-0.066***	0.936	-0.064***	0.938	-0.064***	0.938
Regional-level predictors								
GDP	----		----		0.000	1.000	0.000	1.000
GDP growth	----		----		0.011	1.011	0.011	1.011
Start-up rate	----		----		0.009	1.009	0.009	1.009
Share of creative class	----		----		0.004	1.004	0.004	1.004
Regional-level controls								
Unemployment rate	----		----		0.030*	1.030	0.031*	1.031
Change of unemployment	----		----		0.001	1.001	0.001	1.001
Population size	----		----		0.000	1.000	0.000	1.000
Population density	----		----		-0.000	1.000	-0.000	1.000
Settlement structure	----		----		0.009	1.009	0.006	1.006
Time dummies			YES		YES		YES	
Intercept	-3.328***		-3.485***		-3.976***		-4.005***	
Wald χ^2	----		1,028***		1,038***		947***	
$\Delta\chi^2$	----		5,040***		4		2	
AIC	10,674		5,705		5,718		5,728	
Intra-class correlation	0.014		0.007		0.000		0.002	
Likelihood ratio test vs. logistic regression	9.77***		0.11		0.23		0.66	
Likelihood ratio test of random intercept in Model 3 and random coefficients in Model 4	----		----		4.33		4.99	
Pseudo R^2	----		0.286		0.287		0.287	
Cases	34,549		34,549		34,549		34,549	
Cases with missing data	0		17,589		17,589		17,589	
N	34,549		16,960		16,960		16,960	

Notes: Multilevel logistic regression; *** (**,*) denotes a significance level of 1% (5%, 10%). $\Delta\chi 2$ = chi-square model comparison test based on deviance statistics. Variables displayed in bold are at the centre of the analysis in this set of models.

Model 1 depicts the result of the intercept-only model, replicating the information that there exists a low but significant intra-class correlation of 1.4%. Considering the individual-level predictors in Model 2 (Pseudo R^2 = 0.286), as expected *perceived founding opportunities* (OR = 1.90, $p < 0.01$) and *social capital* (OR = 2.09, $p < 0.01$) are important predictors for engaging in nascent entrepreneurship. Although there is no significant intra-class correlation (χ^2 = 0.11, n.s.) after the inclusion of the individual-level predictors and controls, I run random intercept model (Model 3) and a random coefficient model (Model 4). In both settings none of the regional-level

predictors raises directly the odds of becoming a nascent entrepreneur (Pseudo R^2 = 0.287). Taken together, I conclude Hypotheses 3a and 3b to be fully supported.

2.5 Discussion

The objective of this chapter was to investigate the direct and indirect impact of regional characteristics on individuals' engagement in new venture creation. I developed a theory-based model of pathways through which the objective regional opportunity structure affects individual new venture creation activity. To test the hypotheses, I combined regional-level data on the socio-economic environment with individual-level data on individual attributes and individual entrepreneurial behaviour.

The first main result is, that contrary to my expectation, individual venture creation activity is *not* directly associated with regional-level predictors. The significant between region variation in the dependent variable being a nascent entrepreneur can be explained to a large degree by a regional composition effect (an overrepresentation of individuals with for example high levels of human capital, social capital and financial capital in certain regions). This result contradicts prior research (e.g. Brixy & Grotz, 2007; Boschma & Fritsch, 2009), which however did not use a large array of controls for regional composition effects. However, my findings are supported by recent research investigating regional start-up rates (Tamásy, 2006; Bosma & Schutjens, 2010) and individual entrepreneurial behaviour (Sternberg & Wagner, 2005) which also find small to null correlations for regional-level predictors after controlling for composition effects. I add a new perspective to the ongoing discussion on the reasons for these observed small or null relationships between the region and entrepreneurial behaviour (Davidsson & Wiklund, 1997) by pointing to the relevance of *indirect* effects of the region.

In this regard, and this is the second main result, my in-depth analyses suggest that the region indeed matters for individual entrepreneurship but in more sophisticated manners. According to the data it seems that the impact of regional characteristics on new venture creation activity is more indirect than direct (see also Tamásy, 2006). The theory-driven approach and the data shed light on the "black box" between the region and the enterprising individual by pointing to the mediating role of both individual perceptions of founding opportunities and individual social capital. These findings – in particular on the perception of founding opportunities – extends prior work from Grilo and Irigoyen (2006) and Bosma and Schutjens (2010) who initially emphasised the importance of the individual perception of objective characteristics as an important determinant for entrepreneurial action. I also contribute to the literature by suggesting social capital to be a relevant path between

the region and individual behaviour. As stated by Minniti (2005), the social environment provided by the region seems to play a crucial role in stimulating individual entrepreneurial behaviour.

Furthermore, my results concur with recent research investigating the sources of persistence in regional start-up rates (Andersson & Koster, 2010). The most important indicator of the objective regional opportunity structure in my analysis was the *share of the creative class*, which indicates cultural attitudes towards entrepreneurship and the presence of opportunities. This view is in line with Audretsch's (2007) observation that today's entrepreneurship is about creativity, innovativeness, networks and risk-taking, particularly in the new knowledge-based societies emerging around the globe. Creative people are an important part in the opportunity generation process (e.g., by recombining existing knowledge to new means-ends relationships). Moreover, the creative and proactive atmosphere in a region may stimulate network ties and also the perception of founding opportunities. According to my results, individual social capital and individual perception of founding opportunities were among the most important predictors for individual new venture creation engagement. To the extent that individuals in regions with higher start-up rates will develop a more positive attitude towards entrepreneurship (Minniti, 2005), generate more opportunities (Frenken & Boschma, 2007; Saxenian, 1994) and enjoy higher economic and employment growth (Audretsch & Keilbach, 2004b; Fritsch & Mueller, 2004) this can amount to a self-energising process. This might at least partly serve as an explanation for the already known persistence of regional start-up rates.

At least two important implications can be drawn from these findings. First, concerning implications for theory and future research, the findings suggest that we have to think more intensively about the paths between regional characteristics and individual entrepreneurial behaviour. This calls for a deeper investigation of the mechanisms of how the region affects entrepreneurship and the conditions under which the region impacts entrepreneurship. For this, Fritsch and his co-authors provide first but promising results regarding the region-specific impact of entrepreneurship on economic welfare (Fritsch & Mueller, 2008; Fritsch & Schroeter, 2007). Concerning the regional determinants of entrepreneurial activity, future research might for example study human capital as a possible path. There are indications that regions with higher start-up rates offer the opportunity for people to acquire entrepreneurial skills (Guiso & Schivardi, 2005). Finally, future research should verify the results in different countries and with longitudinal designs.

Second, although my results are based on a cross-sectional design, I might draw some initial policy conclusions. As the direct impact of regional characteristics on individual new venture creation activity seems to be negligible, policy might focus on the pathways of social capital and the perception of founding opportunities in order to foster new venture creation. The active formation of institutions that enable individuals to interact with each other could be one important policy instrument. However, regional or local solutions in the institutional setting are required. Due to differences in regional conditions, founding opportunities and the enterprising individuals' one-size-fits-all solution will be likely to fail. In any case such a policy can only yield results in the medium or long run, because changing cultural attitudes towards entrepreneurship will take a considerable amount of time.

2.6 Conclusion

I acknowledge that this chapter has important limitations. First, I use a cross-sectional design to test my hypotheses. Therefore, my results must be interpreted as correlative rather than causal. However, my conceptual model of pathways between the objective regional opportunity structure and individual new venture creation activity is grounded in international scholarly work and established empirical findings. Second, this chapter might suffer from endogeneity problems. I mitigated this problem by lagging the regional-level predictors and controls by one year. A third caveat of my analysis is the restriction on Western Germany. Unfortunately, the provision of comparable archival data on regional characteristics for all countries participating in GEM is close to impossible. However, the focus on Western Germany allows the use of seven GEM waves and the controlling for a variety of regional-level controls in the statistical analyses.

Despite these limitations, I hope that this chapter may stimulate further research on the pathways through which the region may actually affect nascent entrepreneurship. Knowing more about *how* the region "operates" may contribute to research on both the geography of entrepreneurship and the enterprising individual as embedded and influenced by the social context. My theory-driven approach that combined region-focused and individual-focused perspectives delivered promising results. This may pave the way towards a systematic decryption of the black box between the region and individual entrepreneurship.

3. Balanced Skills among Nascent Entrepreneurs

3.1 Introduction

It is widely acknowledged that entrepreneurship is a key driver for economic development. For example, entrepreneurship is regarded as an important mechanism for the diffusion and exploitation of knowledge (e.g. Acs & Plummer, 2005). Other scholars highlight the importance of entrepreneurship for economic growth. It is argued that new ventures – which are often used as an indicator for entrepreneurial activity – challenge incumbents, thereby amplifying structural change and securing market efficiency. In this indirect way entrepreneurship and, in particular, high-tech and knowledge-intensive new ventures lead to an improved overall competitiveness of the economy and subsequent growth (Andersson & Noseleit, in press, Audretsch & Keilbach, 2004, Fritsch & Mueller, 2004).

One important stream in the literature on entrepreneurship in general and new venture creation in particular focuses on the characteristics of the entrepreneur. However, early research on individual differences – mostly in personality traits – has been heavily criticised, mainly because of the lack of a theoretical framework on how personality traits affect entrepreneurial behaviour (Gartner, 1988; Low & MacMillan, 1988; Rauch & Frese, 2007). As a consequence, research attention has shifted perspective mainly towards resources such as the amount of human and social capital individuals contribute to the emerging venture (e.g. Colombo & Grilli, 2009; Samuelsson & Davidsson, 2009; Mosey & Wright, 2007). The present chapter mainly focusses on human capital, its impact on entrepreneurship and its origins. Thus, it stands in the tradition of Theodore W. Schultz (1980), who discusses the demand and supply of “entrepreneurial ability” in society. According to him, entrepreneurial abilities are not evenly distributed among individuals. Instead, they are scarce and thus valuable, and can be both innate and acquired.

While this is the general route I follow, I study the jack-of-all-trades view on entrepreneurship in particular. According to Lazear (2005), entrepreneurs must be sufficiently skilled in a number of areas, because they have to combine different resources such as physical capital, people and ideas in order to successfully run a business. Considering the case of the founder of a software company, it is not necessary that the entrepreneur is the best programmer, but he might need some knowledge in programming to supervise the output of his employees. To sell the software some experience in marketing and sales would be also appropriated. To overcome resource constraints he must be able to raise funds and hire qualified personal for the new venture. One might argue that all of the above mentioned

entrepreneurial tasks are critical for founding and running a company. However, I expect that those individuals with more balanced skills - conceptualised as having prior work experience in a number of fields such as marketing and R&D - should be the more successful entrepreneurs than their less balanced skilled counterparts.

Previous research on the jack-of-all-trades view of entrepreneurship has primarily focussed on vocational choice. Lazear and other scholars showed that having a balanced skill set increases substantially the likelihood of becoming self-employed (e.g. Lazear, 2005; Silva, 2007; Wagner, 2003). However, Lazear's theory can be extended to derive performance predictions of a balanced skill set, which have not yet been thoroughly investigated. Oberschachtsiek (in press) studied entrepreneurial longevity for necessity entrepreneurs in Germany. Although the empirical evidence is rather mixed, he concludes that balanced skilled entrepreneurs remain longer in entrepreneurship. Contrary to the predictions of Lazear's model, Åstebro and Thompson (2007) find negative returns of a balanced skill set among entrepreneurial Canadian inventors. To the best knowledge of the author, there is no empirical study investigating performance effects of balanced skills in a nascent entrepreneur setting.

Furthermore, knowledge about the origins of a balanced skill set is very limited and subject to disagreement among scholars. There are two competing explanatory models explaining variation in the skill set of individuals. On the one hand, the investment hypothesis states that individuals purposely *invest* in a balanced skill set by engaging in different industries and working in diverse jobs to acquire skills for starting up a business (Lazear, 2005). On the other hand, the endowment hypothesis questions the intentionality of skill acquisition among entrepreneurs. Instead, scholars posit that other factors such as a taste for variety drive the skill accumulation process (Åstebro and Thompson, 2007) or an *innate endowment* with a high level of multiple skills enables individuals to engage in many different roles in the labour market – including entrepreneurship (Silva, 2007).

This chapter examines the effects and origins of balanced skills among nascent entrepreneurs. First, I extend Lazear's jack-of-all-trades theory to formally model performance effects of balanced skills. Second, potential sources of balanced skills are explored. Regarding the investment hypothesis, I raise the question of whether a balanced skill set is the result of an individual's investment strategy, which might encompass prior entrepreneurial or managerial experience, or prior work experience in young and small companies. With respect to the endowment hypothesis, I draw on findings reported in the body of psychological literature on entrepreneurship to investigate whether or not a balanced skill set might be rooted

in the personal development of the entrepreneur and whether or not skill accumulation may be unintentionally driven by personality traits.

The data for my analysis is provided by the Thuringian Founder Study (*Thüringer Gründer Studie*). This is an interdisciplinary research project that studies success and failure of innovative new ventures in the German federal state of Thuringia with an additional sample of 100 high-potential nascent projects. Ultimately, this sample will unite several waves into a longitudinal data set, allowing for causal analysis. However, since the second wave interviews are not yet complete, I analyse the first wave of data, which are cross-sectional by definition.

The remainder of the chapter is organised as follows. In section 3.2, I present a formal model on how balanced skills affect entrepreneurial performance and set out the respective hypotheses. Section 3.3 is dedicated to the presentation of the data and the variables used. The empirical analysis is presented in Section 3.4. Section 3.5 discusses the findings and Section 3.6 concludes.

3.2 Theoretical Background

3.2.1 Impact of Balanced Skills on Entrepreneurial Performance – A Formal Model

In a recent paper, Lazear (2005) proposed a model of vocational choice that gained some consensus in the scientific community. When faced with the decision between entrepreneurship and paid employment, those individuals with a balanced skill set are more likely to opt for self-employment (Åstebro & Thompson, 2007; Lazear, 2004; Lazear, 2005, Silva, 2007, Wagner, 2003; Wagner, 2006a). I extend Lazear's approach to derive performance implications for those individuals who have chosen entrepreneurship. Because my extension is closely connected to Lazear's original model, it might be instructive to briefly review his formal approach.

Let there be two activities – entrepreneurship and paid employment – for an individual to earn a living. In each activity earnings depend on the productive use of two skills whose levels before making the vocational choice are denoted by x_1 and x_2. At the beginning I assume both skills to be independent from each other. Every individual is endowed with a pair (x_1, x_2), whereby $g(x_1, x_2)$ is the joint density of both skills.

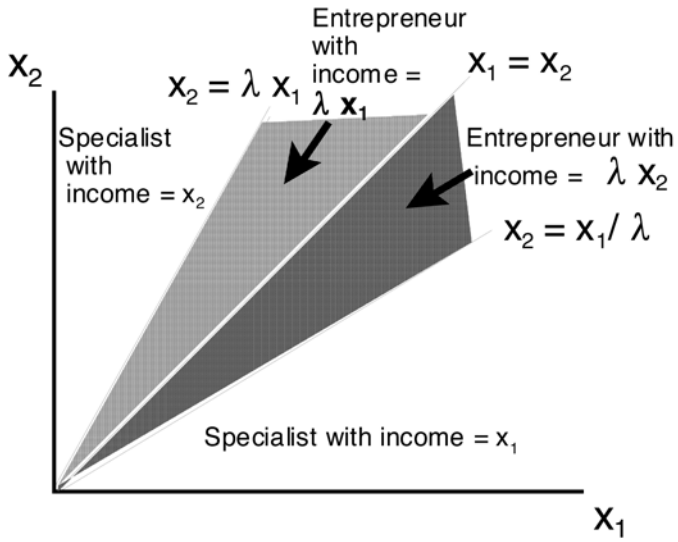
As an employee, the individual may specialise in one skill to earn

$$w_S = max[x_1, x_2], \tag{3-1}$$

while as an entrepreneur his earnings are limited by the weakest skill

$$w_E = \lambda \, min[x_1, x_2]. \tag{3-2}$$

Lazear (2005) terms λ as a market-determined premium to entrepreneurship that is endogenously defined within the model so as to equate supply and demand. The decision to become an entrepreneur is based on a comparison of the earnings. Individuals choose entrepreneurship as long as $\lambda \, min[x_1, x_2] > max[x_1, x_2]$. The weaker skill must exceed a minimum level; otherwise the individual becomes a specialised employee. This can also be seen in Figure 3-1, where the individual decision, its conditions and outcomes are depicted.



Source: Lazear (2005), reproduced with permission of the copyright owner.

Figure 3-1: The Impact of Balanced Skills on Vocational Choice

Given the distribution of the skills, the probability of an individual becoming an entrepreneur is equal to both shaded areas in Figure 3-1, or in mathematical terms

$$Prob = \int_0^{\infty} \int_{x_1/\lambda}^{\lambda x_1} g(x_1, x_2)\, dx_2 dx_1 \, . \tag{3-3}$$

For those individuals who become entrepreneurs, Lazear's theory also has – although not formally modelled by himself – some specific income implications. In my extension of the model,[16] the expected earnings of an entrepreneur is given by

$$E(w_E) = \int_0^{\infty} \int_{x_1/\lambda}^{\lambda x_1} w_E \, g(x_1, x_2)\, dx_2 dx_1 \, . \tag{3-4}$$

As a next step the assumption of independence of the skills is relaxed and the possibility of balanced skills is introduced. The income equation of the

[16] A first approach to model income implications among entrepreneurs stems from Åstebro & Thompson (2007). However, they deviate from the original Lazear model by using the restrictive assumption that both skills are uniformly distributed. The present extension is, thus, as general as Lazear's original model.

entrepreneur in (3-2) already contains the intuition. Only if the entrepreneur is sufficiently good in both skills will he be able to set up a successful business, since his earnings are limited by the weaker skill. To be a jack-of-all-trades should pay for entrepreneurs and therefore raise earnings.

In formal terms, let x_2 depend upon x_1 and a different factor v such as

$$x_2 = \rho x_1 + (1-\rho)v\,, \tag{3-5}$$

where $\rho \in [-1,1]$ denotes the correlation between both skills, and $f(x_1)$ and $h(v)$ are density functions of x_1 and v, respectively. In order to incorporate the balanced skills notion into the earning equation in (3-4), one has to use a standard change of variables and alter the limits of integration to retrieve

$$E(w_E) = \int_0^{\infty} \int_{[(x_1/\lambda)-\rho x_1]/(1-\rho)}^{(\lambda x-\rho x_1)/(1-\rho)} w_E(x_1, v) f(x_1) h(v)\, dv\, dx_1\,. \tag{3-6}$$

Finally, I differentiate this equation with respect to ρ. Because the min-function in (3-2) is non-monotonic and cannot be differentiated, I split the integral into two parts. For points above the 45-degree line ($x_2 > x_1$) in Figure 3-1, the income function is given by $w_E(x_1) = \lambda x_1$. For points below the 45-degree line ($x_1 > x_2$), entrepreneurial income is given by $w_E(x_1, v) = \lambda x_2 = \lambda[\rho x_1 + (1-\rho)v]$. Reorganisation of the integral limits yields equation (3-7a) for points below the 45-degree line, and (3-7b) for points above the 45-degree line:

$$E(w_E) = \int_0^{\infty} \int_{x_1}^{(\lambda x_1-\rho x_1)/(1-\rho)} w_E(x_1) f(x_1) h(v)\, dv\, dx_1\,, \tag{3-7a}$$

$$E(w_E) = \int_0^{\infty} \int_{[(x_1/\lambda)-\rho x_1]/(1-\rho)}^{x_1} w_E(x_1, v) f(x_1) h(v)\, dv\, dx_1\,. \tag{3-7b}$$

Differentiating both equations with respect to ρ and denoting UL and LL as the upper and lower limits, respectively, of the inside integral, yields

$$\frac{\partial E(w_E)}{\partial \rho} = \left[\int_0^{\infty} h(UL)\lambda x_1 \frac{x_1(\lambda-1)}{(1-p)^2} - 0\right] f(x_1)\, dx_1\,, \tag{3-8a}$$

$$\frac{\partial E(w_E)}{\partial \rho} = \left[\int_0^{\infty} 0 - h(LL)x_1 \frac{-x_1(1-1/\lambda)}{(1-p)^2}\right] f(x_1)\, dx_1\,. \tag{3-8b}$$

Both equations are positive upon the condition λ > 1, which is always given according to Lazear (2005). Thus, theory predicts a more balanced skill set of the entrepreneur to be associated with higher earnings, leading to the following hypothesis:

H1: Balanced skills among nascent entrepreneurs are positively associated with nascent entrepreneurs' earnings.

3.2.2 Origin of Balanced Skills

The efforts to empirically test the jack-of-all-trades theory have sparked a controversy. If balanced skills are important, where do they come from? As indicated in the introduction, there are two opposing schools of thought: the investment and endowment hypotheses. On the one hand, the investment hypothesis states that individuals *intentionally* invest in a balanced skill set by engaging in different industries and working in different jobs to acquire skills for starting up a business later (Lazear, 2005). Investigating a sample of Stanford alumni, he found that the probability of becoming self-employed is significantly higher for individuals with multiple functional roles in the previous employment spell.

On the other hand, Silva (2007) found no evidence for a causal and intentional relationship between skill acquisition in one employment spell and entrepreneurial activity in the following employment spell when controlling for time-fixed individual unobservables. Accordingly, he argues that a jack-of-all-trades attitude "only matters as an innate attribute" (p. 122), leading to an *endowment* of entrepreneurs with multiple skills – a view Lazear (2005) only found limited support for. Such an accumulation of skills was labeled *unintentional* as it seems to be driven by individual characteristics that might also impact the decision of whether to become an entrepreneur or not. A similar argument has been brought forward by Åstebro & Thompson (2007). They show that a more balanced skill set and entrepreneurial entry is related to several personality traits that were subsumed under the label "taste for variety". Unfortunately, Åstebro and Thompson (2007) do not provide convincing theoretical arguments why these traits should be related to skill accumulation.

A hard empirical test of both schools of thought would require longitudinal data on the job history and the skill accumulation process of individuals. Since such detailed data are not yet available, I pursue a more modest goal by checking potential sources of a balanced skill set among nascent entrepreneurs who can be best assigned to the respective school of thought. In the following, different factors from both schools of thought will be considered as predictors for a balanced skill set, which in turn is seen as an important precondition for success in the process of venture creation.

<u>Factors Associated with the Investment Hypothesis:</u>

Traditional human capital theory (Becker, 1964) relates an employee's human capital with subsequent earnings in paid employment. Later, this theory was extended to entrepreneurs and small-business owners (Schultz, 1980; Brüderl et al.,

1992), arguing that investments in entrepreneurial skills and abilities pay off in terms of surviving, profitability, and progress. If a balanced skill set is the outcome of an investment strategy of nascent entrepreneurs, occupational history should reflect work and schooling experience fostering the acquisition of various experiences. A review of the literature revealed four possible routes to acquiring a balanced skill set.

First, previous self-employment can be considered as a natural source of a balanced skill set. It is well known that previously self-employed individuals represent a high proportion of business founders (e.g. Evans & Leighton, 1989). Because an entrepreneur has to deal with various tasks such as talking to customers, the development of the product or service, and raising financial funds (Lazear, 2005), past entrepreneurial experience might therefore be seen as the best training to gain specific knowledge and skills in various fields, which are then most productively applied in serial entrepreneurship.

Second, managerial experience should make it more likely to acquire a balanced skill set. Although there are different views about the nature of managerial work, its variety in tasks is a common theme. Irrespective of whether the manager's role is long-term planning of all aspects of an organisation (Willmott, 1987; Fayol, 1916), day-to-day management of a multitude of persons and tasks (Mintzberg, 1973; Stewart, 1976) or a mixture of both, it seems reasonable that "of all job grades, managers will have the greatest exposure to work experience which spans diverse tasks" (Parker, 2009, p.485).

Third, work experience in young and small firms – as opposed working in a large or established firm – makes the acquisition of a balanced skill set more likely. Because small (and especially young and small) firms usually lack complex hierarchical structures and highly-specialised work places, working conditions are characterised by the opportunity for employees to conduct a variety of tasks (Parker, 2009; Saxenian, 1994). Strong support for this reasoning is provided by Wagner (2006b). Analysing a random sample of individuals in specific German regions, he found that the probability of becoming a nascent entrepreneur increases from 6.4% to 19.9% if the individual had prior work experience in a young and small company.

Fourth, besides on-the-job training, formal education can also contribute to a balanced skill set. Lazear (2004, 2005) shows that students with a balanced university curriculum acquire the necessary knowledge to work in different jobs and industries. These students were also more likely to enter entrepreneurship.

Taken together, it seems likely that work and schooling experience fostering the acquisition of various experiences are sources of a balanced skill set. Thus, the following set of hypotheses is proposed:

H2a: Prior entrepreneurial experience is associated with a balanced skill set.
H2b: Prior managerial experience is associated with a balanced skill set.
H2c: Prior work experience in young and small firms is associated with a balanced skill set.
H2d: Prior variety in university curricula is associated with a balanced skill set.

Factors Associated with the Endowment Hypothesis

In contrast to a directed acquisition of a balanced skill set, individuals may also possess such resources through unintentional, predetermined factors – individual characteristics that may feed into a balanced skill set and the decision of whether or not to become an entrepreneur at the same time. A review of the literature on vocational choice reveals that personality traits and characteristics of an individual's personal development may be associated with such unintentional skill accumulation.

First, the role of personality for vocational behaviour has often been studied (e.g. Seibert & Kraimer, 2001). At the heart of these approaches stands the assumption that a person-environment fit towards career choice and adjustment exists (Holland, 1985). Indeed, individuals whose specific personality patterns are congruent with their occupational requirements enjoy higher job satisfaction (e.g. Assouline & Meir, 1987) and success (Seibert & Kraimer, 2001), making them less likely to switch jobs. Besides enjoying the kind of work experience as an entrepreneur, manager, or employee in a small and young company (as discussed above), job mobility (external as well internal) may be seen as the standard way for individuals to work in different areas, conduct new tasks, and have different duties which foster the acquisition of various skills at least at the basic and medium levels (Lazear, 2005).[17] Recent empirical findings indicate that three Big Five traits in particular – openness to experience, extraversion, and agreeableness – affect job mobility (e.g. Wille et al., 2010) and might therefore be seen as a cause for unintentional skill accumulation.

Openness to experience is seen motivationally in the need for variety and experience for personal benefit (McRae & John, 1992). Adjectives such as curious,

[17] For example, job assignment is one of the most commonly used strategies of companies to create a multi-skilled workforce (Pastor & Coromias, 2007).

imaginative, and widely interested are often used to describe people with high openness to experience. The link between the openness trait and a balanced skill set can be seen in the possibility of having new experiences by changing jobs (e.g. Ng et al., 2007). Thus, I expect people with a high openness towards enjoying the possibility of working in different areas to switch jobs more often, thereby making them more likely to acquire a balanced skill set.

Extraversion concerns individuals' engagement with the external world. People with high extraversion scores can be described as active, enthusiastic, outgoing and energetic (McCrae & John, 1992). Vinson, Conelly and Ones (2007) report some extraversion-related traits to be correlated with job switching behaviour. They argue that extraverted people 1) have larger job-related networks, providing them with more job alternatives to act on (Granovetter, 1985), and 2) have the necessary confidence and social expertise to pursue potential employers, making organisation switching more likely. Taken together, I expect people with high extraversion to be more likely to switch jobs, resulting in a balanced skill set.

Agreeableness can be summarised as individuals' preference to social interactions. People scoring low on agreeableness can be characterised as self-centered and indifferent to and jealous of others (Digman, 1990). Wille et al. (2010) argue that such people are less sensitive to interpersonal connections, making it easier for them to cope with the loss of social relations when switching companies. Additionally, employers might be less interested in keeping such employees, because of their negative impact on work performance in teams (Peeters et al., 2006). In sum, I expect people with low agreeableness to switch jobs more often, leading to a more balanced skill set.

Based on the discussion above, I expect individuals with a specific manifestation of traits – high openness and extraversion as well as low agreeableness – to switch jobs more often, making them more likely to acquire a balanced skill set over the course of their career. Note that this specific manifestation of traits has also been linked to entrepreneurial intentions (Obschonka et al., 2010). The corresponding set of hypotheses is formulated as follows:

H3a: A higher level in openness to experience is associated with a balanced skill set.

H3b: A higher level in extraversion is associated with a balanced skill set.

H3c: A lower level in agreeableness is associated with a balanced skill set.

Second, the course of personal development can be expected to be associated with vocational variety and a balanced skill set. The central assumption in developmental psychology is that past interests and actions are reflected in future choices (Holland & Nichols, 1964). Applying this framework, adolescents' *early interests* have been related to the process and the result of vocational choice (e.g. Hong et al., 1993; Munson & Savickas, 1998; Schmitt-Rodermund & Vondracek, 1999). For example, studying vocational choice among Israeli adolescents, Hong et al. (1993) found that for 35% of the participants, the domain of their leisure activities at the age of 17 matched adult occupation 18 years later. Thus, early interests and activities seem to provide an opportunity for adolescents to explore occupation-related activities, to develop initial skills and competencies, and to develop career choice attitudes – all necessary components to make informed career decisions (Munson & Savickas, 1998; Super, 1984).

Applying this framework, I argue that adolescents with a variety of early interests have a broader range of vocational interests – though arguably at a lower level of intensity and ability – and subsequently a higher probability to engage later in different occupations and industries. Interestingly, only a few scholars have investigated this relation. However, Munson & Savickas (1998) found among U.S. students a positive significant correlation between the range of leisure activities and career exploration behaviour. Additional support for this line of reasoning can be found in the literature on giftedness. Milgram and Hong (1999) report that among highly gifted adolescents in Israel, those with an undifferentiated skill set (not concentrated towards one particular domain) had less differentiated vocational interests. In turn, individuals with skills in certain areas were clearer about their career interests. Taken together, according to the endowment hypothesis a balanced skill set should be deeply routed in the personal development of the nascent entrepreneurs and already have been reflected in varied early interests in adolescence. Thus, the following hypothesis is proposed:

H4: Higher variety in early interests at the time of adolescents is associated with a balanced skill set.

3.3 Dataset and Methods

3.3.1 Dataset

The data for my analysis are provided by the Thuringian Founder Study (*Thüringer Gründer Studie*), an interdisciplinary research project on success and

failure of innovative new ventures in the German federal state of Thuringia. One part of this study is a sample of “high-potential” nascent projects. Ultimately, this sample will unite several waves into one longitudinal dataset, allowing causal analysis. However, since second wave interviews are not yet complete I will analyse the first wave of data, which are cross-sectional by definition.

As discussed in the introduction, I view entrepreneurship as the creation of economic value within emerging ventures. According to this definition, the creation of value is not limited to tech-based new ventures, but also includes innovative activity in the service sector. Building a sample of high-potential nascent projects consistent with this broad definition is in line with previous work using PSED datasets. For example, Samuelsson and Davidsson (2009) employ a broad concept to distinguish innovative and imitative nascent projects using indicators of R&D, intellectual property protection, newness of the business idea and low competition. Also Newbert (2005) applies a broad concept by computing a composite score of actions and intentions of nascent entrepreneurs to assess new venture projects’ dynamism. In particular, the research team of the Thuringian Founder Study followed the lead of the CAUSEE project studying the emergence of regular and high-potential nascent projects in Australia (Davidsson et al., 2008a; Davidsson et al. 2008b). Thereby, high-potential nascent projects are identified via a multitude of sources to minimise the bias which would occur when focussing on a single source. Constructing the present dataset comprised three steps (see Table 3-1 for an overview of the data sources and the steps).

First, possible sources of high-potential nascent projects were assessed. The most important sources were the random samples of scientists and innovative young companies constructed within the Thuringian Founder Study. The sample of scientists (as described in Obschonka et al., 2010) was conducted to study entrepreneurial intentions. In order to identify nascent entrepreneurs among them, two standard items from PSED and CAUSEE (Gartner et al., 2004; Davidsson et al., 2008a) were used. The research team expected scientists’ initiated projects to be of high potential, since they often try to commerialise cutting-edge research (Shane, 2004). The random sample of innovative young companies (described in Cantner et al., 2010) was conducted to study the impact of psychological and economic determinants of new ventures’ success and failure. During the initial screening a minority of these ventures were classified as projects in gestation as they reported no positive cash flows. Another source of high-potential nascent projects were public business consultants, technology transfer offices of universities, business angels, and venture capitalists, who were asked to provide detailed information of nascent

entrepreneurs with whom they had had contact in the last two years and whose projects met certain criteria. The research team also visited elevator pitches to get in contact with high-potential nascent projects. Ideas presented at elevator pitches are usually of high quality, since they are a priori screened and selected by the organiser and a committee of experienced founders and financiers. Further sources of high-potential nascent projects were interviewed nascent entrepreneurs who indicated knowing other founders, and personal contacts from members of the research team. All in all, using these different sources 364 suspected high-potential projects could be identified.

The second step of the procedure comprised a customised screening procedure to separate high-potential from non-high-potential projects. Quite similar to the CAUSEE project in Australia (Davidsson et al. 2008b), all suspected high-potential nascent projects were rated by a combination of criteria related to a) human capital of the entrepreneurs (management experience, start-up experience and starting as team), b) sophistication of the project (e.g. scientist sample: relatedness of the idea to their research; others: novelty of the product / service, or production process, or methods of promotion and selling), and c) belonging to a growth-friendly industry (e.g. sample of young companies: operating in a growing market; specific industries). Note that these criteria are usually considered as important drivers of venture growth especially in young businesses (Eisenhardt & Schoonhoven, 1990; Rosenbusch et al., 2010; Unger et al., 2009). The projects were coded for each criterion as 1 for low, 2 for medium, and 3 for high level. The necessary information was gathered from the above-described datasets of scientists and new ventures, as well as from short descriptions of the projects and founders circulated by the organisers of business plan competitions and elevator pitches. If necessary, the public business consultants as well as angel investors were contacted to fill missing information. In sum, 232 cases that reached the predefined score of 6 points qualified for the main interview.

In a third step, the research team contacted the respective founders. The research team was able to conduct 152 structured face-to-face interviews with the solo entrepreneur or leading entrepreneur of the project (from July 2008 to May 2009), resulting in a response rate of 66%. The interviews took on average one and a half hours. During the interviews it turned out that 34 of the projects were already complete firms, in terms of having registered in an official business register and having obtained monthly revenues exceeding monthly expenses (including salaries for the manager-owners) in at least one month. A further 18 projects had already

Table 3-1: Sources of High-potential Nascent Projects

1st stage: Assessment of possible sources of high-potential nascent projects					2nd stage: Cust-omised screening	3rd stage: Interviews
Data sources	**Initial number of cases**	**Initial criteria to detect possible high-potential projects**	**Assessment of the initial criteria by**	**Number of suspected high-potential projects**	**Number of cases qualified for interview**	**Number of interviewed projects**
Random sample of Thuringian scientists (Thuringian Founder Study)	1,119	Are you alone or with others trying to start a new business? Over the past twelve months, have you done anything to help start a new business, such as looking for equipment or a location, organising a start-up team, working on a business plan, beginning to save money, or any other activity that would help launch a business?	Self-assessed by the participating scientists.	61	56	26
Random sample of innovative new ventures (Thuringian Founder Study)	639	Project is still in gestation phase, no positive cash flows yet. Project was classified as 'advanced-technology' or 'technology-oriented service' according ...?	Self-assessed by the participating leading entrepreneur. Assessed by the research team according to ZEW industry classification (Grupp et al., 2000).	41	31	18
Public business consultants (chamber of commerce)	n.a.	(1) Participants of business plan competitions and (2) Individuals seeking consulting within the last two years and whose projects were considered as high-technology or technology-oriented service.	Assessed by the consultants.	130	60	47
Elevator pitches	40	Project is still in gestation phase, no positive cash flows yet.	Assessed by the research team.	26	24	18
Nascent entrepreneurs	n.a.	Project is still in gestation phase, no positive cash flows yet.	Assessed by the nascent entrepreneur.	55	19	12
Technology transfer offices of universities and public research institutes	n.a.	Students and researchers consulting within the last two years and whose projects were considered as high-technology or technology-oriented service.	Assessed by the consultants.	33	27	20
Business angels and venture capitalists	n.a.	Project is still in gestation phase, no positive cash flows yet.	Assessed by the business angels and venture capitalists.	9	8	4
Research team	10	Project is still in gestation phase, no positive cash flows yet. Projects considered as high-technology or technology-oriented service.	Assessed by the research team.	9	7	7
Sum	1,808			364	232	152

Table 3-2: Sample Characteristics of the High-potential Projects of the Thuringian Founder Study and the CAUSEE project

Variables	Thuringian Founder Study	CAUSEE project
Human capital		
Started by team, %	67	68
Started by non-spouse team, %	62	54
Management experience, (sum across founders of a team, median years)	11	20
Start-up experience (1 or more founders of a team have), %	60	82
University education (1 or more founders of a team have), %	93	65
Sophistication of the project		
New product / process or new method of production or new methods of marketing / selling, %	98	not reported
Venture idea is new to the world, %	54	not reported
Sees R&D spending as a major priority, %	77	77
Have applied for protection of intellectual property, %	46	48
Belonging to a growth-friendly industry		
Project is operating in a growing market, %	71	not reported
Industry: ICT, %	31	8
Industry: Consulting, %	19	10
Industry: Manufacturing, %	18	23
Industry: Biotechnology, pharmaceutics, chemical industry, %	11	not reported
Industry: Environmental technology, energy management, %	9	not reported
Industry: Medical engineering, %	3	not reported
Industry: Financing, %	2	not reported
Other characteristics		
Project is facing little or no competition, %	45	not reported

Note: Sample description for the CAUSEE project taken from Davidsson et al. (2008a). Variables in italics were used as items in the customised screening of the Thuringian Founder Study.

abandoned the founding process. Since these cases are not nascent projects according to the usual standards in nascent entrepreneurship research, I solely focus on the remaining 100 projects in gestation.

To evaluate the potential of these projects I provide in Table 3-2 descriptive statistics for the variables used in the screening procedure and some other variables which are often associated with growth and superior business performance.

However, without a meaningful standard of comparison these figures have little information content. Because of some conceptual and procedural similarities I therefore contrast the sample characteristics with those of the high-potential nascent projects in the Australian CAUSEE project. As can be seen from Table 3-2, both samples are comparable in terms of the sophistication of the projects and whether they belong to a growing-friendly industry. In terms of human capital, the founders in the present sample of high-potential nascent projects have less management and start-up experience compared to founders in the CAUSEE project. This difference might be due to the communistic history of Thuringia (as part of Eastern Germany), which has limited the accumulation of business-related experience.

Due to a number of exclusions,[18] the analysed sample consists of 95 projects. The size of this sample is comparable to the CAUSEE high-potential nascent sample as well as to subsamples of the innovative projects in PSED I (Liao & Welsch, 2008) and the Swedish PSED (Samuelsson & Davidsson, 2009). The structured interviews covered a broad set of questions regarding socio-demographic and psychological data of the founders as well as the project. Some of this data trace back to founders' adolescence and are therefore subject to memory decay and hindsight bias (Davidsson, 2006). To ensure validity of these data the research team utilised mnemonic techniques drawn from the Life History Calendar method (Caspi et al., 1996). To be more precise, the research team employed a study-specific version of the Life History Calendar, which is a data-collection tool established in sociological and psychological research. It is based on the principles of the autobiographic memory. This means that, in a first step, interviewees were asked about the timing of well-known life events, sequences, and transitions (e.g., marriage, birth of children, education, or professional life). In a second step, these events served as anchors for the recall of the retrospective study variables. This method has been shown to collect more valid and reliable retrospective information than traditional questionnaires (Belli et al., 2004). The focus on projects in a single region (the German federal state of Thuringia) further allows the holding of constant key labor market and environmental conditions.

3.3.2 Dependent Variable – Nascent Project Progress

In the first part of the empirical analysis I try to explain variance in the earnings of nascent entrepreneurs. Since these projects are by definition still in gestation and I analyse data of the first wave of interviews, traditional performance

[18] Two projects that turned out to be non-independent start-ups were deleted from the sample. In three cases refusals for several variables led to a removal of these cases from the sample.

indicators such as growth in earnings and being profitable can not be applied. However, recent research indicates that making *progress* operationalised as the sum of gestation activities in the venture creation process might be a valid ex-ante indicator for entrepreneurial earnings. From an emergency perspective, as more gestation activities are undertaken, the more the emerging venture takes shape or becomes manifest (e.g. Gartner, 1993; Katz & Gartner, 1988), enabling the project to act as a complete venture, organise production and finally sustainably create economic value as well as generate earnings for its founders. Empirical evidence supports this view, as the number of activities undertaken are strong predictors for project continuation (e.g. Carter et al., 1996; Shane & Delmar, 2004) and achieving initial sales (e.g. Brush et al., 2008b). Also note that making *progress* in the venture creation process is consistently used as a performance measure among nascent ventures (Liao & Welsch, 2008; Davidsson & Honig, 2003; Alsos & Kolvereid, 1998). In the present study, *progress* indicates at the project level the sum of up to a maximum of 32 gestation activities (see Table 3-3 for a list) initiated or completed (as reflecting the particular question) within the new venture project.

3.3.3 Dependent Variable – Balanced Skills

The second part of the analysis deals with the origins of the nascent entrepreneur's balanced skill set. As an indicator for balanced skills I use the *variety of functional background* of the entrepreneurs, which is measured by the number of functional areas in which they had work experience prior to the first gestation activities. Similar measures have been successfully used in previous research studying the jack-of-all-trades hypothesis (Wagner, 2006a; Wagner, 2006b; Lazear, 2005). The same categories were also used in the PSED II questionnaire to assess the primary role of the nascent entrepreneurs within the emerging business.

Although the majority of high-potential projects are usually initiated by teams, I chose the individual as the level of analysis, because Lazear's theory is also formulated at the individual level. Accordingly, the majority of the explanatory variables relate to the interviewed nascent entrepreneur and not to the complete start-up team as a whole.

Table 3-3: Gestation Activities Initiated or Completed Within the Venture Creation Process

1. Development of product/service idea or concept in process	12. Asking financial institutions or other people for funds	23. Applied for membership of a trade or industry association
2. Product/service ready for sale	13. Received funding successfully	24. Joined face-to-face business networks
3. Collecting information on competition	14. Established an exclusive bank account	25. Purchasing or leased raw materials, and minor equipments
4. Defining market opportunities	15. Permits and licenses in process	26. Established supplier credit
5. Organising a start-up team	16. Taken business classes or workshops	27. Purchased or leased major items for production and R&D
6. Writing a business plan	17. Dedicated web page online	28. Started marketing or promotion efforts
7. Revising the business plan in major parts	18. Enrolled at the trade register [Handelsregister]	29. Established dedicated phone line
8. Developing financial projections	19. Conducted the business registration or received tax licenses	30. Hired employees
9. Application for patents, copyrights, trademarks in process	20. Talked to potential customers	31. Achieved first sales
10. Devoted full-time to start-up effort	21. Determined regulatory requirements for the business	32. Revenues exceeded expenses
11. Looking for a business location	22. Received government funding for R&D projects	

Table 3-4: Overview of Variables

Variables	Operationalisation
Progress	Count of gestation activities initiated (max = 32). See Table 3-3 for a complete list.
Variety of functional background	Count of categories with working experience prior to the first gestation activities for the individual entrepreneur. Six possible categories: 1=Management, 2=Marketing/Sales/Promotion, 3=Accounting/Controlling/Financing, 4=Engineering/R&D, 5=Production, 6=Personnel.
Entrepreneurial experience	Count of years with experience as a business owner prior the first steps into the venture creation process for the individual entrepreneur.
Managerial experience	Count of years with experience in executive positions (netting out years of entrepreneurial experience) prior to the first gestation activities for the entrepreneur.
Work experience in young and small firms	Dummy: 1=Entrepreneur with work experience in companies younger than four years and less than 20 employees prior to the first gestation activities.
Variety in university curricula	Count of fields in which the entrepreneur had studied. The fields are 1) Natural sciences and medicine, 2) Engineering and computer science, 3) Business administration and economics, 4) Others. Where the entrepreneur did not receive university education I recoded the variable as zero.
Team size	Number of team members who were actively involved in the venture creation process + (expected) ownership of a part of the venture.
Knowing entrepreneurs	Dummy: 1=Entrepreneur knew personally other entrepreneurs or business founders.

Table 3-4 continued

Variables	Operationalisation
Public advice	Count of fields in which the interviewee received advice from public institutions in the venture creation process. The fields include 1) business plan, 2) financing, 3) analysis of the market and competition, 4) management, and 5) formalities in the founding process.
Time invested	Number of months in which the solo-entrepreneur or all start-up team members worked full time (+40h per week) for the project (project level).
Time since initiation	Number of months since the first two gestation activities were initiated.
Financial capital invested	Financial capital invested in the project at 1,000 euros (project level). Because of its non-normal distribution the logarithmised value of this variable is used
Service project	Dummy: 1=Project plans to offer mainly services; otherwise=0 (project level).
Industry dummies	Categories: 1) ICT, 2) (Opto)electronics, hardware, measurement instrumentation, 3) Quality management, consulting, professional training, marketing services, 4) Biotechnology, pharmaceutics and chemical industry, 5) Automation technology, mechanical engineering, 6) Process engineering, 7) Environmental technology, Energy management, 8) Construction, 9) Miscellaneous (project level).
Age	Age of founder in years.
Gender	Dummy variable: 1=male, 0=female.
Openness	Openness to experience (e.g., “conventional vs. inventive”; α = .61) is measured by nine bipolar items with answers ranging from (0) to (5). I use the mean of the respective nine items to compute openness.
Extraversion	Extraversion (e.g., “uncommunicative vs. talkative”; α = .77) is measured by nine bipolar items with answers ranging from (0) to (5). I use the mean of the respective nine items to compute extraversion.
Agreeableness	Agreeableness (e.g., “good-natured vs. cranky”; α = .63) is measured by nine bipolar items with answers ranging from (0) to (5). I use the mean of the respective nine items to compute agreeableness.
Conscientiousness	Conscientiousness (e.g., “lazy vs. diligent”; α = .83) is measured by nine bipolar items with answers ranging from (0) to (5). I use the mean of the respective nine items to compute conscientiousness.
Neuroticism	Neuroticism (e.g., “vulnerable vs. robust”; α = .78) is measured by nine bipolar items with answers ranging from (0) to (5). I use the mean of the respective nine items to compute neuroticism.
Variety in early interests	14 items indicating inventive behaviour were used. More precisely it was asked: At the age of 14/15 how often did you create or invent something new in the area of 1) Music (e.g. new songs), 2) Writing (e.g. new stories), 3) Painting (e.g. new pictures), 4) Technical constructions, 5) Repairing something (e.g. bike), 6) Woodwork (e.g. carving), 7) Recipes, 8) Handiworks (e.g. stitching), 9) Gardening, 10) Magic (e.g. new tricks), 11) Chemistry (e.g. experimenting with chemicals), 12) Games (e.g. inventing new games), 13) Decoration (e.g. new decorations for tables), 14) Construction (e.g. treehouse). Answers ranging from never (1) to very often (5). Finally, *variety in early interests* is computed as a composite score by counting the number of items in which the nascent entrepreneur engaged often and very often in adolescence (values 4 and 5).

3.3.4 Explanatory Variables – Nascent Project Progress

The major explanatory variable in the first part of the analysis is the *variety of functional background*, indicating a balanced skill set. The rich dataset offers the

opportunity to control for an array of other factors explaining nascent project progress (see Table 3-4 for a detailed description). Nascent entrepreneurs' human capital is arguably one of the most researched success factors, though a recent review revealed that many human capital indicators are only weakly correlated with nascent project success (Davidsson & Gordon, 2009). Nevertheless, I control for years of prior *entrepreneurial experience* and years of prior *managerial experience* (e.g. Tornikowski & Newbert, 2007; Shane & Delmar, 2004).[19] I also control for the *variety in university curricula* of the entrepreneurs and whether or not the entrepreneurs had prior *work experience in young and small firms*.

Research has shown that social capital affects progress in the venture creation process (e.g. Davidsson & Honig, 2003). Hence, I include *knowing entrepreneurs* as a control variable. As another indicator for social capital, I account for *public advice* from public consulting in trade chambers and technology transfer offices of universities (e.g. Parker & Belghitar, 2006).

Also, following past research in nascent entrepreneurship (Samuelsson & Davidsson, 2009) Senyard et al., 2009; Parker & Belghitar, 2006), I include control variables referring to the *time invested* and the *financial capital invested* by the founders into the project, the *time since initiation* of the project, and *team size*.[20] I finally control for possible differences between industrial and *service projects* and the *industry* sector. Note that the controls described in this paragraph are assessed at the level of the project.

3.3.5 Explanatory Variables – Balanced Skills

In the second part of the analysis I focus on origins of balanced skills among nascent entrepreneurs. Main explanatory variables related to vocational background of the entrepreneurs are prior *entrepreneurial experience,* prior *leadership experience*, prior *working experience*, *variety in university curricula* of the entrepreneurs, and prior *work experience in young and small firms* as hypothesised above. To control for life-cycle effects I include *age* of the entrepreneurs as an explanatory variable (Wagner, 2006a).

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[19] As both of these variables were also used as criteria in the screening procedure, the sample consists of projects whose leading entrepreneurs tendentially have managerial and entrepreneurial experience. Although this might give rise to the concern of missing variance in these variables, the descriptive statistics in Table 3-5 do not support this conjecture.

[20] Thereby a start-up team is defined as two or more persons who have been actively involved in the venture creation process and own or expect to own a part of the new venture (Liao et al., 2009).

Variety in early interests of the participating lead entrepreneurs is based on their inventive behaviour in out-of-school activities at the age of 14 or 15. Note that leisure activities are frequently used to rate adolescents' performance (e.g. Holland & Nichols, 1964; Hong et al., 1993; Schmitt-Rodermund, 2007), since they are intrinsically motivated activities requiring intellectual abilities, task commitment, and persistence (Bloom, 1985; Hong et al., 1993). Super (1984) views leisure activities as explorative and educational in which youths can learn about themselves and develop early occupation-related skills. Within the Thuringian Founder Study the research team developed 14 items to assess inventive behaviour in various areas such as construction, music, games, writing, magic, handiworks, etc. Using the mnemonic technique (memory anchors) described in Section 3.3.1, the participants were asked to rate the level of their inventive behaviour (1=never vs. 5=very often). Following Schmitt-Rodermund and Vondracek (1999), I compute *variety in early interests* as a composite score by counting the number of items in which the nascent entrepreneur in adolescence engaged often and very often (values 4 and 5).

The Big Five personality traits *openness to experience*, *extraversion*, and *agreeableness* are assessed using a well-validated German questionnaire (Ostendorf, 1990). Note that I assess the personality traits at the date of the interview. However, longitudinal studies found broad personality traits to be remarkably stable over long time periods (for a review see Caspi et al., 2005), making them a valid predictor of vocational behaviour. I also control for the remaining two Big Five personality traits *conscientiousness* and *neuroticism*, which are assessed by the questionnaire described above. Cronbach alpha coefficients exceeding .6 for all of these traits indicate internal consistency of the scales.

Research has shown that men are more overconfident then women (e.g. Barber & Odean, 2001). This might lead men to report having more varied functional experience than women. To control for this potential bias I include *gender* as a variable.

Table 3-5: Descriptive Statistics and Correlations

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1) Progress	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Variety of functional background	**.32**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(3) Entrepreneurial experience	.14	**.31**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4) Managerial experience	.17	**.38**	-.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5) Work experience in young and small firms	.16	.15	.17	-.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(6) Variety in university curricula	-.02	.05	-.10	.08	-.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(7) Team size	**.30**	.02	.07	-.03	.11	.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(8) Knowing entrepreneurs	.11	.19	.16	.10	.16	-.13	-.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(9) Public advice	.14	.17	**-.22**	-.09	-.02	.10	.01	-.13	-	-	-	-	-	-	-	-	-	-	-	-	-
(10) Time invested	**.55**	.03	.17	.19	.00	.00	.16	.15	.04	-	-	-	-	-	-	-	-	-	-	-	-
(11) Time since initiation	**.35**	**.20**	**.46**	.05	.18	-.19	.10	.06	-.07	**.27**	-	-	-	-	-	-	-	-	-	-	-
(12) Financial capital invested (ln)	**.60**	**.31**	.13	.16	.19	.06	.20	.10	-.03	**.30**	**.30**	-	-	-	-	-	-	-	-	-	-
(13) Service project	-.04	.12	-.01	-.09	-.10	-.03	.12	-.11	-.04	-.07	.14	.07	-	-	-	-	-	-	-	-	-
(14) Age	.07	**.42**	**.40**	**.55**	-.06	-.12	-.14	.04	**-.23**	.14	**.38**	.16	.10	-	-	-	-	-	-	-	-
(15) Gender	.06	.15	.07	.08	.09	.09	.12	.08	-.05	.05	.09	**.21**	-.04	.12	-	-	-	-	-	-	-
(16) Openness	.07	-.01	.06	-.08	.02	.13	**.25**	.05	-.06	.07	-.10	-.10	-.14	**-.21**	-.20	-	-	-	-	-	-
(17) Extraversion	.20	.14	.09	.19	.13	.11	.15	.08	-.06	.20	.09	.13	.04	.10	-.01	**.37**	-	-	-	-	-
(18) Agreeableness	.06	-.11	.05	.11	-.15	-.06	-.02	-.06	.05	.12	.11	-.00	.09	**.30**	.19	.10	.11	-	-	-	-
(19) Conscientiousness	-.11	.15	.04	.15	-.07	.01	**-.20**	.00	-.10	.08	.09	-.07	-.09	.13	-.11	.04	**.27**	.00	-	-	-
(20) Neuroticism	**-.20**	-.11	-.10	**-.25**	.03	-.19	-.15	-.03	.03	-.14	-.13	-.12	-.05	-.19	-.11	-.20	**-.46**	**-.23**	**-.43**	-	-
(21) Variety in early interests	.13	**.22**	.18	**.25**	.04	.18	.04	.05	.08	.17	**.20**	.11	-.08	**.35**	.15	.10	**.29**	.19	.00	**-.23**	-
Mean	15.14	3.22	3.24	2.55	0.40	1.15	2.42	0.89	1.42	12.37	37.33	9.10	0.32	36.45	0.89	3.49	3.18	3.16	3.48	1.42	3.82
SD	5.55	1.62	5.84	5.86	0.49	0.58	1.27	0.32	1.57	16.43	28.38	3.74	0.47	9.96	0.32	0.50	0.65	0.49	0.65	0.54	2.14

Note: Correlation coefficients displayed in bold are significant at the 5% level.

3.4 Results

3.4.1 Descriptive Results

Table 3-5 presents descriptive statistics and correlations for all variables used in the statistical analyses. The nascent projects in the sample conducted on average 15 out of a possible 32 gestation activities before the first interview. This number suggests that we seem to "catch" many of the projects in the middle of the venture creation process. As the research team utilised different sources to get in contact with the nascent entrepreneurs, one concern about the sample is its heterogeneity. Employing the Kruskal-Wallis equality-of-populations rank test, I indeed find statistically significant differences concerning the number of activities initiated (χ^2 = 33.5, p < .01).[21] In order to account for these differences in the regressions, I use *time invested* and *time since initiation* as control variables.

Regarding the major variable of interest – *variety of functional background* as indicator of the balanced skill set – the entrepreneurs have on average experience in 3.3 functional areas (sd = 1.6). These differences might also be an artefact of the utilisation of the different sources in the construction of the dataset. However, the results of the Kruskal-Wallis equality-of-populations rank do not support this concern (χ^2 = 8.0, p = .33), allowing me to safely proceed with the test of the hypotheses.

3.4.2 Regression Analysis and Results

In order to test the hypotheses, I employ the following empirical strategy. The dependent variables – *progress* of the project and *variety of functional background* of the nascent entrepreneur – involve count data. Descriptive statistics in Table 3-5 reveal that for *progress* the variance exceeds the mean suggesting the presence of overdispersion (Hausman et al., 1984). However, a likelihood ratio test does not provide evidence for overdispersion, suggesting the use of a Poisson model. Another concern is the absence of zeros in the dependent variable progress, which is due to the construction process of this variable.[22] Thus, I use a zero-truncated Poisson model for regression analysis below.

Regarding the *variety of functional background* of the interviewed nascent entrepreneur, the descriptive statistics show that the mean exceeds variance, which

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[21] In more detail, especially the projects stemming from the elevator pitches and the sample of young innovative companies tend to have more activities initiated. In contrast, projects from the sample of scientists and technology transfer offices tend to be captured comparatively early in the venture creation process.

[22] Progress in the project is recorded at a minimum of at least one activity initiated or completed in the venture creation process.

Table 3-6: Performance Effects of Balanced Skills

	Dependent variable: Progress in the venture creation process			
	Model I		Model II	
	β	mfx	β	mfx
Balanced skill set				
Variety of functional background	----	----	0.077 *** (3.77)	1.123
Individual level controls				
Entrepreneurial experience	-0.003 (-0.06)	-0.005	-0.006 (-1.01)	-0.084
Managerial experience	0.006 (1.36)	0.092	-0.003 (-0.56)	-0.043
Work experience in young and small firms	0.051 (0.82)	0.754	0.009 (0.14)	0.133
Variety in university curricula	-0.012 (-0.24)	-0.179	-0.018 (-0.35)	-0.257
Knowing entrepreneurs	0.010 (0.09)	0.141	-0.022 (-0.20)	-0.316
Public advice	0.049 ** (2.47)	0.713	0.052 *** (2.63)	0.763
Project level controls				
Team size	0.070 ** (2.98)	1.023	0.077 *** (3.27)	1.120
Time invested	0.007 *** (3.57)	0.095	0.008 *** (4.08)	0.111
Time since initiation	0.002 (1.53)	0.028	0.002 (1.57)	0.029
Financial capital invested	0.000 ** (2.47)	0.001	0.000 ** (2.07)	0.001
Service project	-0.094 (-1.27)	-1.356	-0.111 (-1.49)	-1.158
Industry dummies	Yes *		Yes *	
Intercept	2.289 *** (13.67)		2.084 *** (11.78)	
LR χ^2	96.01 ***		109.66 ***	
Pseudo R^2	0.153		0.175	
AIC	571.46		559.81	
N	95		95	

Notes: Zero-truncated Poisson regression; β=regression coefficients, z-values in parentheses; mfx=marginal effects; *** (**,*) denotes a significance level of 1% (5%, 10%).

violates the assumptions of Poisson models. If this is the case, the standard errors of parameters will be overestimated, resulting in spuriously lower levels of statistical significance (Winkelmann & Zimmermann, 1994). An examination of the ratio of the deviance statistics to the degrees of freedom indeed provides support for the notion of underdispersion. In order to correct for this bias, I follow the recommendations of

Table 3-7: Origins of Balanced Skills

	Dependent variable: Variety of functional background							
	Model I		Model II [a]		Model III		Model IV	
	β	mfx	β	mfx	β	mfx	β	mfx
Investment hypothesis								
Entrepreneurial experience	0.016** (1.97)	0.052	0.156** (2.52)	0.043	-----	-----	0.014* (1.69)	0.045
Managerial experience	0.021** (2.48)	0.067	0.022*** (3.18)	0.060	-----	-----	0.023** (2.51)	0.071
Work experience in young and small firms	0.152 (1.60)	0.493	0.269*** (4.03)	0.774	-----	-----	0.157 (1.53)	0.500
Variety in university curricula	-0.031 (-0.39)	-0.100	0.101** (2.21)	0.228	-----	-----	-0.028 -(-0.34)	-0.088
Endowment hypothesis								
Openness	-----	-----	-----	-----	-0.025 (-0.24)	-0.082	-0.082 (-0.86)	-0.259
Extraversion	-----	-----	-----	-----	0.035 (0.37)	0.114	0.152 (1.32)	0.476
Agreeableness	-----	-----	-----	-----	-0.177* (-1.75)	-0.570	-0.260** (-2.47)	-0.816
Variety in early interests	-----	-----	-----	-----	0.052** (2.13)	0.168	0.029 (1.10)	0.090
Controls								
Age	0.006 (0.91)	0.019	0.015*** (3.06)	0.040	-----	-----	0.006 (0.79)	0.019
Gender	0.175 (1.09)	0.523	0.075 (0.73)	0.202	0.294* (1.66)	0.852	0.300* (1.74)	0.840
Conscientiousness	-----	-----	-----	-----	0.113 (1.30)	0.364	0.108 (1.34)	0.340
Neuroticism	-----	-----	-----	-----	-0.048 (-0.41)	-0.156	0.028 (0.25)	0.088
Intercept	0.655**		0.140		0.925		0.600	
Deviance	57.90		148.04		66.59		53.48	
Pearson	55.70		142.71		62.62		50.56	
BIC	-342.7		-1051		-329.6		-319.9	
N	95		228		95		95	

Notes: Generalised event count model; β=regression coefficients, z-values in parentheses; mfx=marginal effects; *** (**,*) denotes a significance level of 1% (5%, 10%); [a] Some of the nascent projects are team started. Thus, Model III uses an extended data set including not only the interviewed leading nascent entrepreneur of a project, but also all other nascent entrepreneurs.

Winkelmann and Zimmermann (1994) to use a generalised event count model with adjusted standard errors for the data analysis.[23]

[23] Running standard Poisson regressions or OLS-regressions instead of the generalized event count model provides comparable results, which are available from the author on request.

Results Concerning the Effects of Balanced Skills

The first part of the analysis concerns the effect of balanced skills as indicated by the *variety of the functional background* of the nascent entrepreneur on the progress of nascent projects (Models 1–2 in Table 3-6). Model 1 includes all explanatory variables with the exception of *variety of functional background* of the interviewed entrepreneur. In this model, the amount of *time invested* ($p < .01$), and the amount of *financial capital invested* ($p < .01$), as well as receiving *public advice* ($p < .05$) and having a *team* of larger *size* ($p < .05$) affect the *progress* of the nascent project. Neither *knowing entrepreneurs* nor any of the human capital variables – *entrepreneurial experience*, *leadership experience*, *working experience*, and *work experience in young and small firms* – or the *variety in university curricula* turn out to be statistically significant. Model 2 adds the core independent variable to the regression. In support of Hypothesis 1, I find *variety of the functional background* to be positively associated ($p < .01$) with the progress of the project. According to marginal effects, the balanced skill set of an entrepreneur is one of the strongest predictors of making *progress* in the venture creation process.

Results Concerning the Origins of Balanced Skills

After having found support for the notion that balanced skills are related to the success of nascent projects, I now turn to the origins of the balanced skills. Table 3-7 (Models 1–4) presents results of generalised event count model regressions using the *variety of the functional background* of the nascent entrepreneurs as the dependent variable. The analysis is carried out in three steps. First (Models 1–2), I test for the variables associated with the investment hypothesis (Hypotheses 2x). In the second step, variables associated with the investment hypothesis are included, i.e., *personality traits* (Hypotheses 3x) and *variety of early interests* (Hypothesis 4) of the interviewed nascent entrepreneur (Model 3). Third and finally (Model 4), I look at the combined impact of all variables.

Concerning the impact of work and schooling experience (investment hypothesis) on the *variety of the functional background*, I find several significant estimates. According to the results of Model I, *entrepreneurial experience* ($p < .05$) and *managerial experience* ($p < .05$) predict nascent entrepreneurs' variety of functional background. This supports the respective Hypotheses 2a and 2b. Recall that this regression is based on data of the solo entrepreneur or the lead entrepreneur of a new venture team. In the case of team start-ups, by definition more than one entrepreneur is involved in venture creation. Adding these additional

observations[24] and exploiting this expanded data set in Model 2 strengthens the results of the previous model. However, *work experience in young and small firms* ($p < .01$) and more *variety in university curricula* ($p < .05$) also relate to the nascent entrepreneurs' variety of functional background. Because the coefficients of these two variables were not significant in Model 1, I conclude the respective Hypotheses 2c and 2d to be only partially supported.

Turning to the variables associated with the endowment hypothesis, as expected (Model 3) *variety in early interests* ($p < .05$) successfully predicts nascent entrepreneurs' *variety of functional background*. Among the personality traits only agreeableness had a significant ($p < .1$) impact on the functional background variety of nascent entrepreneurs. Contrary to expectations, the regression coefficients for *openness to experience* fail to reach statistical significance. Among the control variables only *gender* ($p < .1$) and not *conscientiousness* and *neuroticism* showed significant effects.[25]

As a final step, all variables were entered into the analysis to explore the origins of balanced skills (Model 4). Again, *entrepreneurial experience* ($p < .1$) and *managerial experience* ($p < .05$) are positively associated with nascent entrepreneurs' *variety of functional background*. Concerning the impact of personality traits, *agreeableness* ($p < .05$) continued to have a significant impact on the variety of functional background. Thus, I conclude Hypothesis 3c – stating lower levels in agreeableness are associated with a balanced skill set – to be supported. However, the expectations concerning openness to experience (H3a) and extraversion (H3b) could not be supported. The coefficient of *variety in early interests* turns insignificant in Model 4 when including the variables on subsequent vocational choice. However, given the significant impact of the variable in the reduced Model 1, I conclude the respective Hypothesis 4 – stating higher *variety in early interests* at the time of adolescence is associated with a balanced skill set – to be partially supported.

The reported results are robust to an array of alternative specifications of the models and variables used.[26] First, I also consider the variables associated with the endowment hypothesis as predictors for nascent project progress. While I do not have any theoretical arguments to expect any particular relationships, the respective coefficients turn out to be insignificant, leaving size, direction, and significance levels

[24] The respective information was provided by the interviewed leading entrepreneur of the team.
[25] I do not control for age in Model 3, because age reflects all kinds of occupational experience and is thus correlated with variables used in the investment hypothesis (e.g. managerial experience and entrepreneurial experience). In Model 3 I intend to solely focus on variables associated with the endowment hypothesis.
[26] The respective results are available from the author on request.

of the original variables generally intact. Second, computing variety of functional background as an indicator for balanced skills at the project level (across all start-up team members) does not change the results in the regression on progress of the nascent project. On the other hand, one concern relates to the relationship between the variables *years of prior managerial experience* and *functional background variety*. Because one sub-category of balanced skill is managerial skills (whether or not the interviewee had prior work experience in the field of management), due to the construction method some shared variance exists between both variables. However, running the same regressions (as in Tables 3-6 and 3-7) with a modified *variety of functional background* variable, which excludes the domain of managerial skills, does not change the respective results.

3.5 Discussion

The objective of this chapter was to examine the effects and origins of balanced skills among nascent entrepreneurs. Regarding the first research question, I extended a recently proposed economic theory (Lazear, 2005) to model performance effects of balanced skills. Concerning the second topic, I combined recent advancements in the fields of entrepreneurship and developmental psychology research to present a more holistic view of the origins of balanced skills among nascent entrepreneurs. In doing so, this chapter contributes above all to human capital theory.

Consistent with the predictions from the theoretical model, balanced skills of the nascent entrepreneur are positively related to the progress of high-potential nascent projects in the venture creation process. This aligns with the original work from Lazear and other scholars, who reported associations between a balanced skill set and the likelihood of becoming an entrepreneur (e.g. Lazear, 2004; Wagner, 2003; Silva, 2007). It is also consistent with work from Oberschachtsiek (in press), who shows balanced skills to positively predict self-employment duration. Taking these findings together, balanced skills appear to be an important success factor throughout the entrepreneurial process.

Moreover, given the results of the present study, balanced skills seem to outperform traditional human capital indicators such as *managerial experience* and *entrepreneurial experience*, whose explanatory power in nascent entrepreneurship research has been recently questioned (Davidsson & Gordon, 2009). Accordingly, no effects of these two factors on project success were found in the present study. The limited performance of these variables can be explained by the investment hypothesis tested above. *Managerial experience* and *entrepreneurial experience* are

human capital investments, whereas balanced skills are more an *outcome* of human capital investment. This view is supported by Unger et al. (2009), who found in a meta-analytic review a stronger relationship between outcomes of human capital investments and entrepreneurial success than between human capital investments and entrepreneurial success. Accordingly, balanced skills might be seen as a more direct and proximal indicator of human capital.

Finally, I examined factors associated with the endowment hypothesis to explain the unintentional accumulation of balanced skills. As expected, I found evidence that the *variety in early interests* during nascent entrepreneurs' adolescent years is related to a balanced skill prior to initiating the nascent venture project. Among the Big Five personality traits, only lower levels of *agreeableness*, and not *openness* and *extraversion*, were significantly correlated with balanced skills. One reason for this unexpected result might be that personality traits affect the development in even earlier stages of an individual's development than adolescence. For example, they might impact age-appropriate manifestations of variety in early interests at the age of six or seven, which in turn affects individual development later on. Nevertheless, the findings taken together suggest a balanced skill set to be deeply rooted in the development and the personal characteristics of a nascent entrepreneur. This result is in line with findings in developmental research showing that early competences and personality traits have no direct, but rather indirect, effects on economic relevant outcomes such as entrepreneurial intentions (Obschonka et al. 2010) and venture survival (Schmitt-Rodermund, 2004).

Comparing the predictive ability of the investment hypothesis and the endowment hypothesis, the latter seems to outperform the former. In particular, the regression investigating the endowment hypothesis (Model 3 compared to Model 1 in Table 3-7) fit the data slightly better, as indicated by a higher value for Schwarz's (1978) Bayesian information criteria (BIC). The highest goodness of fit, however, is observed for the combined Model 4. Although the dataset used in this study does not contain the same level of very detailed information on the timing of skill accumulation as Silva's (2007) study on Italian employees, the results of the present study raise doubts on the generalisability of Silva's conclusion that a balanced skill set is purely attributable to an innate ability. On the contrary and as Lazear (2005) originally suggested, conscious human capital investment in a balanced skill set by work and schooling experience fostering the acquisition of various experience seems to play an important role. Above and beyond this basic comparison, the findings give rise to the conjecture that the investment and endowment view are substantially intertwined and hard to disentangle. For example, as balanced skills

are linked with psychological characteristics, the same might be true for the variables associated with the investment hypotheses such as variety in university curricula, managerial experience, and working in small and young firms. Although a thorough investigation of these relationships was beyond the scope of the present chapter, a brief look in the correlation matrix (Table 3-5) reveals that higher levels of *variety in early interests* is correlated with *managerial experience*.

For prospective nascent entrepreneurs, the present study suggests that a balanced skill set is important to advance the nascent venture project, and might be best acquired by starting a venture, working in management positions, and working in young and small companies. Another way to achieve a balanced skill set resides in learning processes, as skills are not only a product of experience in tasks but also of education and training (Markman, 2003). In particular, vicarious learning by attending seminars, workshops, and other structured educational experiences such as formal university training might be a useful way to fill knowledge gaps (Chandler & Lyon, 2009). Referring to this, the present study speaks in favor of including elements of interdisciplinary cooperation in entrepreneurship education and training. Educational programs including elements from marketing, engineering, financing, law, and management – to name just a few – would provide students with an opportunity for interdisciplinary learning and facilitate their entry into jobs rich in a variety tasks. In this way, prospective entrepreneurs would be better prepared for setting up businesses.

This analysis has several limitations which might however stimulate promising questions for future investigations. First and most importantly, the data were collected during the venture creation process and so many variables were collected retrospectively. Although the research team adopted the Life History Calendar method to facilitate the recall process and to ensure validity of the data (Belli et al., 2004; Caspi et al., 1996), longitudinal approaches are needed to strengthen causal inferences regarding the relationships observed. The fact that, in the present analyses, individual characteristics prior to the start of the venture creation process are linked to subsequent nascent venture progress suggests that causality might work in the direction hypothesised: balanced skills promote nascent venture progress. This problem of causality is even more severe for the relationship between vocational history and the balanced skill set, because the dataset does not include any information on when specific skills were acquired. It might be the case that a nascent entrepreneur already possessed skills in various areas and therefore was promoted to a managerial position. Second, in the present chapter, common-method bias might result from the use of self-reported data from the same source,

namely the lead entrepreneur of a team or the solo entrepreneur. Regarding the performance measure progress used in this study, secondary data from external business information providers do not exist for most projects. A third caveat is that this analysis is limited to high-potential nascent projects in the German federal state of Thuringia. This might raise the question of transferability of results to other national contexts. However, the dataset is comparable in scope with the internationally leading CAUSEE project, and the formal model on balanced skills presented in this chapter is not country-specific. Rather, the concept is based on international scholarly work and the findings are in line with other studies carried out elsewhere with different groups. Finally, because of data restrictions I only used progress in the venture creation process as an indicator for entrepreneurial earnings in the analyses. By considering other success indicators such as achieving sales or profitability, future studies might add to the growing body of empirical evidence on performance effects of balanced skills.

3.6 Conclusion

Besides these limitations, this study contributes to the entrepreneurship literature and human capital theory by proposing a formal model of how balanced skills affect entrepreneurial earnings. Supporting the respective hypothesis I find that a balanced skill set of a nascent entrepreneur is an important predictor of the progress in the venture creation process. Regarding the controversially discussed question of whether balanced skills can be consciously acquired by nascent entrepreneurs or reflect an innate ability or specific individual characteristics, the present study finds support for both views.

4. Disentangling the Effect of New Venture Team Functional Heterogeneity on New Venture Performance

4.1 Introduction

It is widely acknowledged that entrepreneurship occurs as a shared effort with new firms more often being created by groups of people than by individuals (Davidsson & Wiklund, 2001; Francis & Sandberg, 2000; Gartner et al., 1994; Kamm et al., 1990). Entrepreneurial teams have recently been identified as an "omnipresent phenomenon" describing "the superior entrepreneurial start-up concept" (Lechler, 2001, p. 264). An emerging, though relatively limited, body of entrepreneurship literature has given ample empirical support to the notion that team start-ups indeed perform better than solo ventures (e.g., Chandler et al., 2005; Chowdhury, 2005; Ucbasaran et al., 2003). Accordingly, the apparent success of entrepreneurial teams can be attributed to the logic that particularly "high technology industries might require more skills than an individual would be likely to have, necessitating that individuals combine their abilities in teams in order to start an organisation successfully" (Gartner 1985, p. 703).

One of the most discussed team issues deals with the composition of successful teams, especially with regard to heterogeneity and homogeneity. In particular, the upper echelon theory (Hambrick & Mason, 1984) posits that characteristics of the members of top management teams drive venture performance. While most of this research has been conducted by analysing the impact of top management team heterogeneity on the performance of established companies, studies in the context of entrepreneurial teams are scarce (for notable exceptions see, e.g., Chowdhury, 2005; Liao et al., 2009). I attempt to fill this gap in the literature and provide empirical evidence regarding one specific characteristic of entrepreneurial teams that has been identified as a centrally important determinant of venture performance (Hambrick & Mason, 1984) – team members' functional experiences. A focus on functional experience heterogeneity acknowledges that individual team members carry their prior experiences across organisational settings. In my case, functional background therefore provides one useful and accessible indicator of the experiential resources housed within the start-up team.

Previous research examining the performance benefits of functional heterogeneity in teams has been decidedly equivocal, reporting positive relationships in some cases and negative or null relationships in others (e.g., Bantel & Jackson, 1989; Chowdhury, 2005; Hambrick et al., 1996). It is my contention that

this conflicting pattern of empirical evidence can be attributed to limitations in the theoretical and empirical assessment of functional team heterogeneity. Studies on team composition typically employ a unidimensional approach and rely on heterogeneity indices that tend to capture a net effect (see, e.g., Amason et al., 2006; Eisenhardt & Schoonhoven, 1990), not taking account of potentially countervailing influences of functional team heterogeneity on team performance. Recent studies provide some support for this argument. Reviewing the literature on functional team heterogeneity, Bunderson and Sutcliffe (2002) and Bunderson (2005) reveal different conceptualisations of functional heterogeneity yielding different implications for team outcomes. In their study on 45 top management teams from a Fortune 100 consumer products company, Bunderson and Sutcliffe (2002) also find empirical support for their conjecture of a positive and negative impact of functional heterogeneity on team processes and performance. Liao et al. (2009) further differentiate between a functional and a social view on founding teams' heterogeneity. Investigating the probability of setting up a new venture in a sample of nascent start-up teams, their results suggest that both theoretical perspectives differently affect the venture creation process.

The present chapter builds on these studies, but introduces a new conceptual approach to disentangle differential effects of functional team heterogeneity of start-up teams on subsequent new venture performance. Drawing on two established schools of thought, the cognitive resource perspective (Cox & Blake, 1991; Hambrick & Mason, 1984; Wiersema & Bantel, 1992) and similarity/attraction theories (Byrne, 1971; Hogg & Abrams, 1988; Tajfel & Turner, 1986), I model two separate heterogeneity dimensions. Related to the former perspective, the *knowledge scope* dimension captures the beneficial effects of functional team heterogeneity ascribed to the breadth of a team's cognitive resources. The *knowledge disparity* dimension relates to similarity/attraction theories. It captures the detrimental effects of functional team heterogeneity ascribed to social categorisation processes.

Given this theoretical foundation, I first aim to empirically separate the two heterogeneity dimensions *knowledge scope* and *knowledge disparity*. I then investigate the effects that both heterogeneity dimensions have on a team start-up's entrepreneurial performance (measured in terms of firm survival and employment growth) and innovative performance (measured in terms of the number of patent applications). Empirical estimations employing the traditional unidimensional approach further allow me to compare my newly-developed conceptualisation of team heterogeneity with the conceptualisation established in the team literature. For

my empirical analyses, I employ a unique dataset consisting of 337 team start-ups established between 1994 and 2006 in innovative industries in the German federal state of Thuringia. More specifically, I use information on the functional background experiences of each team member to develop new measures of start-up team heterogeneity.

The remainder of the chapter is organised as follows. In the next section, my conceptual model of new venture team heterogeneity and related hypotheses are set out. Section 4-3 is dedicated to the presentation of the data and the variables used. The empirical analysis is presented in Section 4-4. Section 4-5 discusses the findings, provides implications for theory and practice, and points out limitations of the present study. Finally, Section 4-6 concludes.

4.2 Conceptual Background

4.2.1 Theoretical Perspectives on the Heterogeneity-Performance Link

Research in organisational demography and small group behaviour provides two competing schools of thought that have been advanced in order to explain performance effects of team composition. On one side, the cognitive resource perspective argues for a positive effect of team heterogeneity on team performance (Hambrick & Mason, 1984; Wiersema & Bantel, 1992). Specifically, it is suggested that a team's composition is an indicator of its cognitive resources, that is, pooled sets of contacts, skills, information, and expertise available for the team to draw on. As stated by Milliken and Martins (1996, p. 404), "a group that is diverse could be expected to have members who may have had significantly different experiences and, therefore, significantly different perspectives on key issues or problems." Accordingly, as team heterogeneity increases, so do the team's cognitive resources. The wider breadth of cognitive perspectives and abilities is assumed to enhance information processing and encourage teams to be more effective solving complex, non-routine problems (Ancona & Caldwell, 1992; Bantel & Jackson, 1989; DeDreu & West, 2001; Hambrick et al., 1996).

On the other side, similarity/attraction theories propose that heterogeneity is detrimental to team performance (Byrne, 1971). Following this perspective, team members prefer to interact with and regard as attractive those individuals whom they perceive as similar to themselves. Team member heterogeneity on any attribute, thus, can decrease interpersonal liking, impede effective communication, and undermine team cohesiveness. Social identity theory and social categorisation

theory (Hogg & Abrams, 1988; Tajfel & Turner, 1986) make similar predictions about a heterogeneous team's functioning. These theories hold that, based on perceptions of similarities and differences, individuals subconsciously group themselves and others into social categories (defined, e.g., in terms of age, gender, tenure, function) when making judgments or decisions. Categorisation and social comparison, in turn, lead to favouring similar team members (their in-group), while distancing from dissimilar team members (the out-groups). These in-group/out-group biases (e.g., incumbent team members vs. "newcomers"; accountants vs. engineers) tend to give rise to negative team interaction patterns such as less commitment and more detrimental conflict and factionalism (Jehn et al., 1999; Pelled et al., 1999; Williams & O'Reilly, 1998).

In summary, heterogeneity may provide benefits for team performance, while it also involves the risk of incurring process losses (that may partly offset these advantages). This has been coined the "double-edged sword" of team heterogeneity (Milliken & Martins 1996), illustrating the lack of consensus on how team composition influences team outcomes.

In order to reconcile the controversy over whether team heterogeneity helps or hinders new venture performance, I build on recent theoretical and operational developments in the fields of top management team and entrepreneurial team research (Bunderson, 2005; Bunderson & Sutcliffe, 2002; Liao et al., 2009). In particular, I propose a two-dimensional approach to capture differential effects of new venture team heterogeneity. Focusing on the functional experience of each team member at the time of venture creation, this approach allows to model two separate heterogeneity dimensions which both affect subsequent team performance differently. Drawing from the cognitive resource perspective, the first dimension, *knowledge scope*, is defined as the breadth of a new venture team's knowledge stock. The second dimension, *knowledge disparity*, relates to similarity/attraction theories. It is defined as the deviation in the knowledge stocks of the individual team members.

4.2.2 Hypotheses

Knowledge Scope and Entrepreneurial Firm Performance

From a cognitive resource perspective, heterogeneity in team members' functional experience is likely to have a positive impact on new venture performance as it provides a diverse stock of knowledge, capabilities, and expertise upon which the team can draw on when pursuing entrepreneurial activities (Milliken & Martins, 1996; Randel & Jaussi, 2003). Consistent with this notion, Roure and Maidique

(1986) report that an entrepreneurial team's "completeness" – the degree to which key positions (e.g., marketing, engineering, finance) are staffed by experienced team members – is positively associated with survival and growth of the new firm. Ensley and Hmieleski (2005) find a positive relationship between an entrepreneurial team's functional heterogeneity and net cash flow and sales growth of the new venture. Furthermore, there is some evidence that start-up teams' functional experience shapes the competitive strategies, and ultimately performance, of new ventures (Boeker, 1989; Shane & Stuart, 2002; Shrader & Siegel, 2007). For example, a broad scope of functional experiences has been found to improve organisational responsiveness to competitors' actions (Hambrick et al., 1996) and to environmental shifts, caused, e.g., by technological discontinuities (Keck & Tushman, 1993). According to Hambrick et al. (1996, p. 665), the heterogeneous team has a broader potential behavioural repertoire and is able to "conceive and launch actions on many fronts." This is in line with research in the managerial cognition tradition, which let me believe that what external information the start-up team attends to and incorporates into strategic decision making is influenced by team members' expertise and prior knowledge (Cho & Hambrick, 2006; Ocasio, 1997).

Differing viewpoints, expertise, and opinions may also be the cause of disagreement about team tasks, producing cognitive or task-related conflict among team members (Jehn et al., 1999; Jehn, 1995; Pelled et al., 1999). Presumably, task-related conflict can be beneficial to new firm performance, for it is through their attempts to resolve such conflict that entrepreneurial team members are likely to find creative and effective solutions (Amason & Sapienza, 1997; Jehn 1995). Researchers suggest that task conflict promotes open and deliberate debate on ideas, which encourages greater cognitive understanding of the task issues at hand and culminates in improved team decisions (Amason, 1996; Ensley & Pearce, 2001; Ensley et al., 2002; Simons & Peterson, 2000).

Apart from intra-team processes, the scope of functional heterogeneity may also provide a signal to external stakeholders and investors about the new venture's growth prospects (Beckman et al., 2007). Foo et al. (2005), in a study on nascent start-up teams, reveal beneficial effects of team heterogeneity when presenting the business idea to external evaluators. Likewise, Zimmermann (2008) shows that higher levels of functional heterogeneity among team members enable firms to raise more capital at their initial public offering. She concludes that investors positively value breadth in the functional backgrounds as it may signal that the management

team has the talent to make the firm profitable and therefore a worthwhile investment.

Consequently, a heterogeneous start-up team in terms of a broader knowledge base should be more capable of identifying a viable business opportunity, building a resource base, and setting up and maintaining entrepreneurial activities. The corresponding hypothesis is formulated as follows:

H1a: A start-up team's knowledge scope is positively related to the new firm's entrepreneurial performance.

Knowledge Disparity and Entrepreneurial Firm Performance

Beside the advantages associated with heterogeneous functional experience stemming from knowledge scope, disparity in the functional background of start-up team members may negatively impact team performance. Consistent with similarity/attraction theories, potential problems of functionally heterogeneous teams have mainly been attributed to substantive disagreements among team members centering on differences in professional vocabularies, cognitive patterns, and styles (Drach-Zahavy & Somech, 2001; Lovelace et al., 2001). These problems might be particularly evident in innovative team start-ups that attempt to create and market entirely new products or services. As Amason et al. (2006) note, managing such novel environments requires team members to communicate frequently and share information through informal, face-to-face interaction. In a similar vein, Ensley et al. (1998) explain that the dynamic and uncertain nature of an entrepreneurial endeavour places a premium on smooth interaction and team effectiveness. Chatman and Flynn (2001) suggest that the more uncertain the environment the more prone people are to socialise with others that are similar. Related to these arguments is Mathieu et al.'s (2000) notion that team members must share similar mental models in order to anticipate each other's actions and to coordinate their behaviours, especially when time and circumstances do not permit overt and lengthy communication and strategising. Mental models "help people to describe, explain, and predict events in their environment" (Mathieu et al., 2000, p. 274). While the sharing of mental models enables team members to be "on the same page" during task execution and benefits team performance (Mathieu et al., 2000), differences can become a barrier for effective communication and understanding (Amason, 1996). Hence, start-up teams with disparate functional backgrounds may find it difficult to develop a shared understanding of team tasks, like the marketing of their

highly novel product, because of team members' divergent definitions of even basic terms such as "product" and "market" (Ancona & Caldwell, 1992).

Divergent perceptions on how the start-up team should operate in order to realise its goals further increase the likelihood that misunderstanding and misinterpretation triggers affective disputes among team members (Ancona & Caldwell, 1992; Eisenhardt et al. 1997; Ensley et al., 2002). Affective or relationship conflict derives from personal dislikes and animosities and can represent many aspects of dysfunctional interpersonal relationships, including suspicion and hostility (Amason & Sapienza, 1997; Jehn, 1995). In contrast to the previously mentioned task-related conflict, relationship conflict is considered detrimental to team performance (DeDreu & Weingart, 2003; Pelled et al., 1999). It limits the team's information processing ability because team members spend their time and energy focusing on each other rather than on task-related issues (Simons & Peterson, 2000).

To conclude, functional background heterogeneity in terms of divergences in team members' knowledge stocks has a negative effect on team performance by negatively impacting social interactions and cohesion between members of the start-up team. Hence, I expect:

H1b: A start-up team's knowledge disparity is negatively related to the new firm's entrepreneurial performance.

Knowledge Scope and Innovative Firm Performance

Functional heterogeneity also can be considered an important driver of innovation and creativity in organisations (Bantel & Jackson, 1989; Drach-Zahavy & Somech, 2001; Hambrick et al., 1996). Again in line with the cognitive resource perspective, a broad set of functional experience provides the team with unique information and perspectives, which may stimulate innovative team performance (Ancona & Caldwell, 1992; DeDreu & West, 2001). In related research, Cohen and Levinthal (1990) contend that a firm's ability to access and exploit new knowledge, which they label absorptive capacity, should be greater the more diverse the knowledge stocks held by individuals in the firm are. Heterogeneity in this respect facilitates organisational learning and the identification of new resource combinations that offer the potential for entrepreneurial profits (Hayton & Zahra, 2005). Moreover, by opening up constructive discussion (DeDreu & West, 2001) and encouraging "out-of-the-box" thinking (Lovelace et al., 2001), cognitive conflict appears to promote innovative team performance. Thus, all else being equal, start-

up teams with functional experience in different fields should be more capable of turning creative ideas and individually-held knowledge into new products, processes, and services.

There is some empirical evidence that supports this line of reasoning. For example, Bantel and Jackson (1989) observe, in a sample of managerial teams in the finance sector, that heterogeneity in relation to the functional area from which managers came was positively associated with the number of innovations adapted or developed by the firms. Ancona and Caldwell (1992) find that members of cross-functional product development teams communicated more frequently outside their teams, which led to more creative ideas. Smith et al. (2005) demonstrate that the rate of new product and service introductions in high-technology firms was a function of the firms' knowledge creation capabilities as measured by the scope of functional experiences in managers' and employees' knowledge stocks.

However, exposure to multiple functional perspectives may not per se help produce innovative output. At some point, the benefits of an increased knowledge base are expected to be offset by the team's difficulties in information processing (Cho & Hambrick, 2006; Milliken & Martins, 1996; Ocasio, 1997; Sethi et al., 2001). Accordingly, at the highest levels of a start-up team's functional background heterogeneity – i.e., the case of teams made up of individuals with entirely different professional histories – it is most likely that team members will not share a common frame of reference that would allow for the comprehension of others' divergent expertise and knowledge (van Knippenberg & Schippers, 2007). The lack of a common frame of reference to build on may impede interpersonal communication and information sharing, with innovative team performance suffering (Bunderson & Sutcliff, 2002; Nahapiet & Goshal, 1998; Van der Vegt & Bunderson, 2005). Conversely, at the lowest levels of a team's functional background heterogeneity, team members may share largely similar and redundant knowledge bases. Therefore, start-up teams low on heterogeneous functional experience are less likely to possess distinct perspectives that may eventually lead to more innovative output (DeDreu & West, 2001).

Taking the aforementioned arguments together, I suggest an inverse U-shaped relationship between the scope of the knowledge base of start-up teams and the innovative performance of the new firm. As knowledge scope increases from a low to a moderate level, the start-up's innovative performance increases. Beyond a moderate level, the scope of represented functional experience in the team has a negative effect on innovative performance. Thus, the following hypothesis applies:

H2a: The relationship between start-up team's knowledge scope and the innovative performance of the new firm is inverted U-shaped.

Knowledge Disparity and Innovative Firm Performance

In contrast, the social similarity and attraction approaches would suggest that heterogeneous start-up teams may generally be ineffective at capitalising on divergent knowledge and expertise with regard to innovation. Accordingly, increasing diversity in team members' functional backgrounds can induce social categorisation processes and in-group/out-group biasing (Van der Vegt & Bunderson, 2005; Williams & O'Reilly, 1998). The flipside of a positive bias toward one's own functional category is stereotyping and discrimination of team members with different functional backgrounds (Tajfel & Turner, 1986). For example, in a recent meta-analytic review, Mesmer-Magnus and DeChurch (2009) reveal that teams are more likely to share information when team members are highly similar to one another with respect to training and background characteristics. In the same line, Van Knippenberg et al. (1994) report that information was given more attention, seen as more accurate, and deemed as more trustworthy when provided by in-group team members, irrespective of the objective quality of the information. In fact, in functionally heterogeneous start-up teams the tendency may be to stereotype out-group members by assuming that they "just don't understand" and argue and defend rather than seek integration of different perspectives and ideas. Categorisation of team members into those belonging to a functional in-group and out-group may, thus, create a barrier to cooperative behaviour and may even stimulate competitive behaviour among members of the same team (Brewer, 1995). Maltz and Kohli (1996) report that perceived inter-functional rivalry (i.e., rivalry between marketing and non-marketing functions) reduce the willingness to provide, and to be receptive to knowledge exchange across functional boundaries while contact between cross-functional team members was restricted to formal meetings.

Thus, in functionally heterogeneous teams cooperation problems, distrust, and stereotyping may compromise team members' motivation to share knowledge and information. Existing research suggests however that information sharing is a crucial mechanism for translating functional heterogeneity into innovative team performance (Bantel & Jackson, 1989; Drach-Zahavy & Somech, 2001). Drach-Zahavy and Somech (2001) find that team members must exchange information, learn, negotiate, and motivate each other in order to make proper use of their divergent functional experience, and work effectively and innovatively.

In sum, due to processes associated with social categorisation, divergences in team members' knowledge stocks may become a liability diminishing team innovation. I therefore expect:

H2b: A start-up team's knowledge disparity is negatively related to the new firm's innovative performance.

4.3 Methods

4.3.1 Sample and Data Collection

The data for my analysis are provided by the Thuringian Founder Study (*Thüringer Gründer Studie*), an interdisciplinary research project on success and failure of innovative start-ups in the German federal state of Thuringia. This dataset draws from the German trade register (*Handelsregister*) for commercial and private companies established in Thuringia between the years 1994 and 2006. It is further restricted to start-ups in innovative industries, comprising 'advanced technology' and 'technology-oriented services' according to ZEW classification (Grupp et al., 2000)[27]. The survey population consists of 4215 founders who registered 2971 new entries in the *Handelsregister*.

From this survey population, a random sub-sample of 3671 founders was drawn and contacted. Due to team-started ventures, this corresponds to 2604 start-ups in innovative industries. From January to October 2008, I conducted 639 structured face-to-face interviews with either the solo entrepreneur or with the lead entrepreneur of team start-ups, resulting in a response rate of about 25%. There is no response bias with regard to industry structure and gender of founders.[28]

The structured interviews were carried out by the members of the research project. On average, an interview took approximately one and a half hours. The interviews covered a broad set of questions regarding socio-demographic and psychological data of the founders. Retrospective data were collected relating to events in the founder's life and the business history, covering the venture creation process and the first three business years of the start-up[29]. To overcome

[27] Grupp et al. (2000) define innovativeness at the industry level according to the average investments in R&D activities. Thereafter, innovative industries are characterized by firms' average R&D expenditures of at least 3.5% of their turnover.
[28] Since the German trade register only provides limited ex-ante information about registered start-ups we had to stick to these characteristics in order to test for the representativity of our sample.
[29] We define the first business year as the time when accounting started either because of obligations from the German trade register or because of first revenues. Thus, this definition does not necessarily correspond to the date of registration at the Handelsregister.

entrepreneurs' hindsight bias and memory decay (Davidsson, 2006), the research team of the Thuringian Founder Study utilised mnemonic techniques drawn from the Life History Calendar method (Caspi et al., 1996).[30] This method has been shown to collect more valid and reliable retrospective information than traditional questionnaires (Belli et al., 2001; 2004). The focus on firms in a single region (the German federal state of Thuringia) further allows us to hold constant key labour market and environmental conditions. Another important advantage of this study design is the possibility to interview founders of companies which had failed at the time of data collection. Hence, this sample is not biased toward surviving or successful firms.

Since I choose the start-up team as the unit of analysis, I only rely on data regarding the 410 team-started companies in the database. Thereby, a start-up team is defined as two or more persons who have been actively involved in the venture creation process and own or have owned a part of the new venture (Gartner et al., 1994; Kamm et al., 1990).[31] Due to the fact that some of these start-ups were not genuinely new but subsidiaries or diversifications of existing companies, I had to omit 53 observations. Furthermore, I had to exclude 20 observations from the analysis due to incomplete data. The final sample consists of 337 start-up teams.

4.3.2 Dependent Variables

Entrepreneurial Performance

I use two indicators to gauge team start-ups' entrepreneurial performance: venture survival and employment growth. First, I consider *venture survival* because it is among the most commonly used dependent variables in entrepreneurship research and can be seen as the minimum criterion for entrepreneurial success (Brüderl & Preisendörfer, 1998). In the present study, this variable indicates whether a team-started new venture survived a minimum of three years after start-up, measured dichotomously (1 = survived at least the first three business years; 0 = closed before year three). Second, *employment growth* is approximated by the new firms' absolute number of employees in the third business year. Members of the new venture team as well as the board of directors (where applicable) are not counted as employees. Growth in employment is used as performance indicator because it

[30] The research team employed a study-specific version of the Life History Calendar, which is a data-collection tool established in sociological and psychological research. It is based on the principles of the autobiographic memory. This means that, in a first step, we asked interviewees about the timing of well-known life events, sequences, and transitions (e.g., marriage, birth of children, education, or professional life). In a second step, these events served as anchors for the recall of our retrospective study variables.

[31] Persons entering to and exiting from the team were also counted as team members.

signals the need for additional resources to meet customer demands. Relative growth rates could not have been computed as my sample consists of genuinely new firms which in most cases started with zero employment (for a similar approach see Baum et al., 2001). If a new venture did not reach its third business year I recoded the number of employees as zero.

As Sapienza et al. (1988, p. 46) observe, "many owners/entrepreneurs for a variety of reasons report manipulated performance outcomes." Therefore, I gathered objective information regarding the number of employees in the third business year from two business information providers (*Creditreform* and *Bureau van Dijk*). Secondary data and data from the present survey overlapped for 66 team start-ups, giving me the opportunity to validate the employment growth measure used in this study. Correlations between both data sources indicate validity of my measure of firm growth (r = .78, p < .001).

Innovative Performance

To measure team start-ups' innovative performance, I count the *number of patent applications* which either members of the founding team (as inventor) or the company (as applicant) filed during the first four years of business operation. Therefore, data on patent applications at the German Patent Office (*DPMA*) were accessed.[32] I focus on patent output because patents are tangible manifestations of firms' ideas, techniques, and products (DeCarolis & Deeds, 1999), and represent an important milestone in the innovation process within firms. Furthermore, patenting performance has frequently been used to measure innovative firm behaviour in past research (Ahuja & Katila, 2001; Griliches, 1990; Hall and Ziedonis, 2001).[33]

4.3.3 Independent Variables

Even though functional heterogeneity in teams has been conceptualised in a number of different ways (for a review see Bunderson & Sutcliff, 2002), they typically

[32] Applying for a patent at the DPMA involves lower fees as compared to applications at, e.g., the European Patent Office (EPO). This implies that smaller firms, not being able or willing to bear the higher fees, will apply at the DPMA alone. However, applications at the EPO that cover the German territory will appear in the DPMA dataset as well. We therefore can expect the German database to be more complete.

[33] There are several potential shortcomings of patent applications as a measure of innovative firm performance that should be kept in mind (see Griliches, 1990, for an extended discussion of this topic). Most importantly, patent data might underestimate innovative activity because firms might use other strategies to protect the output of R&D efforts, for example secrecy or speed of innovation (Mansfield et al., 1981; Cohen et al., 2000). Firms might not patent because not all inventions are patentable, such as inventions in the service sector. Other reasons for not patenting might include the lengthy application process relative to the duration of the innovation cycle or the ease of inventing around (Cohen et al., 2000).

take account of the distribution of team members' prior experiences across different functional categories. The most commonly employed measure of a team's functional heterogeneity is Blau's (1977) index (see Harrison & Klein, 2007) $1-(\sum_{i=1}^{n} p_i^{\,2})$,

where p_i denotes the proportion of team members with prior experience in the *i*th functional category. However, this measurement approach does not allow the consideration of two separate dimensions of functional heterogeneity. Instead, Blau's (1977) index captures an overall net effect of the productive and destructive impact team heterogeneity has on team performance (see discussion in Section 4.2).

In order to more adequately capture a start-up team's functional heterogeneity, I aim to disentangle functional heterogeneity into two separate dimensions, namely *knowledge scope* and *knowledge disparity*. On that account I apply four different heterogeneity indices. More precisely, *variety* and *diversity* indices are used to build the measure of knowledge scope, capturing the breadth of the teams' knowledge base. *Dissimilarity* and *non-redundancy* indices form the knowledge disparity measure, which capture divergences within the structure of the functional background among the team members.

In this chapter, the calculation of the four different heterogeneity indices draws from the functional background experiences that start-up team members have acquired prior to the first steps in the venture creation process. To gather this information, interviewees were asked to indicate whether each member of their start-up team possessed prior work experience in each of six functional categories: management, marketing or sales or promotion, accounting or controlling or financing, engineering or R&D, production, and personnel. These functional categories have frequently been used in previous studies on venture team heterogeneity (e.g., Murray, 1989; Zimmerman, 2008). For reasons of time constraints, data on functional experience were collected for a maximum of five team members. In the following sections, I demonstrate how the indices of *variety*, *diversity*, *dissimilarity*, and *non-redundancy* were calculated in order to finally obtain my measures of knowledge scope and knowledge disparity.

Knowledge Scope

Both *variety* and *diversity* are captured with an entropy-based indicator of team heterogeneity. Originally developed by Shannon (1948) in the communication literature, I apply the formalisation Hill (1973) and Baumgärtner (2004) adapted to study ecological and product heterogeneity, respectively. Following their lead, entropy is defined as

$$v_a(s) = \begin{cases} (\sum_{i=1}^{n} {s_i}^a)^{1/(1-a)}; \ a \geq 0, a \neq 1 \\ \lim_{a \to 1} (\sum_{i=1}^{n} {s_i}^a)^{1/(1-a)}; \ a = 1. \end{cases} \quad (4\text{-}1)$$

As a central parameter, s_i denotes the weighted probability that members of the start-up team are experienced in the functional category *i*. Therefore, the number of team members' experiences in the functional category *i* is weighted against the total number of experiences the start-up team possesses in all functional categories. Put formally,

$$s_i = \sum_{j=1}^{m} x_{ij} \, / \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij} \ , \quad (4\text{-}2)$$

where *n* denotes the total number of functional categories in which each team member might have gained practical experience prior to start-up, *m* denotes the total number of team members, and x_{ij} is defined by

$$x_{ij} = \begin{cases} 1 \text{ if team member } j \text{ has experience in the functional category } i \\ 0 \text{ otherwise.} \end{cases}$$

The parameter *a* determines whether the entropy measure in equation (4-1) gives priority to the absolute variety of functional experience (low values of *a*) or to the evenness of the distribution of functional experience (high values of *a*). A number of entropy indices can be derived by variations of *a*.[34] I calculate my indices of *variety* and *diversity* with *a* = 0 and $a \to +\infty$, respectively. Hence, for *variety*, equation (4-2) evolves to

$$Variety \equiv v_0(s) = \sum_{i=1}^{n} {s_i}^0 = z \leq n \, , \quad (4\text{-}3)$$

where *z* denotes the number of functional categories in which at least one member of the start-up team has prior work experience.[35] The *variety* index is normalised and ranges from 0 (low variety) to 1 (high variety).

With *a* approaching infinity, equation (4-2) evolves to

$$Diversity \equiv v_{+\infty}(s) = 1 / \max(s_i) \, . \quad (4\text{-}4)$$

Accordingly, my measure of *diversity* is determined by the weighted probability of those functional categories in which the start-up team is experienced the most. It thus captures the (de-)concentration of a team's prior work experience in different functional categories. Contrary to the *variety* measure, *diversity* is a relative measure paying attention to the distribution of prior work experience among team

[34] For example, one obtains the Teachman (1980) index for a = 1, or the Herfindahl-Hirschman index for a = 2 (Herfindahl, 1950; Hirschman, 1964).

[35] Note that for si=0, equation (4-3) is not defined as Baumgärtner's (2004) entropy measure only takes account of functional categories which are effectively occupied. In the context of our study, this might be of concern since it is most likely that entrepreneurial teams are experienced in some categories but not in others. Therefore, equation (4-3) is only calculated for those functional categories in which at least one team member gained prior work experience.

members. I normalised the measure, so that it ranges from 0 (low diversity) to 1 (high diversity).

Finally, *knowledge scope* is computed by taking the mean of the variety and diversity indices. Higher values for knowledge scope indicate a broader and less concentrated knowledge base of a start-up team.

Knowledge Disparity

My measure of *dissimilarity* is based on pairwise comparisons of team members' functional background patterns. For two members A and B of a start-up team, this can be formalised as

$$f_i^{A,B} = \begin{cases} 1 \text{ if } x_i^{A} = 1 \wedge x_i^{B} = 1 \text{ for all } i \in N \wedge i \in [1,...,n] \\ 0 \text{ otherwise.} \end{cases}$$

Summing f_i over all functional categories, I receive $F^{A,B} = \sum_{i=1}^{n} f_i^{A,B}$, denoting the number of categories team members A and B share prior work experience in. To obtain a *dissimilarity* measure, I compare this overlap of functional experiences of team members A and B with the potential overlap given their individual functional backgrounds. Thus, *dissimilarity* in functional backgrounds of team members A and B can be calculated by

$$Dissimilarity^{A,B} = 1 - \frac{F^{A,B}}{(\Sigma_{i=1}^{n} x_i^{A} + \Sigma_{i=1}^{n} x_i^{B})/2}. \quad (4\text{-}5)$$

This variable ranges from 0, indicating complete overlap/similarity of functional backgrounds, to 1, indicating complete dissimilarity of the functional backgrounds of team members A and B. By taking the mean of all pairwise dissimilarity measures, I obtain the *dissimilarity* index at the team level. Generally, the higher the value of dissimilarity, the more disperses is the start-up team's knowledge base.

My *non-redundancy* index builds on the conceptualisation of *variety* described above. Here, the number of functional categories *z* in which at least one team member is reported to have prior work experience is weighted with the total number of functional experiences the team possesses in the *z* categories. Hence, *non-redundancy* is defined as

$$Non\text{-}redundancy = z / \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij}. \quad (4\text{-}6)$$

Non-redundancy indicates the extent to which team members' functional experiences exceed the level necessary to maintain a certain *variety* in functional experiences within the start-up team. This index is normalised, ranging from 0 (low non-redundancy) to 1 (high non-redundancy). The higher the value for *non-*

redundancy, the smaller is the team members' shared experience in the different functional categories.

By taking the mean of the dissimilarity and non-redundancy indices, I finally derive my measure of *knowledge disparity*. High values of knowledge disparity indicate more pronounced differences within the knowledge stocks of start-up team members.

Traditional Functional Heterogeneity

In order to compare my proposed two-dimensional measurement of team heterogeneity with the established unidimensional approach, I estimate a *traditional functional heterogeneity* measure. Based on a modified version of Blau's (1977) index, *traditional functional heterogeneity* is computed by

$$1 - (\sum_{i=1}^{n} s_i^2), \tag{4-7}$$

where s_i is the weighted share of team members' experience in a given category i from equation (4-2). This unidimensional measure is normalised, ranging from 0 (low traditional functional heterogeneity) to 1 (high traditional functional heterogeneity).

4.3.4 Control Variables

Furthermore, the unique dataset provides the opportunity to control for a variety of other factors in order to more accurately assess the influence of the knowledge scope and knowledge disparity dimensions of team heterogeneity on start-up teams' entrepreneurial and innovative performance. In doing so, I apply Blau's (1977) original index to consider *age heterogeneity* (based on team members' age in seven age categories), *industry experience heterogeneity* (based on dichotomous variables indicating whether or not each team member has prior industry experience), and *gender heterogeneity* (Chowdhury, 2005; Eisenhardt & Schoonhoven, 1990; Hambrick et al., 1996; Williams & O'Reilly, 1998). Other than in previous studies, I do not consider *ethnic heterogeneity* because virtually no member of a start-up team in my sample belonged to an ethnic minority. This is not surprising, though, given the high degree of ethnic homogeneity of the general population in the German federal state of Thuringia (Statistisches Bundesamt, 2008).

There are reasons to believe that relationships among team members impact new venture performance (Francis & Sandberg, 2000). Accordingly, start-up teams' *relational composition* is also taken into consideration (Ruef et al., 2003).

Relationships among start-up team members at the time of start-up are assessed with several categories (1 = spouse or partner; 2 = relative; 3 = friend or colleague from previous employment; 4 = acquaintance; 5 = stranger). The relational composition index is computed by taking the mean of all pairwise combinations among the start-up team members.

Research has shown that larger start-up teams are more likely to encompass heterogeneous perspectives, knowledge stocks, and personal goals (Ancona & Caldwell, 1992; Ucbasaran et al., 2003). Larger teams have also been linked to higher growth of start-ups (Eisenhardt & Schoonhoven, 1990). Hence, I control for *team size* as the number of team members at the time of new venture creation.

Also, following past research on small firm growth and development (e.g., Baum et al., 2001; Chandler & Hanks, 1993; Cooper et al., 1994), I include control variables referring to *start-up capital* (total amount of financial capital available at the start of the first business year) and *industry sector* (dummy variables). Additionally, I include a series of dummy variables controlling for potential effects of the *start-up year* on the new venture's performance.

Innovative new ventures are faced with unique challenges when securing the financial, organisational, and managerial resources needed for growth and survival (Audretsch, 2000). Because of these potentially confounding influences, I control for the *innovativeness* of the start-up (1 = conducting R&D was a major activity in the venture creation phase as well as in the first three years of business operation; 0 = otherwise).

I finally control for *growth aspirations* of the start-up team because prior research has linked higher growth aspirations with higher levels of subsequent new venture growth (Naffziger et al., 1994). Growth aspirations at the time of firm formation are measured dichotomously (1 = the new firm should have become a market leader; 0 = the new firm should have remained a small-scale competitor).

4.3.5 Cross-Validation of Interviewees' Responses

The data for my study is collected from self-reports of the start-up team's lead entrepreneur on one questionnaire, which can have limitations (Podsakoff & Organ, 1986). Thus, the primary potential limitation of my newly-developed measurement of start-up team heterogeneity is a common-method bias. In order to strengthen the case and to validate the core independent variables, members of the research project conducted additional face-to-face interviews with a second team member, applying the same questionnaire. These data were gathered for a random subsample of 48 start-up teams. Dependent t-tests for paired samples did not reveal

significant differences with respect to my four heterogeneity indices *variety* (t = -1.25; p = .22), *diversity* (t = -.70; p = .49), *dissimilarity* (t = -.48; p = .11), and *non-redundancy* (t = -.94; p = .36), indicating validity of the measurement of start-up team heterogeneity.

4.4 Results

4.4.1 Descriptive Results and Factor Analysis

Table 4-1 presents descriptive statistics and correlations for all variables included in this study. As can be seen, the team start-ups in the sample on average applied for 1.81 patents in the first four business years, and had 8.42 employees at the end of the third year of business operation. Furthermore, I find the sampled team start-ups to show a high survival rate with 92% of these firms surviving the first three business years. The average team size was 2.81 members, with 46% of the start-up teams consisting of two members, 34% of three members, 13% of four members, and 7% of five or more members. A mean value of 3.18 for the relational composition further indicates that these teams in most cases consisted of friends or colleagues from previous employment. Hence, unlike other datasets (e.g., PSED I and II), the present sample does not contain a large proportion of 'romantic teams' (only 6% of the teams consist of spouses), which have been shown to skew results (Ruef et al., 2003).

As expected, my indices of *variety* and *diversity* are highly correlated (r = .83). The same holds true for the indices of *dissimilarity* and *non-redundancy* (r = .82). Interestingly enough, both pairs of heterogeneity indices show low correlations, ranging from r = .03 to r = .12. While preliminary, these findings offer some initial support for my two-dimensional measurement of start-up team heterogeneity. An exploratory factor analysis is thus performed to assess the discriminant and convergent validity of two distinct heterogeneity dimensions. A principal component analysis with Varimax rotation reveals that the four heterogeneity indices *variety*, *diversity*, *dissimilarity*, and *non-redundancy* can indeed be reduced to two factors which correspond to the two theoretically-specified team heterogeneity dimensions *knowledge scope* and *knowledge disparity* (see Table 4-2). More specifically, *variety* and *diversity* load on *knowledge scope* (factor loadings .957 and .953, respectively), explaining 50.14% of the variance. The indices for *dissimilarity* and *non-redundancy* load on *knowledge disparity* (factor loadings .951 and .955, respectively), explaining

Table 4-1: Descriptive Statistics and Correlations

Variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1)	# of patent applications	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2)	Survival	.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(3)	# of employees	.00	.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4)	Variety	.00	-.07	**.12**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5)	Diversity	-.04	-.05	**.13**	**.83**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(6)	Dissimilarity	-.06	**-.15**	.04	**.12**	.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(7)	Non-redundancy	**-.16**	-.11	.05	.03	**.11**	**.82**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(8)	Knowledge scope	-.02	-.07	**.14**	**.96**	**.95**	**.11**	.07	-	-	-	-	-	-	-	-	-	-	-	-	-
(9)	Knowledge scope squared	-.03	-.04	**.14**	**.89**	**.96**	.03	.02	**.10**	-	-	-	-	-	-	-	-	-	-	-	-
(10)	Knowledge disparity	**-.11**	**-.14**	.05	.08	**.11**	**.96**	**.94**	.10	.02	-	-	-	-	-	-	-	-	-	-	-
(11)	Traditional functional heterogeneity	.01	-.10	.11	**.88**	**.77**	**.29**	**.19**	**.87**	**.72**	**.26**	-	-	-	-	-	-	-	-	-	-
(12)	Traditional functional heterogeneity squared	-.00	-.09	**.12**	**.95**	**.86**	**.23**	**.15**	**.95**	**.84**	**.20**	**.96**	-	-	-	-	-	-	-	-	-
(13)	Team size	**.24**	.02	-.03	.10	**-.16**	-.03	**-.51**	-.02	-.06	**-.26**	.02	-.01	-	-	-	-	-	-	-	-
(14)	Industry experience heterogeneity	-.02	-.03	-.09	**.11**	.04	**.15**	**.14**	.08	.05	**.15**	**.12**	**.11**	-.01	-	-	-	-	-	-	-
(15)	Age heterogeneity	**.13**	-.00	.08	.03	-.02	.05	-.10	.01	-.02	-.02	.05	.04	**.25**	.04	-	-	-	-	-	-
(16)	Gender heterogeneity	**.12**	-.03	-.03	.04	.02	.06	-.06	.03	.02	.00	.02	.03	**.17**	.08	.02					
(17)	Relational composition	.02	-.07	.02	.05	-.05	-.05	**-.19**	.00	.00	**-.12**	.01	.01	**.27**	-.06	.07	-.22	-	-	-	-
(18)	Innovativeness	**.20**	.02	.01	.03	-.07	.02	-.03	-.02	-.02	-.00	.01	-.02	**.13**	.09	.04	-.02	.08	-	-	-
(19)	Start-up capital	**.14**	-.08	**.30**	**.19**	**.13**	.11	.06	**.17**	**.15**	.09	**.18**	**.18**	.05	.04	.07	-.04	**.13**	**.18**	-	-
(20)	Growth aspirations	**.13**	.02	.10	.02	.05	-.03	-.03	.04	.05	-.03	.00	.01	-.00	.01	-.01	-.07	-.04	**.19**	.08	-
Mean		1.81	0.92	8.42	0.68	0.48	0.47	0.54	0.58	0.42	0.50	0.82	0.51	2.81	0.25	0.45	0.09	0.43	3.37	0.39	0.39
SD		9.97	0.28	13.7	0.31	0.28	0.32	0.26	0.28	0.31	0.28	0.23	0.19	0.90	0.41	0.31	0.18	0.50	1.37	0.49	0.49

Note: Correlation coefficients displayed in bold are significant at the 5% level.

Table 4-2: Results of Factor Analysis on Team Heterogeneity Dimensions

	Knowledge Scope	Knowledge Disparity
Variety	**.957**	.027
Diversity	**.953**	.067
Dissimilarity	.070	**.951**
Non-redundancy	.024	**.955**

Note: Exploratory factor analysis: Principal component analysis with varimax rotation.

another 41.16% of the variance. There is thus strong support for my contention of team heterogeneity as a two-dimensional concept.[36]

4.4.2 Regression Analysis and Results

In order to test for our hypotheses, I pursue the following empirical strategy. My first indicator of team start-ups' entrepreneurial performance – venture survival – is dichotomous in nature. I therefore employ logistic regression in this step of the analysis. The second indicator of entrepreneurial performance – employment growth – and the indicator of team start-ups' innovative performance – the number of patent applications – involve count data. Descriptive statistics in Table 4-1 reveal that for both of these dependent variables the variance exceeds the mean, suggesting the presence of overdispersion. If this is the case, the standard errors of parameters will be underestimated, resulting in spuriously higher levels of statistical significance. A likelihood ratio test indeed provides evidence to conclude that overdispersion is given for both employment growth and the number of patent applications. In order to correct for overdispersion in the data on employment growth, I use negative binomial models (Hausman et al., 1984). Regarding the patent data, another concern is the high frequency of zeros (approximately 85% of the sampled team start-ups did not apply for any patents during the first four business years), suggesting the use of zero-inflated negative binomial models (Greene, 2003). In order to select between negative binomial and zero-inflated negative binomial models, I run the Vuong (1989) test. Test statistics indicate that zero-inflated negative binomial models fit the patent data better. The regression results for all three performance indicators are displayed in Tables 4-3 to 4–5.

[36] For our empirical analysis, we use the original variables instead of the factor loadings.

Table 4-3: Start-up Team Heterogeneity and New Venture Survival

	Dependent variable: New venture survival		
	(I)	(II)	(III)
Two-dimensional approach to heterogeneity			
Knowledge scope	-----	-0.123	-----
Knowledge disparity	-----	-0.481 **	-----
Unidimensional approach to heterogeneity			
Traditional functional heterogeneity	-----	-----	-0.474
Control variables regarding the new			
Industry experience heterogeneity	-0.116	-0.045	-0.081
Age heterogeneity	0.040	0.060	0.026
Gender heterogeneity	-0.179	-0.168	-0.170
Relational composition	-0.300	-0.321	-0.295
Team size	0.182	0.040	0.190
Control variables regarding the new venture project			
Innovativeness	0.154	0.119	0.126
Start-up capital	-0.287	-0.231	-0.239
Growth aspirations	0.071	0.049	0.075
Time/Industry dummies	No/No	No/No	No/No
Constant	2.551 ***	2.643 ***	2.622 ***
Pseudo R^2	0.046	0.074	0.056
AIC	214.109	212.557	213.573
Chi^2	17.636	25.314	19.710
N	337	337	337

Notes: Logistic regression, coefficients reported; *** (**,*) denotes a significance level of 1% (5%, 10%).

My analysis first examines determinants of new venture survival (Table 4-3). Model 1 includes all control variables relating to the new venture team and to the new venture project. Model 2 adds the core independent variables *knowledge scope* and *knowledge disparity*. In both models, control variables do not show up as significant. Looking at Model 2, *knowledge scope* – the breadth of a start-up team's knowledge base – does not significantly affect new venture survival. Moreover, I find start-up teams' *knowledge disparity* – the divergences in team members' functional background patterns – to be a significant negative predictor of venture survival ($p < .05$).

Table 4-4: Start-up Team Heterogeneity and Employment Growth

	Dependent variable: Number of employees in the 3rd business year		
	(I)	(II)	(III)
Two-dimensional approach to heterogeneity			
Knowledge scope	-----	0.157 ***	-----
Knowledge disparity	-----	0.085	-----
Unidimensional approach to heterogeneity			
Traditional functional heterogeneity	-----	-----	0.143 **
Control variables regarding the new venture team			
Industry experience heterogeneity	-0.124 **	-0.139 **	-0.136 **
Age heterogeneity	0.167 ***	0.171 ***	0.169 ***
Gender heterogeneity	0.043	0.045	0.044
Relational composition	0.062	0.072	0.073
Team size	-0.056	-0.029	-0.062
Control variables regarding the new venture project			
Innovativeness	-0.024	-0.022	-0.022
Start-up capital	0.325 ***	0.306 ***	0.302 ***
Growth aspirations	0.134 **	0.145 **	0.146 **
Time/Industry dummies	Yes/Yes	Yes/Yes	Yes/Yes
Constant	1.959 ***	1.944 ***	1.950 ***
Alpha	0.871	0.840	0.854
Likelihood ratio test	1871.52 ***	1792.65 ***	1807.78 ***
Pseudo R^2	0.046	0.051	0.049
AIC	2076.01	2069.68	2072.13
Chi^2	98.743	109.071	104.623
N	337	337	337

Notes: Negative binomial regression; *** (**,*) denotes a significance level of 1% (5%, 10%).

Turning to Table 4-4, I replicate the structure of analysis employed above using employment growth as the dependent variable. Regarding the control variables in Model 1, I find several significant estimates. Accordingly, start-up teams with lower levels of *industry experience heterogeneity* ($p < .05$) and higher levels of *age heterogeneity* ($p < .01$) are more likely to grow their ventures in the first three business years. I also find the amount of *start-up capital* ($p < .01$) and *growth aspirations* ($p < .05$) to positively predict employment growth in the first three years after start-up. These control variables retain their significance in Model 2 as well. Furthermore, in Model 2, *knowledge scope* has a positive effect ($p < .01$), while *knowledge disparity* does not significantly predict the number of employees in the third business year. Summing up, the results for both indicators of start-up teams' entrepreneurial performance provide partial support for Hypotheses H1a and H1b.

Table 4-5: Start-up Team Heterogeneity and Number of Patent Applications

	Dependent variable: Number of patent applications in the first 4 business years		
	(I)	(II)	(III)
Two-dimensional approach to heterogeneity			
Knowledge scope	-----	1.723 **	-----
Knowledge scope squared	-----	-1.690 **	
Knowledge disparity	-----	-0.633 **	-----
Unidimensional approach to heterogeneity			
Traditional functional heterogeneity	-----	-----	-0.054
Traditional functional heterogeneity squared	-----	-----	0.285
Control variables regarding the new venture team			
Industry experience heterogeneity	0.021	0.148	-0.040
Age heterogeneity	0.031	0.129	0.074
Gender heterogeneity	0.006	-0.057	-0.084
Relational composition	-0.228	-0.179	-0.292
Team size	0.707 **	0.431	0.720 ***
Control variables regarding the new venture project			
Innovativeness	0.373	0.781 *	0.401
Start-up capital	0.349 *	0.340 *	0.291 *
Growth aspirations	0.368 *	0.300	0.395 **
Time/Industry dummies	No/Yes	No/Yes	No/Yes
Constant	0.785	0.305	0.815 *
Auxiliary regression (logit model)			
Innovativeness	-1.248 ***	-1.046 ***	-1.222 ***
Constant	1.660 ***	1.500 ***	1.730 ***
Alpha	1.356	1.105	1.119
Likelihood ratio test	225.27 ***	157.61 ***	190.65 ***
Vuong test	1.75 **	1.30 *	1.75 **
Pseudo R^2	0.095	0.100	0.091
AIC	570.194	568.795	572.436
Chi^2	38.04	43.76	38.12
N	337	337	337

Notes: Zero-inflated negative binomial regression; *** (**,*) denotes a significance level of 1% (5%, 10%).

Finally, determinants of team start-ups' innovative performance are investigated (Table 4-5). In Model 1, *team size* ($p < .05$), *start-up capital* ($p < .10$), and *growth aspirations* ($p < .10$) emerge as significant positive predictors. Although *innovativeness* of the start-up does not significantly relate to the number of patent applications, one cannot completely rule out *innovativeness* as an important predictor of innovative firm performance. Indeed, the negative sign of the *innovativeness* coefficient ($p < .01$) provided by the auxiliary logit regression

suggests that a high degree of *innovativeness* increases the likelihood of a team start-up being in the "not always zero" group and, thus, applying for at least one patent in the first four business years.[37] In Model 2, only *start-up capital* ($p < .10$) remained significant. Furthermore, I find the *innovativeness* of the team start-up ($p < .10$) to show a positive effect. Supporting Hypothesis H2a, *knowledge scope* ($p < .05$) and *knowledge scope squared* ($p < .05$) significantly contribute to the explanation of the number of patents applied for by the start-up team, with the maximum being reached at a value of .47 for *knowledge scope*. As expected in Hypothesis H2b, I also find a negative effect of *knowledge disparity* ($p < .05$).

My results are robust with respect to several modifications of the regression models.[38] First, running all regressions for different team sizes does not change the directions of the coefficients of *knowledge scope* and *knowledge disparity*. However, due to reduced sample sizes, significance levels decrease slightly. Second, controlling for the entry and exit of team members during the venture creation process does not alter my results either. Third, I also consider *knowledge disparity squared* as a predictor of team start-ups' innovative performance as well as *knowledge disparity squared* and *knowledge scope squared* as predictors of team start-ups' entrepreneurial performance. While I do not have theoretical arguments to expect any particular relationships, the respective coefficients turn out to be insignificant and are therefore not reported in the regression tables.

4.4.3 Supplementary Analysis: The Unidimensional Approach to Heterogeneity

In an additional analysis, I compare my proposed two-dimensional measurement of team heterogeneity with the conservative unidimensional approach. I therefore re-run the regressions for my three dependent variables (venture survival, employment growth, number of patent applications) using *traditional functional heterogeneity* instead of *knowledge scope* and *knowledge disparity* as the core independent variable. The results are displayed in Model 3 in Tables 4-3 to 4-5. Except for employment growth in the first three business years ($p < .05$; Table 4), *traditional functional heterogeneity* is found to be insignificant. Furthermore, for all three dependent variables, models containing *knowledge scope* and *knowledge disparity* achieve larger explanatory power (as indicated by pseudo R^2) compared to

[37] A zero-inflated negative binomial model consists of two nested models. The auxiliary logit regression in Table 4-5 estimates the probability of a team start-up applying for at least one patent, while the negative binomial model explains the variance in patent counts within the group of patent applicants.
[38] The respective results are available from the author.

models containing *traditional functional heterogeneity* as the core independent variable.

Using Akaike's (1973) information criteria (AIC), I further compare the goodness-of-fit of the models including *knowledge scope* and *knowledge disparity* (Model 2 in Tables 4-3 to 4-5) with those including *traditional functional heterogeneity* (Model 3 in Tables 4-3 to 4-5). Throughout, the AIC provides support for the use of the proposed two-dimensional heterogeneity measurement as opposed to the traditional unidimensional heterogeneity measure.

4.5 Discussion

4.5.1 Interpretation of the Results

The objective of my study was to reconcile the inconclusive results of prior research on the connection between functional heterogeneity of new venture teams and subsequent new venture performance. Therefore, I draw on recent theoretical and methodological advancements in the fields of top management team and entrepreneurial team research, showing that different conceptualisations of team heterogeneity yield different effects on team processes and outcomes (see e.g., Bunderson, 2005; Bunderson & Sutcliff, 2002; Liao et al., 2009). I contribute to this literature by providing empirical evidence for two separate dimensions of functional team heterogeneity, which both affect new venture performance differently.

Consistent with a cognitive resource perspective on teams (e.g., Cox & Blake, 1991; Hambrick & Mason, 1984), the *knowledge scope* dimension of functional heterogeneity appeared to positively relate to new ventures' entrepreneurial performance. Drawing from theories on social similarity and attraction (Byrne, 1971; Hogg & Abrams, 1998; Tajfel & Turner, 1986), the *knowledge disparity* dimension showed a negative effect on entrepreneurial performance. There are two aspects that deserve closer attention. Interestingly, I found *knowledge disparity* to reduce survival chances of newly-founded businesses, whereas this dimension of team heterogeneity did not affect new venture growth. In contrast, *knowledge scope* did not affect survival but predicted the growth of the new venture in the first three years of business operation. It seems that for setting up and maintaining a new venture, arguably the minimum criterion for entrepreneurial success, an entrepreneurial team needs cohesion, trust, and a 'common language' and, thus, a low degree of disparity (or a high degree of similarity) in the functional background experiences. If, on the other hand, the new venture is to grow in the first years of business operation, the start-up team needs to

leverage the benefits of a diverse stock of knowledge, capabilities, and expertise provided by a broad scope of functional experience. These results are in line with prior work on new venture team formation and nascent venture success. For example, Ruef et al. (2003) find that social similarity among team members (in terms of gender and ethnic homogeneity) seems to be the most important driver of team formation. Liao et al. (2009) show that social similarity, but not functional heterogeneity, within a new venture team contributed to getting an emerging business up and running. However, they argued that a broad knowledge stock "may become increasingly more important as the venture evolves into a larger business" (p. 13).

Moreover, I was interested in the effects of both heterogeneity dimensions on the innovative performance of team start-ups. As expected, I found evidence for an inverse U-shaped relationship between *knowledge scope* and the number of patents applied for in the first four business years. Firm innovation turned out to be highest at a moderate level of an entrepreneurial team's breadth in functional experience. This is consistent with related research on R&D alliances (Sampson, 2007), which shows that firms reap most innovative benefits from collaborative R&D when cooperation partners have some, but not all, capabilities in common. Bringing these findings together, I can speculate that an overly-narrow knowledge stock of a start-up team (as might be given in a team consisting of three engineers) restrains the potential for knowledge creation because there is not much team members can learn from each other. On the other hand, members of a start-up team with an overly-broad knowledge stock (i.e., a team formed by a marketing expert, an engineer, and a financing expert) might find it difficult to learn from each other because of a missing common frame of reference to build on. Extending this line of reasoning, I also find that *knowledge disparity* negatively related to innovative team performance. Irrespective of the level of *knowledge scope*, it was some overlap in team members' functional background (referring to a low level of *knowledge disparity*) that might have been crucial for effective communication and mutual understanding among team members and, ultimately, team innovation. Without any functional overlap (referring to a high level of *knowledge disparity*), the start-up team might have been likely to suffer from unfavourable social categorisation processes, distrust, and stereotyping (Tajfel & Turner, 1986), which then could have impaired innovative performance.

Finally, I examined the goodness-of-fit between the conservative unidimensional measurement of team heterogeneity and its hypothesised two-dimensional conceptualisation. In all models, my two-dimensional approach to

heterogeneity fitted the data better (as indicated by lower values for Akaike's (1973) information criteria (AIC)), suggesting the superiority of the measurement concept proposed in this chapter. Additionally, using *knowledge scope* and *knowledge disparity* instead of *traditional functional heterogeneity* as core independent variables provided statistically significant results which are in line with theoretical expectations. In particular, my findings for innovative team performance indicated that a unidimensional measurement concept might comprise countervailing effects of functional team heterogeneity, resulting in an insignificant net effect. This supports earlier research in organisational demography (Pfeffer, 1983), arguing that a better match of theory and construct measurement is a necessary precondition for understanding the complex relations of individuals in organisational settings.

4.5.2 Implications for Practice

For prospective entrepreneurs, the present study suggests that, when forming a team, a fit between team goals and team structure should be considered. However, entrepreneurs more frequently compose teams based on mutual interest and attraction rather than on complementary capabilities (Ruef et al., 2003). Hence, start-up teams usually do not possess all of the relevant competences and resources required for new venture success. For example, a university-based start-up team formed by a group of scientists may have a strong technological knowledge base but probably lacks industry-specific and managerial background experiences. One mechanism to fill this knowledge gap and, thus, to broaden the team's *knowledge scope* is the adding of new team members endowed with the lacking commercial competences (Chandler et al., 2005; Forbes et al., 2006; Vanaelst et al., 2006). In the light of my findings, these commercially-experienced team members, so-called "surrogate entrepreneurs" (Franklin et al., 2001), also need to have some technological competences to secure sufficient overlap of the functional background experiences with the original team members. While avoiding the drawbacks of an increased *knowledge disparity*, new team members would then be able to comprehend the technological base of the products that they will be marketing and to draw on a 'common ground' for communication with the scientist team members.

Another way to achieve a broader *knowledge scope* in a start-up team resides in learning processes (Chandler & Lyon, 2009). Accordingly, engineers and researchers who have been engaged in the development of the new venture's technological basis can gain business-related knowledge vicariously through learning from the actions of their commercially-experienced team members. Vicarious learning can also take place by attending seminars, workshops, and other

structured educational experiences such as formal university-based training. Referring to this, the present study speaks in favour of including elements of interdisciplinary cooperation in entrepreneurship education and training. Educational programs on cooperative teamwork between engineering and business management students provide an opportunity for interdisciplinary learning and can help reduce stereotypical assumptions and ease mutual understanding (Lüthke & Prügl, 2006). In this way, prospective entrepreneurs would be better prepared for engaging in functionally heterogeneous start-up teams.

This study may also inform the practices of venture capitalists who consistently consider start-up team composition as an important funding criterion (Cyr et al., 2000). Depending on the funding strategy of the venture capitalist, there are two particular implications from my research. First, profit maximising private venture capitalists, earning the bulk of their returns with a few investments in their portfolios (Gompers & Lerner, 2004), might raise the growth potential of their investments by focusing on the prevalence of a broad *knowledge scope*, irrespective of potentially overlapping functional experiences (low *knowledge disparity*) in team members' job histories. Second, public venture capitalists might emphasise low levels of *knowledge disparity* within the entrepreneurial team in order to reduce the default risk of their investments. In doing so, public venture capitalists might reduce the overall risk of their portfolios and contribute to their public investors' targets such as fostering (regional) economic growth (Manigart et al., 2002).

4.5.3 Limitations and Future Research

This chapter has several limitations which might however provide promising opportunities for future investigations. First and most importantly, the cross-sectional study is mainly based on retrospective data. Although the adopted Life History Calendar method facilitates the recall process and to ensure the validity of the data (Belli et al., 2004; Caspi et al., 1996), longitudinal data are needed to strengthen causal inferences regarding the relationships we observed. The fact that, in my analyses, start-up team characteristics at the time of firm formation are linked to new venture performance three years after start-up at least suggests that causality might work in the direction hypothesised: start-up teams' *knowledge scope* and *knowledge disparity* shape new venture performance. Second, in the present chapter, common-method bias might result from the use of self-reported data from the same source, the lead entrepreneur of each start-up team. I mitigated this problem by accessing patent data in order to derive an objective and well-established measure of innovative firm performance. Secondary data from external business information

providers enabled me to validate the measure of employment growth. Furthermore, for a small sub-sample of team start-ups, I gathered additional interview data from a second team member in order to validate my core independent variables *knowledge scope* and *knowledge disparity*. A third caveat is that the present analysis is limited to team start-ups in the German federal state of Thuringia. This might raise the question of transferability of results to other national contexts. While my study is not internationally comparative in nature and therefore cannot offer any answers to this question, the conceptual model of new venture team functional heterogeneity presented in this chapter is not country-specific, but rather is grounded in international scholarly work and established empirical findings. Finally, only direct effects of *knowledge scope* and *knowledge disparity* on start-up performance were investigated. In fact, recent research has begun to consider how (via what mediators) and when (in the presence of what moderators) entrepreneurial teams' functional heterogeneity might lead to higher or lower firm performance. While clearly beyond the scope of my analysis, future research may find these aspects in connection with the proposed two heterogeneity dimensions worth studying.

4.6 Conclusion

Besides these limitations, this chapter contributes to one of the still-unresolved questions in the entrepreneurial team literature: Does functional team heterogeneity help or hinder new venture performance? The answer I provide draws from a new conceptual approach to disentangle two separate dimensions of functional team heterogeneity, namely knowledge scope and knowledge disparity. My empirical analysis suggests, however, that this answer is not a holistic one but rather depends on the team performance criterion considered. For example, while a start-up team's knowledge disparity negatively relates to survival but does not affect growth of the new venture, knowledge scope does not affect survival but contributes to new venture growth. Composing a successful new venture team thus requires more than just finding the optimal trade-off point in a unidimensional heterogeneity-homogeneity continuum.

5. The Use and Effect of Social Capital in New Venture Creation – Solo Entrepreneurs vs. New Venture Teams

5.1 Introduction

A central development within the management literature has been the growth of nascent entrepreneur research analyzing on-going venture start-up efforts and/or firms in gestation over time (Davidsson, 2006). New ventures have an important effect on economic development. They are credited for the transfer of innovations into the market (Schumpeter, 1934; Acs & Plummer; 2005) and creating regional employment (e.g. Fritsch & Mueller, 2004).

Central questions in nascent entrepreneurship research concern the characteristics of the venture creation process and the factors affecting performance of these firms (for an overview see Davidsson, 2006). Among other factors considered in the literature, the social embeddedness of the entrepreneur has been found to play a pivotal role (Davidsson & Honig, 2003). Social capital enables entrepreneurs to access resources (Florin et al., 2003) or novel information (Uzzi, 1997) in order to create opportunities (Baker & Nelson, 2005). During the venture creation process, most firms suffer from substantial resource constraints (Shepherd et al., 2000) and use their personal networks as a means to access resources and information far below market price (Elfring & Hulsink, 2003).

However, a sizeable gap exists in the burgeoning social capital literature on the subject of team start-ups. A most prominent finding is that team start-ups are more successful than solo start-ups (e.g. Lechler, 2001). One of the offered explanations is that entrepreneurs can combine their abilities and financial capital in a team, giving them an advantage above solo entrepreneurs (e.g. Gartner, 1985; Stam & Schutjens, 2006). Sometimes explicitly (e.g. Colombo & Grilli, 2005; Stam & Schutjens, 2006) but more often implicitly (e.g. Davidsson & Honig, 2003; van Gelderen et al., 2005), the same argument is applied to the usage of social capital, i.e. that the social capital from individual team members is combined to provide an advantage for teams over solo entrepreneurs. As yet, to my knowledge, no study has explicitly analyzed whether, compared to solo entrepreneurs, more social capital is found within teams and whether this leads to their better performance.

In this chapter, I approach these two questions and empirically explore the use of social capital of solo entrepreneurs and entrepreneurial teams during the venture creation process. In doing so, I refine the empirical concept of social capital in that I do not look at its mere existence but focus on its use in terms of concrete

support (e.g. advice on the business plan, marketing, or research and development (R&D)) for the entrepreneurs. I address two major research questions. The first concerns the differential use of social capital. Do solo entrepreneurs rely more often on social capital than new venture teams, or is it the other way around? How do both types of start-ups use social capital? More precisely, I investigate the relationship between social capital and other characteristics of the new venture and its founders (e.g. human capital). The second research question then turns to the effect of social capital on subsequent new venture performance. Appropriate hypotheses in this study are tested using a dataset of 456 start-ups in innovative industries in the German state of Thuringia.

The reminder of this chapter is organized as follows. In Section 5.2, I review the theory and previous research on social capital in order to generate six testable hypotheses. In Section 5.3, I describe the dataset and the methods employed to measure the use of social capital. I then present (Section 5.4) the results of my analysis. The chapter concludes in Section 5.5, where I interpret and discuss the results and draw some conclusions.

5.2 Theoretical Background

5.2.1 New Firm Creation and Social Capital

Creating a new firm, in comparison to being employed, involves high levels of risk and uncertainty (Lumpkin & Dess, 2001). Entrepreneurs may consider alleviating the effects of risk and uncertainty by approaching others for help and advice, broadly captured by the concept of social capital. While there are various definitions of social capital in the literature (for an overview see Adler and Kwon, 2002) I follow the integrative approach of Nahapiet and Goshal (1998). They define social capital at the individual level “as the sum of the actual and potential resources embedded within, available through and derived from the network of relationships possessed by an individual or a social unit” (Nahapiet & Goshal, 1998, p.243). Social capital is multidimensional, encompassing a structural, a relational and a cognitive dimension (Nahapiet & Goshal, 1998). While the structural dimension is concerned about the properties of the social network such as the density and the connectivity among actors (Burt, 1992), the relational aspect of social capital refers to the quality and kind of interpersonal relationships (Granovetter, 1992). The cognitive dimension of social capital captures shared representations and systems of meaning that individuals have with one another. Another distinction in social capital literature is that between bridging and bonding social capital (Putnam, 2000).

Bridging social capital refers to links between individuals and organizations representing different expertise, views of the world and cultural habits (e.g. Samuelsson & Davidsson, 2009). In contrast, bonding social capital refers to the positive (but sometimes also negative) effects of cohesion and trust between actors enabling collective actions (Putnam, 2000). In a closely related classification of social capital, theorists distinguish between weak and strong ties (Granovetter, 1973). Here, weak ties describe loose relationships to actors providing non-redundant information (e.g. Davidsson & Honig, 2003) whereas strong ties refer to close relations to a limited set of actors featuring trust and its positive by-products (e.g. Samuelsson & Davidsson, 2009).

Using the definition of Nahapiet & Goshal (1998) as a starting point, different implications arise for solo and team-started ventures. I return to that point immediately after the introduction of the concept of new venture teams. I define a venture as a team start-up where more than one person is actively involved in the venture creation process and where these persons own or had owned a part of the venture (Kamm et al., 1990). As to mastering the venture creation process, the superiority of team start-ups compared to solo start-ups is one result readily acknowledged in entrepreneurship research (e.g. Cooper & Bruno, 1977; Lechler, 2001). In particular, for high technology firms (the sample of interest), there is a higher requirement of skills, making team start-up a necessity. Gartner (1985, p.703) argues that “individuals combine their abilities in teams in order to start an organization successfully.” Hence, the advantage of a team lies in the bundling of human and financial capital (Stam & Schutjens, 2006).

Upon initial investigation, the argument of bundling human and financial capital can also be applied to a solo entrepreneur’s use of social capital, considered as the ability of an actor to mobilize useful resources from his social network (Bourdieu, 1986; Burt, 1992; Coleman, 1988). Teams combine and integrate the social capital of their members, possibly providing them with an advantage above solo entrepreneurs (Davidsson & Honig, 2003). As yet, to my knowledge, little is known whether, compared to solo entrepreneurs, more social capital is found within teams and whether this leads to their superior performance.

Comparing venture teams and solo entrepreneurs with respect to the structural dimension of social capital, the former may have an advantage through broader access to critical resources through their larger number of contacts within their social network. The decision to create a venture team or to add an additional team member has the potential to increase the social capital base of the start-up and, as a result, may improve the resource profile of the new venture, leading to

increased new venture persistence and success. Implicitly, this argument is made in a considerable number of studies, as belonging to a start-up team is considered to be an indicator of social capital (e.g. Colombo & Grilli, 2005; Davidsson & Honig, 2003; van Gelderen et al., 2005).

Looking at the relational dimension of social capital, a contrary argument can be put forward. While a positive correlation may exist between team size and the possible access to resources via entrepreneurs' contacts, the actual use of those contacts may not be correlated with team size. Compared to a solo entrepreneur, a new venture team can complete more venture creation activities in-house through combining (often different) skills from its members (Gartner, 1985, p.703). The actual use of social capital may thus decrease.

In my empirical analysis, I explore whether the mere use of social capital differs between solo and team start-ups. With respect to the team start-ups, the two counteracting arguments are to be considered: First, the strengthening and broadening of the social network in a team increases (ceteris paribus) the likelihood of using social capital. Second, the ability of a team to perform more tasks on its own decreases the likelihood of using social capital. Both effects work in opposite directions concerning the use of social capital. With due care, I therefore test whether the use of social capital differs at all between the two types of venture founding by the following hypothesis:

H1: Solo entrepreneurs and entrepreneurial teams differ regarding their respective use of social capital in the venture creation process.

5.2.2 The Effects of Social Capital

A further focus of my analysis is on the way in which social capital use differently affects the venture performance for solo entrepreneurs and new venture teams. Given the nature of the dataset consisting of start-ups in innovative industries, I assess the literature concerning social capital of tech-based as well as knowledge-based start-ups. The review of that literature reveals that social capital influences the venture creation process via three different channels. It 1) assists (nascent) entrepreneurs in accessing resources, 2) provides trusted feedback to the entrepreneurs and 3) provides access to novel information.

Access to resources is of critical importance to small and young companies in innovative industries which traditionally suffer from a range of resource constraints including financial capital, a skilled workforce, or equipment necessary for R&D and production (Aldrich & Martinez, 2001), which are critical for growth.

Anderson et al. (2007) analyze ten technology companies in Aberdeen and find evidence that the use entrepreneurs' contacts with former business partners supporting them in recruiting their work-force. Much more work has been done in studying the relationship between social capital and the financing of start-ups. Shane & Cable (2002) argue that via network ties potential investors were able to screen and to evaluate the entrepreneurs and their business ideas, which was the basis of the investment decision. Florin et al. (2003) reports for a sample of US firms seeking to float on the stock exchange that the level of social capital is positively and significantly related to the level of attracted funds and return on sales. However, this result could only be partially confirmed by Honig et al. (2006), who find some evidence for a relationship between social capital and the amount of sales, but no links between social capital and financial capital.

Furthermore, social capital affects growth aspirations among nascent entrepreneurs (Liao & Welsch, 2003), which is considered a precursor of subsequent venture growth (Baum et al., 2001). Using a sample of Swedish tech-nascent entrepreneurs, Samuelsson & Davidsson (2009) find that projects which extensively use social capital significantly make progress in the venture creation process. Taken together, I propose the hypothesis:

H2: Social capital in the venture creation process has a positive impact on later new venture performance.

Trusted feedback is the second transfer channel of social capital. Its theoretical foundations lie in the relational dimension of social capital (Nahapiet & Goshal, 1998), which deals with the quality or the kind of ties an actor possesses (Granovetter, 1990). Within the relational aspect of social capital, tie strength has attracted great interest in the research community. Although it is a simplification of Granovetter's (1973) original argument that tie strength is a continuum, ties are typically categorized as being either weak or strong. Thereby, Granovetter characterizes strong ties in contrast to weak ties by a combination of high emotional intensity and intimacy, much time spent with the network contact, and high reciprocity of services.

The strength of strong ties lies in the high level of trust between the network members. It is well known that networks with a high proportion of strong ties are "dense" networks (Burt, 2000), which indicates that many network members are directly connected to each other. Scholars highlight the importance of trusted feedback and the transfer of tacit knowledge (Aldrich & Martinez, 2001) for

entrepreneurs stemming from such networks as necessary components of entrepreneurial learning (Zahra et al., 2006). Thereby I understand learning as the process of accumulating the knowledge required for being effective in starting up and managing new ventures (Politis, 2005).

Learning takes place throughout the venture creation process. Bhave (1994) was one of the first researchers to recognize the complex nature of the venture creation process, which he described as nonlinear and iterative. Key features of his model are feedback loops between the different stages of venture creation, allowing for changes in the business concept after receiving corresponding feedback and information from, for example, customers and financiers. Other scholars also emphasize the importance of learning and adapting in the venture creation process (Aldrich & Ruef, 2006; Ronstadt, 1988; Shane & Venkataraman, 2000) for the development of routines and capabilities (Zahra et al., 2006) to run a business successfully (Teece et al., 1997).

A well-known example of the benefits of learning from strong ties is the study from Elfring and Hulsink (2003). They report that high-tech start-ups benefit from trusted feedback of their strong ties to better recognize opportunities. Studying 23 cases in New York's apparel industry, Uzzi (1997) finds that companies profit from information transfer on strategies, prices and products from a dense network which enables them to take advantage of fast-changing market opportunities. However, Uzzi (1997) acknowledges serious drawbacks in relying solely on strong ties and high-density networks. It is argued that information and ideas coming from too densely connected networks lack newness. Entrepreneurs, who receive information only from inside such insulated networks may experience below-average performance. This disadvantage is of particular importance for high-tech start-up projects with innovative products (as shown by Presutti et al., 2007), as they operate within global markets and require greater diversity in ideas, information and feedback concerning the business idea in line with greater complexity and requirements of their numerous international markets. In evaluating these mixed findings on the effects of strong ties and dense networks on entrepreneurial performance, I still postulate the following hypothesis:

H3: Strong ties in the venture creation process have a positive impact on later new venture performance.

Access to novel information – the third transfer channel – is beneficial for entrepreneurs because ventures in gestation often do not possess information about

relevant facets of business, for example prices, production processes, inputs, and competition (Aldrich & Ruef, 2006) being critical requirements of the entrepreneurial learning described above (Zahra et al., 2006). This information is widely dispersed among individual actors within the market (customers and suppliers), as well as among people seemingly unrelated to the market (engineers, technicians, or financiers).

In general, to access this dispersed information weak ties are considered important, because through them it is possible to reach distant subgroups of the network via a rather close network partner. In contrast to strong ties, which have a tendency for closure (Coleman, 1988), weak ties can serve as bridges to indirect ties (Granovetter, 1973). Therefore, weak ties enlarge the network of an entrepreneur and provide the nascent entrepreneur with access to novel information which may assist in the discovery of more profitable business opportunities (e.g. Elfring & Hulsink, 2003), the development of products (Lechner & Dowling, 2003), the reduction of the cost of production (Yli-Renko et al., 2001), and the contacting potential investors (Shane & Cable, 2002). Therefore I hypothesise:

H4: Weak ties in the venture creation process have a positive impact on later new venture performance.

To access social capital in general and strong and weak ties in particular requires that the entrepreneur or the new venture team show an appropriate ability to do so. This leads to the concept of human capital. A number of empirical studies report that human capital variables (e.g. entrepreneurial experience, leadership experience or business experience) have positive significant effects on the progress of nascent entrepreneurs and subsequent venture success (e.g. Honig et al., 2006; Samuelsson & Davidsson, 2009). Being more specific in my discussion on the effects of social capital on venture performance, I argue that an entrepreneur or a new venture team learns more successfully if human capital aligns with social capital. More precisely, entrepreneurs with a pronounced human capital variety should have a higher level of “absorptive capacity” to tap a broad array of relevant information (Cohen & Levinthal, 1990). With human capital variety, I refer mainly to an entrepreneur’s or a venture team’s breadth of experience over different functional activities. Following Hayton and Zahra (2005), I argue that, because of their broader experience, these entrepreneurs should be more able to rate new information on their usefulness, and incorporate this new information more easily into their existing

knowledge stock.[39] Furthermore, I suggest that entrepreneurs with higher human capital variety should have a larger social network to draw on, giving them broader choices and opportunities to select the most appropriate helpers within their networks. This latter argument is considered within the context of weak ties, because the strong tie network of an entrepreneur only consists of a very limited number of persons (Lechner & Dowling, 2003).

To the best of my knowledge, only the study by Batjargal (2007) on internet start-ups in China has yet examined the moderating effect of human capital on the linkage between social capital and venture success. Although the econometric findings are mixed, Batjargal (2007) concludes that the combined effect of human capital and social capital enhances the survival chances of newly founded businesses. I, therefore, propose the following hypotheses:

H5: The relationship between social capital in the venture creation process and subsequent venture performance is stronger for solo entrepreneurs and entrepreneurial teams with a higher level of human capital variety, and

H6: The relationship between weak ties in the venture creation process and subsequent venture performance is stronger for solo entrepreneurs and entrepreneurial teams with a higher level of human capital variety.

5.3 Dataset and Methodology

5.3.1 Dataset and Interview Strategy

For my empirical analysis, I use data from the "Thuringian Founder Study". This study is an interdisciplinary research project on success and failure of innovative start-ups and contains both venture creation data and psychological data. The unique dataset comprises the entries of private and commercial companies in the commercial register (Handelsregister) between the years 1994 and 2006 in the German state of Thuringia. This design made it possible to interview not only founders of active companies but also founders of ventures that had failed. The database is restricted to entries in innovative industries (Grupp et al., 2000)[40]. The

[39] Principally, one could think of different human capital variables affecting the learning process. However, the approximation of human capital by the heterogeneity of the functional background of top management teams in high-tech ventures is suggested by Hayton & Zahra (2005), who argue that the absorptive capacity of a new venture team is better measured with the breadth of the knowledge base rather than its depth (e.g. heterogeneity of functional background vs. the average number of years of leadership experience of the entrepreneurial team).

[40] Grupp et al. (2000) define innovativeness at the level of the industry. On average, companies in innovative industries spend more than 3.5% of their turnover on research and development.

first registered owner-managers for each new entry form the survey population. From this population, a random sample of 2,604 start-ups was generated. From January to October 2008, my colleagues and I conducted 639 face-to-face interviews with the solo entrepreneur or the leading entrepreneur of a start-up team (response rate: 25%). As some companies were not genuinely new but rather were subsidiaries or the result of a diversification of an existing company into a new business field, I removed 76 companies from the sample. Thirteen companies were removed from the sample due to interview quality concerns. For this chapter, I restrict the analysis to observations within the complete dataset and therefore drop 78 observations with missing values in one or more used variables. Furthermore, to avoid censoring, I dropped 16 observations which started later than 2005.[41] My empirical analysis evaluates the effect of social capital use in the venture creation process on subsequent venture performance in the third business year. The final sample consists of 456 companies, which can be further classified as 182 solo entrepreneurs and 274 new venture teams.

The structured interviews were conducted by members of the research project and student research assistants who were trained in various sessions in December 2007. The research team used a retrospective design to collect the data. To overcome the bias of hindsight as well as memory decay (Davidsson 2006), the research team adapted the 'Life History Calendar' tool from psychology in order to obtain information on the venture creation process. The Life History Calendar is a useful tool for constructing individual processes and developments (Caspi et al. 1996; Freedman et al. 1988). With it, one gains more reliable and valid retrospective information compared to traditional questionnaires (Belli et al., 2001). When the interview commenced, the participants together with the interviewer filled in major life events and sequences in the Life History Calendar (family life, working sequences, historical events, and important dates of the business history). During the interview, the Life History Calendar was visible to the participants. Before each retrospective item (e.g. team composition, human and social capital questions) was started, we asked the interviewee to look at the specific time point in the Life History Calendar and verbally recalled special events that took place during that time in order better to better remember that time. The interview strategy and the Life History Calendar are in line with the recommendation by Belli et al. (2004).

The restriction of this study to the German state of Thuringia has the major advantage of reducing sample heterogeneity stemming from, for example, regional differences. This is of particular importance in Germany, where there are still

[41] Firms founded in 2006 cannot answer any question on their third year of business activity.

pronounced differences in the determinants of new venture success between Eastern and Western Germany (Fritsch, 2004).

5.3.2 Dependent Variable

My dependent variable attempts to measure the performance of start-up firms. I approximate this by the absolute number of employees in the third year of operation of the firm. The solo entrepreneur, members of the new venture team as well a potential board of directors were in no cases counted as employees. As my sample consists only of new firms and does not include franchises or corporate ventures, the vast majority of firms have zero employees in the venture creation phase. For that reason, employment growth rates could not be computed (for a similar approach see Baum et al., 2000). If a new venture did not survive the third business year, the number of employees remained coded as zero.

Traditional outcome variables such as firm value, profitability and turnover are not applied in this study for two reasons. First, the self-reported measure of sales turned out to be unreliable. While respondents could assess the amount of sales generated in the first three business years, monetary reform in Germany replacing the Deutschmark with the Euro in several steps between 1999 and 2001 made it difficult for the entrepreneurs to correctly attribute the sales to either currency. Second, secondary data from business information providers could not be used, because such databases tend to focus on larger and surviving firms, substantially reducing the overlap with the dataset.

Nevertheless I checked the validity of the dependent variable. Two business information providers (Creditreform and Bureau van Dijk) made available data regarding employment growth in the first three business years for 66 start-ups in my data set. I found that my measure of number of employees and the corresponding information provided by Creditreform and Bureau van Dijk (2009) correlated highly (r = .78, p < .001).

5.3.3 Independent Variables

My independent variables attempt to measure the actual use of social capital in the venture creation process, which comprises the time from the first concrete steps into the venture creation process until the start of the first business year.[42]

[42] The first business year is defined as the time when accounting started either because of obligations from the commercial register or because of first revenues. This does not necessarily correspond to the date of registration in the commercial register.

Typically, researchers use the name generator or the position generator in social capital measurement. The name generator (McCallister & Fischer, 1978) maps the ego-centered social network of an entrepreneur comprising persons who were most helpful in establishing and running an entrepreneur's new venture. However, the name generator has a tendency to focus on strong ties (van der Gaag & Snijders, 2004). Therefore, I opted against this method.

The position generator (Lin & Dumin, 1986) uses the occupations of network members as an indicator of the access to valuable resources and information. The usefulness of this instrument hinges on the relative importance and relatedness of the individuals role to the type of start-up being created. For a biotech start-up, knowing bankers or a professor in biology may be more useful than knowing a poet; but this may be the opposite if an entrepreneur opens up a bookstore. Hence, this approach has limited value for studies not focusing on a single industry with a clear hierarchy of useful contacts.

Therefore, I attempt to improve the measurement of social capital in the field of entrepreneurship by applying a more recently used measurement procedure, the resource generator, as developed by van der Gaag and Snijders (2005). This approach focuses on *potential* helpful flows of resources and asks typically a battery of questions such as: Do you know any people who can lend you 5.000 €? The main advantage of this measurement concept is that it measures social capital at a 'general' base (van der Gaag & Snijders, 2004), which refers to the possibility to access different, concrete and restricted sub domains of social capital. For my analysis, I adapt the methodology of the resource generator to *concrete* resource flows instead of potential resource flows, because my approach is based on the "use" of social capital rather than its mere existence.

To quantify social capital use, I ask the entrepreneurs if they received advice, support or help from a third party, free or for less than the usual charge, during the venture creation process in nine different fields. These fields are derived from the nascent entrepreneurship literature (see Davidsson, 2006 for an overview), where important activities in the venture creation process, such as R&D, market exchange, financing and management, are addressed. I chose the items to cover the activities that are important to enable the business to get up and running, primarily focusing on the recognition and the exploitation of the business opportunity (Shane & Venkataraman, 2000).

Table 5-1: Social Capital Variables for Predicting Venture Success

Social capital	Operationalisation
Social capital use	
Strong ties (Interviewee)	I asked the solo-entrepreneur or the interviewee of a start-up team if he received help, support or advice from a third party free or for less than the usual charge during the venture creation process. More precisely I asked: How many people from the circle of the closest friends and family members ... 1) ... have helped to write the business plan? 2) ... have supported the project with experience in the specific industry? 3) ... have conveyed contacts to potential customers? 4) ... brought knowledge and experience needed for the development of products and services? 5) ... brought knowledge and experience needed for producing products / delivering services? 6) ... have helped the project with contacts to potential investors and lenders? 7) ... have helped in marketing and promotion? 8) ... have helped the project with their contacts to the administration and policy or their reputation? 9) ... have helped by the refinement of the business idea? However, I do not use the mere amount of received advice. Instead, dummy variables for each field were created, indicating whether the entrepreneurs use social capital at all. The measure of help from strong ties is then the count of fields with received help, support or advice.
Weak ties (Interviewee)	Count of fields with received help support or advice (same procedure as with strong ties) from the circle of acquaintances. Acquaintances were defined as people the entrepreneur knew and could have talked to when meeting on the street.
Overall social capital (Interviewee)	Count of fields with received help support or advice (same procedure as with strong ties) from either the circle of acquaintances or the circle of the closest friends and family members.
Overall social capital (Team)	In the case of a start-up team, I additionally asked the interviewee if the other team members received help, support or advice from a third party in the nine respective fields. To ensure answerability of the questions, these are only binary items of whether the other members used social capital. The measure of overall social capital is an aggregation of the help received by the interviewee and the other team members. I compute for overall social capital the count of fields with received help, support or advice across all members of the start-up team.
Any social capital (Interviewee)	Dummy: 1=Use of social capital in any of the nine different categories; otherwise=0; data at the interviewee level.
Any social capital (Team)	Dummy: 1=Use of social capital across all members of the start-up team in any of the nine different categories; otherwise=0.
Social capital traditional	
Knowing other managers and business owners	Dummy: 1=Knowing other managers and business owners from the first steps into the venture creation process until the start of the first business year; otherwise=0; data at the venture level.
Encouragement and social support	Dummy: 1=Received encouragement and social support in the venture creation process until the start of the first business year; otherwise=0, data at the interviewee level.
Public advice	Dummy: 1=Received advice from public institutions for different activities in the venture creation process until the start of the first business year; otherwise=0; data at the venture level.

Table 5-1 displays my measures of social capital use. For solo entrepreneurs and the interviewee of a start-up team, I have at hand information on whether the advice, support or help came from the circle of the closest friends and family (*strong ties*) or from acquaintances (*weak ties*). Following the suggestions of Marsden and Campbell (1984), closeness or, in other words, emotional intensity serves as an

indicator for the tie strength.[43] Note that, in the case of a new venture team, the interviewee was briefed not to report the help which he received from the other members of the team. I count only help from outside the new venture team. Consequently, the interviewee was asked whether his team members received advice and support at all from outside, regardless of whether the helpers counted as family, friends or acquaintances.[44]

To verify the information of the interviewee, for a random sample of 55 cases the research team conducted an additional face-to-face interview with another member of the start-up team and received 42 matchable and usable responses. I performed dependent t-tests for paired samples on the equality of means concerning my main social capital variables, the *overall social capital* use (indicated by the number of fields with received advice) for the complete team (t = -.48; p = .63) and the propensity to use *any social capital* in at least one field (t = -.37; p = .71). The tests reveal no statistical differences in both cases, giving evidence for the reliability of my social capital variables.

As suggested in the literature (e.g. Delmar & Gunnarson, 2000; Vivarelli, 2004), I also collected data on whether the entrepreneurs' networks contained *other managers and business owners* (whether they provided support or not), whether the entrepreneur received *public advice* from public consulting agencies, and whether people provided *encouragement or social support* to start a business. These social capital variables serve as a standard of comparison to my measures of social capital use and are measured at the venture level (Table 5-1), with the exception of *encouragement and social support*. This variable is based on the interviewee only because the respective question for the other team members can hardly be answered by the interviewee in a reliable way.

As indicator for human capital variety, I use the *variety of functional background* of the entrepreneur(s), which is measured by the number of functional areas in which the founder (team) has prior work experience (Table 5-2). In the case of a new venture team, I count as team members all persons who were actively involved in the venture creation process and owned or had owned a part of the venture. Persons entering to and exiting from the team were also counted as team

[43] In their seminal work, Marsden and Campbell (1984) identify educational differences, kinship and the fact that two persons work together as important predictors of tie strength. They suggest closeness or emotional intensity as the best available indicator for evaluating the strength of a tie. The majority of the empirical studies apply this concept (for an overview see Kim & Aldrich, 2005), either intentional or unintentional due to practical reasons, since this measurement procedure is easy to administer and straightforward.

[44] In the case of team founders, the distinction between weak and strong ties cannot be made, as the interviewee usually was not able to classify his cofounders' contacts as weak or strong. Therefore, I only have information about tie strength concerning the interviewee of the new venture team.

members. As additional indicators for human capital, I include at the venture level the *number of team members*, years of *leadership experience*, and prior *entrepreneurial experience* since, in similar studies, they have been found to have a significant impact on the development and performance of new ventures (Colombo & Grilli, 2005; Cooper et al., 1994; Eisenhardt & Schoonhoven, 1990).

To control for the effect of financial capital, I include the *start-up capital* in the first year of operation. Final controls refer to industry, the start-up year, the possible differences between industrial and *service companies*, and the *innovativeness* of the start-up. The descriptive statistics and correlation matrices are displayed for solo entrepreneurs and entrepreneurial teams separately in Tables 5-3 and 5-4 respectively.

Table 5-2: Independent Variables for Predicting Venture Success

Independent variable	Operationalisation
Human capital	
Number of team members	Count of all team members who were actively involved in the venture creation process until the start of the first business year + ownership of a part of the venture.
Variety of functional background	Count of categories with working experience prior the first steps into the venture creation process across all team members (Six categories: 1=Management, 2=Marketing/Sales/Promotion, 3=Accounting/Controlling/Financing, 4=Engineering/R&D, 5=Production, 6=Personnel); data at the venture level.
Leadership experience	Count of years with experience in executive positions prior the first steps into the venture creation process across all team members; data at the venture level.
Entrepreneurial experience	Count of companies (registered in the commercial register) prior to the first steps into the venture creation process across all team members; data at the venture level.
Others	
Service company	Dummy: 1=Company offers mainly services; otherwise=0.
Innovativeness	Dummy: 1=Conducting R&D in the venture creation phase and the first three years of business was a major activity for the start-up; otherwise=0.
Start-up capital	Financial capital (equity + debt) at the start of the first business year, Categorical variable: 1=1,000 euros or less, 2= 1,000 euros till 9,999 Euro, 3= 10,000 euros till 49,999 euros, 4= 50,000 euros till 99,999 euros, 5= 100,000 euros till 249,999 euros, 6= 250,000 euros till 499,999 euros, 7=more than 500,000 euros.
Time dummies	Start-up year, 4 dummy variables: 1) start-up prior to 1994, 2) start-up between 1994 and 1997, 3) start-up between 1998 and 2000, 4) start-up between 2000 and 2006.
Industry dummies	NACE, 1-digit: 1) Chemical industry, metalworking industry, engineering, 2) Electrical engineering, fine mechanics, optics, 3) Information and communication technology, R&D, services, 4) Miscellaneous.

Table 5-3: Descriptive Statistics and Intercorrelation Matrix for Solo Entrepreneurs

Variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1)	Number. of employees 3rd year	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2)	Overall social capital (Interviewee)	.00	-	-	-	-	-	-	-	-	-	-	-	-	-
(3)	Any social capital (Interviewee)	.05	**.67**	-	-	-	-	-	-	-	-	-	-	-	-
(4)	Weak ties (Interviewee)	.09	**.78**	**.51**	-	-	-	-	-	-	-	-	-	-	-
(5)	Strong ties (Interviewee)	-.09	**.59**	**.38**	.04	-	-	-	-	-	-	-	-	-	-
(6)	Knowing other managers and business owners	.02	**.26**	**.26**	**.19**	**.16**	-	-	-	-	-	-	-	-	-
(7)	Encouragement and social support	.05	**.41**	**.34**	**.26**	**.33**	**.24**	-	-	-	-	-	-	-	-
(8)	Public advice	.12	**.21**	.07	**.25**	**.03**	-.06	.13	-	-	-	-	-	-	-
(9)	Variety of functional background	.04	-.05	.02	.06	**-.15**	.07	-.07	-.00	-	-	-	-	-	-
(10)	Leadership experience	**.28**	-.11	**-.25**	.04	**-.15**	-.02	-.13	.03	**.28**	-	-	-	-	-
(11)	Entrepreneurial experience	-.07	.07	.04	.11	-.05	-.03	-.06	-.10	.11	**.15**	-	-	-	-
(12)	Service company	-.14	**.19**	**.25**	.12	.12	**.20**	-.04	.02	-.05	**-.21**	.04	-	-	-
(13)	Innovativeness	-.01	-.10	-.20	-.07	-.05	-.07	-.09	.03	.09	**.19**	.12	-.12	-	-
(14)	Start-up capital	.23	-.05	-.01	-.02	-.04	-.06	-.10	.12	.17	.13	.08	**-.22**	.13	-
Mean		6.77	2.98	0.76	2.02	1.36	0.58	0.52	0.42	3.02	6.73	0.18	**0.48**	0.29	3.18
SD		11.56	2.45	0.43	2.18	2.01	0.50	0.50	0.50	1.74	7.67	0.48	**0.50**	0.45	1.40

Note: Correlation coefficients displayed in bold are significant at the 5% level.

Table 5-4: Descriptive Statistics and Intercorrelation Matrix for Entrepreneurial Teams

Variable		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1)	Number of employees 3rd year	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2)	Overall social capital (Team)	.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(3)	Overall social capital (Interviewee)	.05	**.91**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(4)	Any social capital (Team)	-.10	**.66**	**.60**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(5)	Any social capital (Interviewee)	-.06	**.66**	**.69**	**.89**	-	-	-	-	-	-	-	-	-	-	-	-	-
(6)	Weak ties (Interviewee)	.04	**.78**	**.84**	**.50**	**.57**	-	-	-	-	-	-	-	-	-	-	-	-
(7)	Strong ties (Interviewee)	.03	**.50**	**.61**	**.34**	**.38**	.08	-	-	-	-	-	-	-	-	-	-	-
(8)	Knowing other managers and business owners	-.01	**.41**	**.41**	**.33**	**.36**	**.33**	**.26**	-	-	-	-	-	-	-	-	-	-
(9)	Encouragement and social support	.10	**.36**	**.35**	**.24**	**.24**	**.30**	**.20**	**.34**	-	-	-	-	-	-	-	-	-
(10)	Public advice	-.07	.10	**.13**	**.13**	**.14**	.12	.07	-.00	-.00	-	-	-	-	-	-	-	-
(11)	Number of team members	-.03	.05	.05	.05	.07	.07	-.02	.07	.05	.05	-	-	-	-	-	-	-
(12)	Variety of functional background	**.14**	.04	.04	-.07	-.04	.01	.07	.04	-.12	-.12	.11	-	-	-	-	-	-
(13)	Leadership experience	.07	.08	.12	.06	.08	**.14**	.00	.06	.07	.07	**.32**	**.32**	-	-	-	-	-
(14)	Entrepreneurial experience	.01	-.01	-.04	-.04	-.02	.01	-.08	-.03	-.14	**-.14**	**.28**	**.28**	**.39**	-	-	-	-
(15)	Service company	-.05	-.01	.02	-.03	-.02	.01	.02	.06	-.05	-.05	**-.15**	-.09	-.03	-.05	-	-	-
(16)	Innovativeness	.00	.09	.05	.04	.05	.02	.06	-.03	.09	.03	.16	.10	.03	.08	**-.15**	-	
(17)	Start-up capital	**.32**	.04	.04	-.02	.01	.05	.00	.01	.07	.07	.06	**.23**	**.18**	**.17**	**-.13**	**.18**	-
Mean		9.12	2.71	2.30	0.73	0.68	1.74	0.80	0.61	0.52	0.44	2.77	4.33	16.81	1.13	0.49	0.34	3.31
SD		14.84	2.51	2.32	0.45	0.47	2.12	1.46	0.49	0.50	0.50	0.90	1.64	17.74	1.78	0.50	0.47	1.34

Note: Correlation coefficients displayed in bold are significant at the 5% level.

Table 5-5: The Effect of Social Capital Use

	Dependent variable: Number of employees in the third year of operation										
	All start-up projects			Solo entrepreneurs				Entrepreneurial teams			
	Venture level	Interviewee level						Venture level		Interviewee level	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Social capital use											
Social capital (Team)	0.01	-----	-----	-----	-----	-----	-----	0.03	-0.02	-----	-----
Social capital (Interviewee)	-----	0.03	-----	0.10	0.10	-----	-----	-----	-----	-----	-----
Weak ties (Interviewee)	-----	-----	0.03	-----	-----	0.18**	0.16**	-----	-----	0.01	-0.02
Strong ties (Interviewee)	-----	-----	-0.06	-----	-----	-0.12	-0.11	-----	-----	0.02	0.02
Social capital traditional											
Knowing other managers and business owners	0.02	0.01	0.02	-0.05	-0.05	-0.05	-0.05	0.04	0.04	0.04	0.05
Encouragement and social support	0.07	0.06	0.08	0.04	0.04	0.05	0.05	0.05	0.08	0.05	0.70
Public advice	0.01	0.01	0.01	0.09	0.09	0.05	0.05	-0.09	-0.10	-0.09	-0.10
Human capital and controls											
Number of team members	0.03	0.04	0.02	-----	-----	-----	-----	-0.01	-0.02	-0.01	-0.02
Variety of functional background	0.18***	0.18***	0.18***	0.04	0.05	0.01	0.02	0.18***	0.17**	0.17**	0.16**
Leadership experience	0.04	0.04	0.03	0.27***	0.27***	0.24***	0.24***	-0.09	-0.08	-0.08	-0.06
Entrepreneurial experience	-0.07	-0.07	-0.07	-0.15**	-0.15**	-0.17**	-0.17**	-0.07	-0.06	-0.07	-0.06
Service company	0.01	0.01	0.01	-0.02	-0.02	-0.01	0.01	0.05	0.05	0.05	0.07
Innovativeness	-0.04	-0.04	-0.04	-0.08	-0.07	-0.06	-0.05	-0.02	-0.03	-0.02	-0.03
Start-up capital	0.32***	0.32***	0.33***	0.24***	0.25***	0.25***	0.26***	0.38***	0.39***	0.38***	0.38***
Time/Industry dummies	Yes/Yes	Yes/Yes	Yes/Yes	No/Yes	No/Yes	No/Yes	No/Yes	Yes/Yes	Yes/Yes	Yes/Yes	Yes/Yes
Interaction terms											
Variety of functional background x Overall social capital	-----	-----	-----	-----	0.12	-----	-----	-----	0.15***	-----	-----
Variety of functional background x Weak ties (Interviewee)	-----	-----	-----	-----	-----	-----	0.08	-----	-----	-----	0.14**
Constant	1.97***	1.97***	1.97***	1.72***	1.72***	1.70***	1.70***	2.05***	2.03***	2.05***	2.05***
Chi^2	108.8	109.0	110.9	67.60	69.63	74.27	75.18	74.56	81.12	74.57	80,13
Pseudo R^2	0.04	0.04	0.04	0.06	0.06	0.07	0.07	0.04	0.05	0.04	0.05
Number of observations	456	456	456	182	182	182	182	274	274	274	274

Note: Negative binomial regression; *** (**,*) denotes a significance level of 1% (5%, 10%).

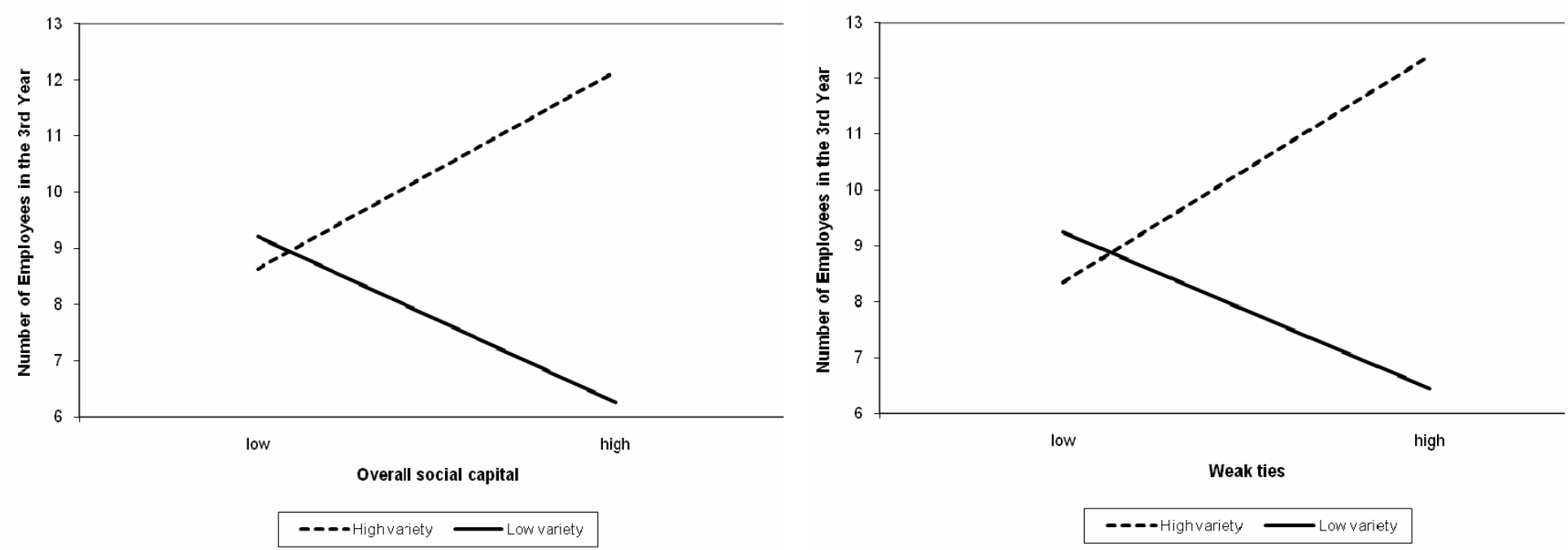

Figure 5-1: The Moderating Effect of Teams' Variety of Functional Background

5.4 Results

5.4.1 Do Solo Entrepreneurs and New Venture Teams Differ in the Use of Social Capital?

I start with a test of Hypothesis 1: Do solo entrepreneurs and new venture teams differ in the use of social capital and, if so, in which fields? To answer this question, I distinguish between two cases. In the first, I compare the interviewees of the different modes of firm founding (solo start-up vs. team start-up), henceforth called the interviewee level. In the second case, I compare the solo start-up with the aggregate of all members of a team start-up, henceforth called the venture level. On the one hand, these comparisons are accomplished by using my measure for *overall social capital use*, representing the number out of nine fields in which social capital can be used, and by the propensity to use *any social capital*. On the other hand, I compare both start-up modes on the basis of the traditional social capital variables. I apply Wilcoxon-Man-Whitney and Chi-square tests in order to find differences in those counts and probabilities.

Table 5-6: Use of Social Capital between Solo Entrepreneurs and Entrepreneurial Teams

		Solo entrepreneurs (mean values)	Entrepreneurial teams (mean values)	Wilcoxon-Mann-Whitney test [a] Chi-square test [b]
Social capital use				
Overall social capital	IL [c]	3.0	2.3	2.920 (0.004)***
	VL	3.0	2.7	1.244 (0.210)
Any social capital	IL	0.76	0.68	4.167 (0.041)**
	VL	0.76	0.73	0.800 (0.371)
Social capital traditional				
Knowing other managers and business owners	IL	0.58	0.53	1.165 (0.281)
	VL	0.58	0.61	0.482 (0.488)
Encouragement and social support [d]	IL	0.52	0.52	0.001 (0.971)
	VL	0.52		
Public advice	IL	0.42	0.42	0.015 (0.903)
	VL	0.42	0.44	0.185 (0.667)
Number of observations		182	274	

Note: [a] Wilcoxon-Mann-Whitney test on overall social capital use with prob > |t| in parentheses; [b] Chi-square test any social capital use and on social capital traditional with prob > |z| in parentheses; [c] data in first row on interviewee level (IL), data in second row on the venture level (VL), for solo entrepreneurs both levels are identical; [d] encouragement and social support is based on the interviewees response only; *** (**,*) denotes a significance level of 1% (5%, 10%).

With respect to the interviewee level, I find (Table 5-6) that a solo entrepreneur uses, in general, more social capital than the interviewee of a team

start-up. More precisely, the solo entrepreneur uses, with a probability of 76%, *any social capital* and at the mean *overall social capital* in 3.0 fields compared to 68% and 2.3 fields in the sub-sample of the interviewees of a team start-up. These differences are significant at least at the 5% level. Looking at the traditional indicators of social capital, I find no statistically significant differences between the two modes of firm founding on the interviewee level.

Concerning the venture level (Table 5-6), I find no statistically significant difference between solo start-ups (76%; 3.0 fields) and team start-ups using *any social capital* in 73% of the cases representing *overall social capital* use in 2.7 fields. Testing also for two of the three traditional indicators for social capital[45] does not deliver significant differences between the solo and team responses.

To summarize, I find no support for Hypothesis 1 according to which solo entrepreneurs and new venture teams differ in their use of social capital.[46]

5.4.2 The Effects of Social Capital

Testing the effects of social capital on venture performance, I refer to hypotheses (H2) on overall social capital, (H3) on strong ties and (H4) on weak ties. Each of them is supposed to have a positive impact on new venture performance, as expressed in the absolute number of employees in the third year of firm operation. I run regressions for a sample containing all start-ups, including both solo and team start-ups. I again distinguish between two ways of representing team start-ups, namely the venture level and the interviewee level. As the dependent variable is a count variable and there is evidence for the presence of overdispersion, I use negative-binomial regression models for the following analyses. The regression results are displayed in the Models 1-3 in Table 5-5. Looking at the venture level in Model 1, *overall social capital* turns out to be insignificant. In Model 2 and Model 3, relying on variables at the interviewee level, I do not get significant coefficients for either individual *overall social capital* or for *weak ties* and *strong ties*. Furthermore, in all three models, the traditional social capital variables *knowing other managers and business owners*, *encouragement and social support* and *public advice* show no significant effects. Concerning human capital, I only find significant positive effects

[45] Since I am operating at the venture level, I cannot perform a comparison with respect to the variables encouragement and social support, because I only possess these data for the interviewee member of the start-up team.

[46] Interestingly, this result holds for the traditional indicators of social capital. What empirically distinguishes these traditional indicators from the nine fields of used social capital is the fact that they occur with a much higher probability. Furthermore, the traditional indicators do not show the observed pattern with higher occurrence for a solo entrepreneur compared to the interviewee of a new venture team. This confirms my argument that traditional indicators can‘t disentangle social capital from team issues.

for *variety of functional background* at the 1% level. Concerning the controls, I find significantly positive effects for *start-up capital* at the 1% level, as well as significant time and industry dummies.

Based on these results, I am forced to reject Hypotheses 2 to 4. This is quite an unexpected outcome and, combined with the unexpected result of no difference in using social capital between solo start-ups and entrepreneurial teams, leaves me with a puzzle. A solution to this puzzle may be found in analyzing whether the two types of start-ups differ in their respective use of social capital. This may give some explanation for the results found so far.

5.4.3 The Differential Use of Social Capital

Looking at the way in which the two types of start-ups use social capital, as a dependent variable I use various binary measures for the general use of *any social capital*. As independent variables, I include the controls as well as one of the traditional social capital measures, *knowing other managers and business owners*. I start by analyzing solo entrepreneurs.

Table 5-7 provides the results of the logistic regression. Model 1 refers to solo entrepreneurs. I find *knowing other managers and business owners* to have a positive significant effect on the use of social capital at a level of 1%. A significantly negative effect at the 1% level is found for *leadership experience*. In addition, service companies are significantly more likely to use social capital, whereas more innovative ventures use significantly (at the 10% level) less social capital.

Performing the same analyses for entrepreneurial teams, I run two models distinguishing between the venture level (Model 2 in Table 5-7) and the interviewee level (Model 3 in Table 5-7). For Models 2 and 3, as for solo entrepreneurs, *knowing other managers and business owners* shows up significantly positive at the 1% level for entrepreneurial teams. At the venture level in Model 2, higher *innovativeness* and *higher leadership experience* contribute significantly to the usage of social capital in the complete team at the 5% and 10% levels, respectively. The effect of the *variety of functional background*, however, is significantly negative at the 5% level. The level of the interviewee in Model 3 reveals significantly positive effects from the number of team members (5%) and the leadership experience (1%).

Table 5-7: The Differential Use of Social Capital

	Dependent variable: Any social capital use		
	Solo entrepreneurs	Entrepreneurial teams	
		Venture level	Interviewee level
	(1)	(2)	(3)
Social capital traditional			
Knowing other managers and business owners	0.601 ***	0.841 ***	0.861 ***
Human capital and controls			
Number of team members	-----	-0.088	0.325 **
Variety of functional background	0.221	-0.360 **	-0.054
Leadership experience	-0.592 ***	0.330 *	0.322 *
Entrepreneurial experience	0.211	-0.125	-0.334
Service company	0.496 **	-0.135	0.244
Innovativeness	-0.379 *	0.428 **	0.172
Start-up capital	0.144	-0.067	0.115
Time/Industry dummies	No/No	No/No	No/No
Constant	1.453 ***	1.234 ***	-1.537 ***
Chi^2	35.701	47.673	41.487
Pseudo R^2	0.182	0.148	0.142
Number of observations	182	274	274

Note: Logistic regressions; *** (**,*) denotes a significance level of 1% (5%, 10%).

Comparing these two sets of results, I find major differences in using social capital between the two types of start-ups. *Leadership experience* reduces the use of social capital for solo entrepreneurs, but increases the use of social capital in start-up teams. For new venture teams only, a higher *variety of functional background* significantly reduces the use of social capital. In addition, the *number of team members* is positively correlated with the use of social capital in entrepreneurial teams.

This difference in the way the use of social capital is determined between solo entrepreneurs and entrepreneurial teams is remarkable and unexpected given the existing literature on social capital. One may ask whether this can already be explained by significant differences among the two groups in some major features such as *innovativeness* or their assignment to certain *industries* and start-up years. However, Chi-square tests on equality and Wilcoxon-Mann-Whitney tests could not be rejected for *innovativeness* (χ^2 = 1.27, *p* = .26), *industry assignment* (χ^2 = .66, *p* = .88), for *service company* (χ^2 = 0.94, *p* = 0.76), for start-up year (χ^2 = 15.99, *p* = .45). The only difference between both start-up modes I find concerning the

independent and control variables is the *variety of functional background* (z = -2.05, p = .04). Hence, I can conclude that the purpose of accessing social capital differs between solo entrepreneurs and entrepreneurial teams. For the former, it is rather a matter of whether the entrepreneur is convinced of mastering the task successfully as expressed by *leadership experience*. In entrepreneurial teams, the focus is rather on getting the portfolio of competences right, as expressed by the *variety of functional background*.

5.4.4 The Differential Effect of Social Capital

Based on these results, I now return to the first analysis of the effects of social capital on firm performance, as expressed in employment three years after foundation. I run regressions separately for the two types of venture founding and integrate an interaction term accounting for the manner in which social capital is used in both groups.

Solo Entrepreneurs

Table 5-5 (middle section) displays the results of negative binomial regressions. I distinguish between the case of social capital in general (Models 4 and 5) and the case of disaggregated social capital in terms of weak and strong ties (Models 6 and 7). Using identical controls in all four models, I find *start-up capital* and *leadership experience* to be significant predictors (at the 1% level) of venture performance. The regressions also show significantly negative effects of *entrepreneurial experience* on venture success. This result is very unusual and can only be understood in light of the transformation process of Eastern Germany from a planned to a market economy (Fritsch, 2004). During this process starting from 1990, a considerable number of western German entrepreneurs founded businesses in the eastern part of Germany. The data suggest that these western entrepreneurs more often failed than eastern entrepreneurs if they did not team up with people from the eastern part of Germany. It could be argued that these entrepreneurs lacked relationships with suppliers and critical contacts to access customers and were vulnerable in the face of fast-changing market conditions. Furthermore, western entrepreneurs often ran businesses in their home region to which they could easily return if the new businesses in Eastern Germany were about to fail.

Looking at my hypotheses stating that (H2) overall *social capital*, (H3) *weak ties* and (H4) *strong ties* have a positive impact on new venture performance, I find only Hypothesis 3 (Model 6) to be supported at the 5% level. Insignificant

coefficients for overall *social capital* (Model 4) as well as *strong ties* (Model 6) force me to reject Hypotheses 2 and 4. In contrast, the traditional social capital indicator variables, *knowing other managers and business owners*, *encouragement and social support* and *public advice* show no significant effects in all models.

For a test of Hypotheses 5 and 6, suggesting moderating effects of the *variety of functional background* (H5) on the relationship between overall *social capital* and performance as well as (H6) on the relationship between *weak ties* and performance, I include respective interaction terms in Models 5 and 7 in Table 5-5. However, both hypotheses have to be rejected due to insignificant coefficients of the respective interaction terms.

Entrepreneurial Teams

Turning to entrepreneurial teams, Table 5-5 (right section) delivers the results of the negative binomial regressions. I distinguish again between the venture level in Models 8 and 9 and the level of the interviewee in Models 10 and 11. As to the human capital variables, the results differ from those of the solo entrepreneurs: *leadership experience* and *entrepreneurial experience* are not essential for the success of entrepreneurial teams. Instead, team *variety of functional background* is highly significant at the 5% level. With respect to the traditional social capital indicators, all results for solo entrepreneurs are confirmed: *Knowing other managers and business owners*, *encouragement and social support* and *public advice* all failed to show significant effects.

Again, examining the hypotheses stating that (H2) overall *social capital*, (H3) *strong ties* and (H4) *weak ties* will have a positive impact on new venture performance, I find all hypotheses rejected (Models 8 and 10) due to insignificant coefficients. In contrast, the interaction term of *variety of functional background* × *social capital* in Model 9 is positive and highly significant at the 1% level. Hence, the *variety of functional background* moderates the effect of team *social capital* on firm performance. This result is also found when looking at level of the interviewee (Model 11). Here again, the interaction term of *variety of functional background* × *weak ties* is significantly positive at the 5% level. Hence, quite distinct from the evidence on solo entrepreneurs, I find here a moderating effect of the *variety of functional background*. Running an OLS regression instead of a negative binomial regression confirms these results, albeit at a lower level of significance of 10%.

I examine the impact of the *variety of the functional background* in more detail in Figure 5-1.[47] As illustrated in the left part of the figure, entrepreneurial teams

[47] These figures are computed using the regression coefficient of a respective OLS-regression.

which had a greater variety in their functional background enjoyed a higher employment level when employing *social capital* more often, supporting Hypothesis 5. This result holds if I focus on social capital in terms of *weak ties* (right part of Figure 5-1), supporting Hypothesis 6.[48]

5.5 Discussion and Conclusion

5.5.1 Interpretation and Discussion of the Results

The study empirically examined the use of social capital among solo-entrepreneurs and entrepreneurial teams in the venture creation process. Based on a sample of 456 start-ups in innovative industries, I tried to answer two research questions: First, do entrepreneurial teams more often use social capital than do solo entrepreneurs do? Second, what are the effects of social capital use in the venture creation process on subsequent venture performance? Table 5-8 summarizes the results.

To answer the first question, I find that venture teams do not use more social capital than solo entrepreneurs in the venture creation process. This unexpected result is due to the fact that the two links explained below have reverse but quantitatively coequal impacts on social capital use.

Table 5-8: Summary of Results

Hypotheses	Results		
	All start-up projects	Solo entrepreneurs	Entrepreneurial team
H1: Solo entrepreneurs and entrepreneurial teams differ in social capital use	Supported		
H2: Overall social capital positive for performance	Not supported	Not supported	Not supported
H3: Strong ties positive for performance	Not supported	Not supported	Not supported
H4: Weak ties positive for performance	Not supported	Supported	Not supported
H5: Human capital variety moderating the effect of overall social capital on performance	Not tested	Not supported	Supported
H6: Human capital variety moderating the effect of weak ties on performance	Not tested	Not supported	Supported

[48] The results do not hold true if I run a regression on the moderated effect of strong ties. In this case, the respective interaction term is insignificant. These regressions are not shown here, but are available from the author upon request.

The standard proposition concerning the social capital issue is that a team start-up compared to a solo-entrepreneur, or a larger team compared to a smaller team, has more social capital. This proposition is sometimes more explicitly (e.g. Colombo & Grilli, 2005) made, but more often implicitly applied (e.g. Davidsson & Honig, 2003; van Gelderen et al., 2005). Its validity depends on how we define social capital. If wee define social capital as the *potential access* to resources and information, the standard proposition holds true, because the number of team members will be positively correlated with the overall number of contacts and hence with the possible access to resources or information. When we, however, focus on the actual *use* of the network contacts, the proposition is at least questionable, if not unfounded. In a start-up team, its members combine their (often) different skills, abilities, information and resources, enabling them to perform more activities in the start-up process in-house. Hence, the actual use of social capital will be negatively correlated with the corresponding heterogeneity of the start-up team.

Looking at the empirical results, I find evidence for both links affecting the use of social capital of new venture teams. First, team size is positively correlated with social capital use, suggesting that a new venture team compared to a solo entrepreneur as well as a larger team compared to smaller one has more contacts to use. Second, the variety of functional backgrounds in a team is negatively correlated with social capital use. This result suggests that the use of those contacts is interdependent on other characteristics of the entrepreneurs. Previous empirical literature has paid limited attention to that second link. The study by Renzulli and Aldrich (2005) is an exception and complements my results. They focus on the determinants of tie activation for business start-ups and find that heterogeneity within the social network of an entrepreneur significantly increases the probability of using those contacts for business purposes. In contrast to the present study, they evaluate the characteristics of network ties and the resulting impact on social capital use, while I am concerned with the characteristics of the team or solo entrepreneur and its impact on social capital use. In both cases, heterogeneity among actors is positively correlated with the use of social capital.

Despite the evidence that new venture teams and solo-entrepreneurs do not differ in their use of social capital, there are pronounced differences in the way in which both start-up modes use social capital in the venture creation process. I find that the human capital characteristics influencing social capital use are different for both groups. For solo entrepreneurs, there are clear indications of a substitutive relationship between human capital in terms of the leadership experience of the founder and social capital use. For start-up teams in contrast, no such clear

relationship was found. Leadership experience positively correlates with social capital use. Team size and the variety of a team's knowledgebase have reverse effects on social capital, as described above.

Concerning the second question, I find that social capital use affects new venture performance differently for both start-up modes. The results of Section 5.4.4 lead to the conclusion that, for entrepreneurial teams, there are rather indirect effects of social capital use on firm performance moderated by the *human capital variety*. The more that teams are specialised in their functional background, the more the team members work with and learn from each other and the less they are on accessing social capital. A more diversified team complements the human capital available by increasingly relying on social capital. In contrast, for solo entrepreneurs, there appears to be a direct relationship of social capital on performance. The solo entrepreneurs profit from information provided by their weak ties. However, their human capital variety (*variety of functional background*) does not significantly contribute to any employment effects.

The results of the analysis lead to the conclusion that solo start-ups and team start-ups differ beyond the pure number of entrepreneurs. Although the difference in the significance level of the interaction term between human capital and social capital variables is only indirect evidence, I argue that one of the key characteristics which differentiate solo entrepreneurs from entrepreneurial teams is the learning process. Thereby I understand the need for the development of necessary knowledge as effective in starting up and managing new ventures (Politis, 2005). This process is more complex for teams because, as they work together in the start-up project, they also learn together. Consider the case of a solo entrepreneur. He can directly evaluate information stemming from his personal contacts and integrate them into his knowledge base. By way of contrast, a member of a new venture team may not directly use such contacts. The entrepreneur will probably first ask his team members if he should approach his personal contact for help or information. Thereafter, the team members together probably consult this outside help and then evaluate together the usefulness of the information and their further actions.

This supposed model fits well to the data and to the description the entrepreneurs gave during the interviews. I suppose that, for a team which has a broad knowledge base, it is more likely that they opt against help from the outside. However, if such a team indeed uses social capital, it profits considerably from the information transfer as a result of two mechanisms. First, their learning and evaluation procedure enables them to detect more valuable information. Second,

because of the breadth of their knowledge base, they can more efficiently integrate and exploit the new knowledge. This view of organizational learning and the importance of a diverse knowledge base are in line with recent studies (e.g. Hayton & Zahra, 2005) on venture teams.

5.5.2 Implications for Practice

This study has several implications for practice. For those who have chosen to start up alone, access to novel information about markets, prices and competitors is of critical importance. This information is best accessed via weak ties, which includes (former) colleagues, friends and former employers, as well as people at conferences and trade fairs. I find that help, advice or support from those weak ties has positive effects on venture performance. In contrast, help from the circle of the closest friends and family members does not appear to have measurable effects on performance. Entrepreneurs may value trusted feedback from such sources highly, but the information lacks breadth and scope.

For those who have chosen to team up with other people to start a venture, my implications are somewhat counterintuitive. I observe a high level of human capital in the new venture teams. On average, in four out of six predefined categories the team as a whole benefits from the work experience of its members. Such teams with a high variety of skills tend not to use their contacts, instead relying heavily on the knowledge base within the start-up team. However, these teams would gain the most from really using their network contacts. It seems that these teams have several advantages compared to less-equipped teams. First, they can better evaluate information from outside concerning their usefulness. Second, they probably have a choice of different helpers, leading to higher quality of the help.

5.5.3 Implications for Theory

The results have one particular implication for entrepreneurship theory, by contributing to the discussion concerning the nature of an entrepreneurial team. What is an entrepreneurial team? Is it just the leading entrepreneur dominating? Is it the sum of its parts? Is it more or rather something different than the sum of its parts? This question is of crucial importance for the understanding of entrepreneurship, since a substantial share of new venture projects are started by teams. The answer to that question given by the research community has changed over recent decades.

The trait approach treated the entrepreneur as a lonely hero and mainly paid attention to the psychological characteristics of the single actor (for an overview see Gartner, 1988). The entrepreneurial team was not part of the research agenda. Over the past few years, the majority of the research has used the venture as the level of analysis (Davidsson & Wiklund, 2001). Team-related variables are often treated by summing the individual responses of the entrepreneurs. In my view, this is progress because it at least accepts the existence of the new venture team. However, studies focusing on team issues in entrepreneurship are scarce – with some notable exceptions (e.g. Chandler et al., 2005; Chowdhurry, 2005). These studies find evidence that the internal team processes such as communication, co-laboring and common decision-making are important predictors for team success. This contradicts the view that teams are purely the sum of their parts, but does not answer the question of whether the team is more than the sum of its parts or different from them.

I find interaction effects between human and social capital variables for team start-ups but not for solo start-ups, suggesting that the team start-ups are something different than the sum of their parts. I argue that this interaction effect stems from collective work and information-sharing between the team members in the venture creation process, fostering learning at the individual and collective level. My view is supported by research on teams operating in a range of contexts, such as primary care teams (Bunniss & Kelly, 2008), new product development teams (Bourgeon, 2007) and multidisciplinary working teams in the oil and gas industry (van der Vegt & Bunderson, 2005). All these studies emphasize the roles of collective work and information-sharing in the learning process of a team.

In the field of entrepreneurship, some work has already been done concerning collective cognition (West, 2007; Shepherd & Krueger, 2002; Ensley & Pearce, 2001). For example, West (2007, p.83) argues that in team start-ups "decisions are not left up to the individual". Instead, often the team makes the decision. For West, it is important to understand how the individual perspectives of the entrepreneurs on the strategy translate into a collective understanding triggering collective decision and action. His model of collective cognition contains the individual cognition of the team members, as well as team internal processes and the environment external to the team.

As Weick and Roberts (1993) suggest, I want to emphasize that I use the word collective instead of group, because I do not think that the team members merge into one group and I deny the existence and importance neither of the individuals nor the collective. Both levels – the individual as well as the collective –

are present in an entrepreneurial team. In my view, research combining the individual and the collective level should yield valuable results for entrepreneurship. Future research may address in more detail how individual skills and individual social network contacts translate into the knowledge base of the emerging venture and which factors, such as communication and trust, influence this process. Process research techniques could shed light on these transfer mechanisms.

5.5.4 Strengths and Limitation

I believe that the strengths of this chapter mainly lie in the methods applied. First, I apply a new method to measure social capital in emerging and young organizations. The resource generator from van der Gaag and Snijders (2005) is a useful tool for accessing social capital in various concrete and restricted sub domains. Furthermore, it is easy to administer and does not consume much time in an interview. Second, I apply for the first time in entrepreneurship research the established method of the Life History Calendar (Freedman et al., 1988). This method is of particular usefulness for studies using a retrospective design, because it helps to reduce the well-known memory decay and hindsight bias. Third, the data are based on face-to-face interviews with the entrepreneurs and I tried to verify independent variables as well as dependent variables.

However, my analysis also has its limitations. First and most important, the study is retrospective in nature. Although I use the above-described techniques to gain reliable information about the venture creation process from the entrepreneur, I cannot completely rule out memory decay and hindsight bias. In one extreme case, there was a time span of 20 years from the first steps into the venture creation process until the interview. Second, I use self-reported measure of the number of employees as a dependent variable. The results, thus, suffer from the self-report bias. However, I checked for the reliability of the data using secondary information of a business information provider. Market value of the start-up or turnover would be more appropriate dependent variables, which unfortunately are inaccessible for the present dataset consisting of very young and small enterprises. Third, concerning the independent variables, I also relied on information of only one member of a start-up team. I checked the reliability of the respondent information by interviewing an additional member of the entrepreneurial team. Regardless of whether these efforts confirm the overall reliability of my social capital use variables, I still lack disaggregated information on the use of weak and strong ties for the other team members.

6. Conclusions

This thesis is comprised of four papers investigating the origins of human and social capital, its use in different stages of the entrepreneurial process and its impact on entrepreneurial success. The general objective of the papers is to contribute to our understanding of main individual and group characteristics in entrepreneurship. This chapter summarises the main results (Section 6.1) and discusses the main findings and draws some conclusions (Section 6.2). In both sections, I first turn to the issue of social capital (Chapters 2 and 5) and second to human capital (Chapters 3 and 4).

6.1 Main Results

Central topics in Chapter 2 are the origins of social capital and its impact on an individual's decision to become a nascent entrepreneur. In Chapter 2, I contribute to the literature by proposing and testing a path model on the impact of regional characteristics on entrepreneurial activity. In a nutshell, I empirically show that the general regional opportunity structure has mainly indirect effects on an individidual's engagement in nascent entrepreneurship. Thereby, the objective regional opportunity structure is positively correlated with both the individual social capital and the individual's perception of founding opportunities, which in turn substantially increases the odds of engaging in nascent entrepreneurship. In contrast, there was no direct correlation between regional-level variables and individual entrepreneurial behaviour. Thus, the results suggest that an individual's social capital and individual's perception of founding opportunities are pathways via which regional characteristics affect individual entrepreneurial activity.

Chapter 5 investigates the use and the effects of social capital in later stages of the entrepreneurial process. To be more precise, I study the use of social capital in the nascent phase and its effects on subsequent new venture performance in the post-nascent phase. In the analysis a distinction is made between solo entrepreneurs and new venture teams. Prior research argued that new venture teams have an advantage above solo entrepreneurs because they have more social capital. However, an analysis of the pattern of social capital use reveals that both start-up modes use social capital to the same extent. This is due to a countervailing mechanism. While teams probably have more networks contacts to turn to compared to solo entrepreneurs have, the bundling of individuals' skills in a team enables the team to conduct more venture creation activities in-house. This makes the team more autarchic from the use of social capital. Regarding the performance

effects of social capital use, there exist pronounced differences between both start-up modes. For solo entrepreneurs, the results suggest a direct performance effect of social capital use (and in particular from weak ties). In contrast, no such direct relationship was found for new venture teams. Instead, the effect of social capital use in teams on new venture performance is moderated by the breadth of the team's human capital.

The concept of human capital and in particular issues of human capital breadth and heterogeneity are the central topics in Chapters 3 and 4. Chapter 3 is dedicated to the origins of balanced skills and its effect on making progress in new venture creation in the nascent phase. Regarding the controversial question of whether balanced skills can be consciously acquired by nascent entrepreneurs or reflect an innate ability or specific individual characteristics, Chapter 3 finds support for both views. In this chapter I extend prior research by also proposing a formal model of how balanced skills affect entrepreneurial earnings. I find that a balanced skill set of a nascent entrepreneur is an important predictor for making progress in the venture creation process, supporting the respective hypothesis.

However balanced the human capital base of an entrepreneur is, quite often entrepreneurs form teams to compensate for their own missing skills and knowledge. Especially start-ups in "high-technology industries might require more skills than an individual would be likely to have" (Gartner, 1985, p. 703). However, functional heterogeneity in new venture teams does not only have advantages; there are also detrimental effects on performance due to communication problems and increased conflicts within the team. Chapter 4 tries to resolve the ambiguity in prior functional heterogeneity studies by disentangling functional heterogeneity of a new venture team into two separate dimensions, knowledge scope and knowledge disparity. Knowledge scope is intended to capture productive effects of functional heterogeneity stemming from the breadth of a team's knowledge base. Knowledge disparity shall capture destructive effects of functional heterogeneity due to divergences within the knowledge base of the team. Although the empirical results differ for different dependent variables, in general teams' knowledge scope pays off, while teams' knowledge disparity has a negative effect on subsequent new venture performance in the post-nascent phase.

6.2 Discussion and Implications

Social capital

Recall that one of the major findings of Chapter 2 is that the relationship between regional characteristics and individual entrepreneurial activity is not a direct

one, but more complex. Taking into account individual-level variables eliminates most of the regional-level variance in entrepreneurial activity. Consequently, none of regional-level predictors had a direct impact on individual-level entrepreneurial activity.

How does this relate to studies (operating solely at the regional level) that show large and persistent inter-regional differences in entrepreneurial activity (e.g. Fritsch & Mueller, 2007)? First, one interpretation of the finding is that the region only matters because of the inter-regional differences in the characteristics of the people within the region. In other words, regions with an endowment of well-educated people, with social capital and financial capital, still have higher founding rates compared to less-equipped regions. A second interpretation is that we have to think more about the pathways of how regional characteristics impact individual behaviour. In Chapter 2, I suggested social capital and the perception of business founding opportunities to be such pathways. Regional characteristics, such as institutions, have an important but indirect impact on entrepreneurship in the way people perceive their environment and interact with others. In Chapter 5, I find social capital to also be positively correlated with new venture performance. As the impact of social capital manifests in (successful) new ventures it can set in motion a self-energising process that can lead to the persistent and substantial inter-regional differences in entrepreneurship we observe.

Two implications can be drawn from these findings. Concerning implications for theory, the findings offer a link to cognitive psychology in general and entrepreneurial cognition in particular. These emerging fields of research deal with mental processes that occur within individuals (or entrepreneurs) as they interact with other people and the surrounding environment (Mitchell et al., 2002). Future research might study in greater detail differences in entrepreneurial cognition between individuals living in regions with a favourable opportunity structure and less well-equipped regions.

Although these results are primarily based on cross-sectional designs and need verification by future research, I might draw some policy implications. In general, the results do not offer short-term solutions to reducing regional disparities in entrepreneurship. However, there are several policy instruments that can foster entrepreneurship in the long run. Given the empirical evidence in Chapters 2 and 5 on the impact of social capital, building institutions that enable individuals to interact with each other can be one important policy instrument. However, regional or local solutions in the institutional setting are required. Due to differences in regional conditions, founding opportunities and the enterprising individuals' one-size-fits-all

solution will be likely to fail. For that reason it is not an easy task to provide general guidelines for policy makers. Instead I will provide an example of such a well-functioning institution in Thuringia: “Gründerwerkstatt neudeli” (short neudeli). I interviewed the spokesman of neudeli, Thomas Wagner, as part of my project work in the Thuringian Founder Study in 2008.

Neudeli is loosely connected to the university in Weimar and financed by both public and private partners. Because of this loose connection to the university, neudeli still has access to the university facilities, but is not perceived as a university department, which provides a welcome freedom to interact with public organisations as well as private firms. Neudeli provides services for latent entrepreneurs and nascent entrepreneurs. These services include workshops, seminars and individual consulting, which are often held by external experts and entrepreneurs. Neudeli has acknowledged that founding opportunities and founders are idiosyncratic. They offer no one-size-fits-all solution, but try to match the specific needs of a (potential) entrepreneur with specific solutions. Moreover, neudeli is also characterised by a climate that values unconventional thinking and being different, which supports the recombination of existing knowledge into novel configurations. By applying these instruments, neudeli, as an institution, successfully 1) assists in the sorting process of students into entrepreneurship and 2) accompanies nascent projects in the venture creation process.

Human Capital

One of the major findings of Chapters 3 and 4 is that human capital variables indicating the breadth of the knowledge base or skill base are positively correlated with entrepreneurial success. These results confirm a recently proposed theory postulating that (successful) entrepreneurs are skilled in a number of different areas, or in other words are jack-of-all-trades (Lazear, 2005). Because an entrepreneur has to deal with a variety of tasks, a balanced set of skills and knowledge should pay off.

In contrast, traditional human capital variables related to depth of experience such as years of management experience and years of prior entrepreneurial experience are not directly correlated with (nascent) venture performance. This observation is in line with a recent overview of nascent entrepreneurship research (Davidsson & Gordon, 2009), which also questions the explanatory power of the traditional human capital variables. The limited performance of these variables might be explained by the investment hypothesis which is investigated in Chapter 3. According to this hypothesis, managerial experience and entrepreneurial experience can be regarded as human capital investments, whereas variables indicating an

entrepreneur's breadth of skills and knowledge are more an *outcome* of human capital investment. This view is supported by Unger et al. (2009), who found in a meta-analytic review a stronger relationship between *outcomes* of human capital investments and entrepreneurial success than between human capital investments and entrepreneurial success. Accordingly, balanced skills and other variables indicating the breadth of skills and knowledge might be seen as a more direct and proximal indicator of human capital.

Besides the economic approach to human capital origins (which builds the base for the investment hypothesis), the results of Chapter 3 also indicate that the psychological approach to entrepreneurship is conducive for our understanding of human capital. In particular the life-span perspective seems to be a promising point of departure. Here, this thesis presents empirical evidence on the link between the breadth of interests in adolescence and the breadth of skills among nascent entrepreneurs prior to the start of their new venture project. Within the Thuringian Founder Study other analyses also highlight the importance of early entrepreneurial skills on the formation of entrepreneurial intentions and entrepreneurial performance (e.g. Obschonka et al., 2010).

Regarding implications for theory, these findings demonstrate the potential for interdisciplinary research between psychology, economics and business administration. Integrative models building on these schools can substantially contribute to our understanding of entrepreneurship. For example, despite some progress there is a considerable research gap in potential mediated and moderating effects of personality traits. Traits can be understood as predispositions that make certain individual behaviour more/less likely or more/less promising. Possible research questions could be: which entrepreneurs show bricolage behaviour and for which entrepreneurs does bricolage pay off? Which entrepreneurs employ effectuation?

Regarding policy implications the same caveats (cross-sectional design, reporting correlations) apply as discussed above. Taking this into account, the empirical evidence of Chapters 3 and 4 still offers a range of starting points for education policies. Even at early stages of the educational process (in childhood and adolescence), career development programs can make a difference. Of course it is not possible and advisable to transform every child into an entrepreneur. However, as Schröder & Schmitt-Rodermund (2009) demonstrate, a training program focussing on the exploration of personal requirements and skills for entrepreneurship can raise the awareness of adolescents towards an entrepreneurial career. In order to promote human capital breadth, educational

programs in childhood and adolescence should be opened up to include a wide array of activities and subjects. Early specialisation and focussing should be avoided. At later stages of the educational process more specific programmes might be applied. The results of Chapters 3 and 4 speak in favour of including elements of interdisciplinary cooperation in entrepreneurship education and training at universities.

Again, I will provide an example of a well-functioning programme at the Thuringian universities fostering the acquisition of various experiences. The specific program with the title “Prototypenseminar” is jointly offered by the universities of Weimar and Jena with the assistance of local companies. During one semester students from different fields work together in interdisciplinary teams on one specific practical problem of a company. The seminar is, thus, not limited to specific recurring tasks, but changes according to the participating local firms. In recent years the wide range of tasks included the development of a sensor system, the design of a company logo and the planning and execution of a marketing strategy. The students’ effort is supervised by mentors of the two universities and the firms. The cooperative teamwork in this seminar between students from different fields provides an opportunity for interdisciplinary learning. Thus, it helps students to acquire a broad range of skills and knowledge and can reduce stereotypical assumptions against students from other fields – contributing to a mutual understanding. In this way, participating students might be better prepared for engaging in entrepreneurship and working in functionally heterogeneous start-up teams.

References

Acs, Z.J. & Armington, C. (2004), Employment Growth and Entrepreneurial Activity in Cities, in: *Regional Studies*, Vol. 39(8), 911-927.

Acs, Z. & Plummer, L. (2005), Penetrating the Knowledge Filter in Regional Economies, in: *The Annals of Regional Science*, Vol. 39(3), 439-456.

Adler, P. & Kwon, S. (2002), Social Capital: Prospects for a New Concept, in: *Acamdemy of Management Review*, Vol. 27(1), 17-40.

Ahuja, G. & Katila, R. (2001), Technological Acquisitions and the Innovation Performance of Acquiring Firms: A Longitudinal Study, in: *Strategic Management Journal*, Vol. 22(3), 197-220.

Akaike, H. (1973), *Information Theory and the Extension of the Maximum Likelihood Principle*, In: Petrov, B.N. & Csaki, F. (Eds.), Second International Symposium on Information Theory (pp. 267-281), Budapest: Academia Kiado.

Aldrich, H.E. & Martinez, M.A. (2001), Many are Called, but Few are Chosen: An Evolutionary Persepctive for the Study of Entrepreneurship, in: *Entrepreneurship Theory and Practice*, Vol. 25(4), 41-56.

Aldrich, H.E. & Ruef, M. (2006), *Organizations Evolving*, Second Edition, London, Thousand Oaks: Sage Publications.

Allcott, H.; Karlan, D.; Möbius, M.M; Rosenblat, T.S; Szeidl, A. (2007), Community Size and Network Closure, in: *American Economic Review*, Vol. 97(2), 80-85.

Alsos, G.A. & Kolvereid, L. (1998), The Business Gestation Process of Novice, Serial and Parallel Business Founders, in: *Entrepreneurship Theory and Practice*, Vol. 22(4), 101-114.

Amason, A.C. (1996), Distinguishing the Effects of Functional and Dysfunctional Conflict on Strategic Decision Making: Resolving a Paradox for Top Management Teams, in: *Academy of Management Journal*, Vol. 39(1), 123-148.

Amason, A.C. & Sapienza, H.J. (1997), The Effects of Top Management Team Size and Interaction Norms on Cognitive and Affective Conflict, in: *Journal of Management*, Vol. 23(4), 495-516.

Amason, A.C., Shrader, R.C. & Tompson, G.H. (2006), Newness and Novelty: Relating Top Management Team Composition to New Venture Performance, in: *Journal of Business Venturing*, Vol. 21(1), 125-148.

Ancona, D.G. & Caldwell, D.F. (1992), Demography and Design: Predictors of New Product Team Performance, in: *Organization Science*, Vol. 3(3), 321-341.

Anderson, A.R.; Park, J. & Jack, S. (2007), Entrepreneurial Social Capital: Conceptualizing Social Capital in New High-tech Firms, in: *International Small Business Journal*, Vol. 25(3), 245-272.

Andersson, M. & Koster, S. (2010), Sources of Persistence in Regional Start-up Rates – Evidence from Sweden, in: *Journal of Economic Geography*, doi:10.1093/jeg/lbp069.

Andersson, M. & Noseleit, F. (in press), Start-ups and Employment Dynamics Within and Across Sectors, in: *Small Business Economics*, doi:10.1007/s11187-009-9252-0.

Arenius, P. & De Clerc, D. (2005), A Network-Based Approach on Opportunity Recognition, in: *Small Business Economics*, Vol. 24(3), 249-256.

Arenius, P. & Minniti, M. (2005), Perceptual Variables and Nascent Entrepreneurship, in: *Small Business Economics*, Vol. 24(3), 233-247.

Armington, C. & Acs, Z.C. (2002), The Determinants of Regional Variation in New Firm Formation, in: *Regional Studies*, Vol. 36(1), 33-45.

Assouline, M. & Meir, E.I. (1987), Meta-analysis of the Relationship Between Congruence and Well-being measures, in: *Journal of Vocational Behavior*, Vol. 31(3), 883-901.
Åstebro, T. & Thompson, P. (2007), *Does it Pay to be a Jack of all Trades?*, Working Paper, retrieved October 10, 2009, from www.economics.buffalo.edu/documents/seminars/spring2007/astebro.20070420.pdf.
Audretsch, D.B. (2000). Entrepreneurship in Germany, In: Sexton, D.L. & Landstrom, H. (Eds.), *The Blackwell Handbook of Entrepreneurship* (pp. 107-127), Oxford, UK: Blackwell Publishing.
Audretsch, D.B. (2007), *The Entrepreneurial Society.* New York: Oxford University Press.
Audretsch D.B., & Feldman, M. (1996), R&D Spillovers and the Geography of Innovation and Production, in: *American Economic Review*, Vol. 86(3), 630-640.
Audretsch, D.B. & Fritsch, M. (1994), The Geography of Firm Births in Germany, in: *Regional Studies*, Vol. 28(4), 359-365.
Audretsch, D.B. & Keilbach, M. (2004a), Does Entrepreneurship Capital Matter?, in: *Entrepreneurship Theory and Practice*, Vol. 28(5), 419-429.
Audretsch, D.B. & Keilbach, M. (2004b), Entrepreneurship Capital and Economic Performance, in: *Regional Studies*, Vol. 38(8), 949-959.
Audretsch, D.B. & Keilbach, M. (2007), The Knowledge Spillover Theory of Entrepreneurship, in: *Journal of Management Studies*, Vol. 44(7), 1242-1545.
Autio, E. & Wennberg, K. (2010), *You Think, Therefore, I Become: Social Attitudes and the Transition to Entrepreneurship*, Working paper presented at the DRUID summer conference, retrieved October 22, 2010, from www2.druid.dk/conferences/viewpaper.php?id=501642&cf=43.
Baker, T. & Nelson, R.E. (2005), Creation Something from Nothing: Ressource Construction through Entrepreneurial Bricolage, in: *Administrative Science Quarterly*, Vol. 50(3), 329-366.
Baker, T.; Miner, A.S.; Esley, D.T. (2003), Improvising Firms: Bricolage Account Giving and Improvisational Competencies in the Founding Process, in: *Research Policy*, Vol. 32(3), 255-276.
Bantel, K.A. & Jackson, S.E. (1989), Top Management and Innovations in Banking: Does the Composition of Top Team Makes a Difference?, in: *Strategic Management Journal*, Vol. 10(Special Issue), 107-124.
Barber, B.M. & Odean, T. (2001). Boys will be Boys: Gender, Overconfidence, and Common Stock Investment, in: *Quarterly Journal of Economics*, Vol. 116(1), 261-292.
Barbier, F. (2006), L'Europe De Gutenberg: Le Livre et L'Invention de la Modernite Occidentale, Paris; Berlin.
Barney, J. (1991), Firm Resources and Sustained Competitive Advantage, in: *Journal of Management*, Vol. 17(1), 99-120.
Baron, R.A. (2006), Opportunity Recognition as Pattern Recognition: How Entrepreneurs 'Connects the Dots' to Identify New Business Opportunities, in: *Academy of Management Perspectives*, Vol. 20(1), 104-119.
Baron, R.A. (2007), Entrepreneurship: A Process Perspective, in: Baum J.R. et al. (Eds.) The Psychology of Entrepreneurship (pp.19-39), Mahwah New Jersey: Erlbaum.
Batjargal, B. (2007), Internet Entrepreneurship: Social Capital, Human Capital and Performance of Internet Ventures in China, in: *Research Policy*, Vol. 36(5), 605-618.
Baum, J.A.C.; Calabrese, T. & Silverman, B.S. (2000), Don't go it Alone: Allicance Network Composition and Startups' Performance in Canadian Biotechnology, in: *Strategic Management Journal*, Vol. 21(3), 267-294.

Baum, J.R. & Locke, E.A. (2004), The Relationship of Entrepreneurial Traits, Skill, and Motivation to Subsequent Venture Growth, in: *Journal of Applied Psychology*, Vol. 89(4), 587-598.

Baum, J.R.; Locke, E.A. & Smith, K.G. (2001), A Multidimensional Model of Venture Growth, in: *Academy of Management Journal*, Vol. 44(2), 292-303.

Baumgärtner, S. (2004), *Diversity as a Potential for Surprise: An Information Theoretic Measure of Effective Product Diversity*. Working Paper, retrieved October 10, 2006, from www.eco.uni-heidelberg.de/ng-oeoe/research/papers/EffDiv.pdf.

Becker, G.S. (1964), *Human Capital*, University of Chicago Press, Chicago.

Beckman, C.M., Burton, M.D. & O'Reilly, C. (2007), Early Teams: The Impact of Team Demography on VC Financing and Going Public, in: *Journal of Business Venturing*, Vol. 22(2), 147-173.

Belli, R.F.; Lee, E.H.; Stafford, F.P. & Chou, C. (2004), Calendar and Question-List Survey Methods: Association between Interviewer Behaviors and Data Quality, in: *Journal of Official Statistics*, Vol. 20(2), 185-218.

Belli, R.F.; Shay, W.L. & Stafford, F.P. (2001), Event History Calendars and Question List Surveys, in: *Public Opinion Quarterly*, Vol. 65(1), 45-74.

Bergmann, H. (2005), Entrepreneurial Attitudes, in: *Zeitschrift für Wirtschaftsgeographie*, Vol. 49(3-4), 185-199.

Bergmann, H. & Sternberg, R. (2007), The Changing Face of Entrepreneurship in Germany, in: *Small Business Economics*, Vol. 28(2-3), 205-221.

Bhave, M.P. (1994), A Process Model of Entrepreneurial Venture Creation, in: *Journal of Business Venturing*, Vol. 9(3), 223-242.

Blau, P.M. (1977), *Inequality and Heterogeneity*. New York: Free Press.

Bloom, B.S. (1985), *Developing Talent in Young People*, New York: Ballantine.

Boeker, W. (1989), Strategic Change: The Effects of Founding and History, in: *Academy of Management Journal*, Vol. 32(3), 489-515.

Boschma, R.A. & Fritsch, M. (2009), Creative Class and Regional Growth: Empirical Evidence from Seven European Countries, in: *Economic Geography*, Vol. 85(4), 391-423.

Bosma, N. & Levie, J. (2009), Global Entrepreneurship Monitor: 2009 Global Report, retrieved October 22, 2010, from http://www.gemconsortium.org/about.aspx?page=pub_gem_global_reports.

Bosma, N. & Schutjens, V. (2010), Understanding Regional Variation in Entrepreneurial Activity and Entrepreneurial Attitude in Europe, *Annals of Regional Science*, doi:10.1007/s00168-010-0375-7

Bosma, N.; van Stel, A. & Suddle, K. (2008), The Geography of New Firm Formation: Evidence from Independent Start-ups and New Subsidiaries in the Netherlands, in. *International Entrepreneurship and Management Journal*, Vol. 4(2), 129-146.

Bourdieu, P. (1986), The Forms of Capital, in: Richardson, J.G. (Eds.), *Handbook of Theory and Research for Sociology of Education* (pp. 241-258), New York: Greenwood Press.

Bourgeon, L. (2007), Staffing Approach and Conditions for Collective Learning in Project Teams: The Case of New Product Development Projects, in: *International Journal of Project Management*, Vol. 25(4), 413-422.

Bowers, C. A., Pharmer, J. A., & Salas, E. (2000), When Member Homogeneity is Needed in Work Teams: A Meta-analysis, in: *Small Group Research*, Vol. 31(3), 305-327.

Brewer, M.B. (1995), Managing Diversity: The Role of Social Identities, in: Jackson, S.E. & Ruderman, M. (Eds.), *Diversity in Work Teams: Research Paradigms for a Changing Workplace* (pp. 47-68), Washington, DC: APA.

Brixy, U. & Grotz, R. (2007), Regional Patterns and Determinants of the Success of New Firms in Western Germany, in: *Entrepreneurship and Regional Development*, Vol. 19(4), 293-312.
Brixy, U.; Hundt, C. & Sternberg, R. (2009), *Global Entrepreneurship Monitor (GEM). Länderbericht Deutschland 2008*. Hannover: Institut für Wirtschafts- und Kulturgeographie, Universität Hannover, Nürnberg: Institut für Arbeitsmarkt- und Berufsforschung der Bundesagentur für Arbeit (IAB).
Brixy, U.; Sternberg, R. & Stüber, H. (2008), *From Potential to Real Entrepreneurship*, IAB Discussion Papers, 32, 1-34.
Brockhaus, R.H. (1980), Risk Taking Propensity of Entrepreneurs, in: *Academy of Management Journal,* Vol. 23(3), 509-520.
Bronfenbrenner, U. (1979), *The Ecology of Human Development: Experiments by Nature and Design*, Cambridge: Harvard University Press.
Brüderl, J. & Preisendörfer, P. (1998), Network Support and the Success of Newly Founded Businesses, in: *Small Business Economics*, Vol. 10(3), 213-225.
Brüderl, J.; Preisendörfer, P. & Ziegler, R. (1992), Survival Chances of Newly Founded Business Organizations, in: *American Sociological Review*, Vol. 57(2), 227-242.
Brush, C.G.; Edelman, L.F. & Manolova, T.S. (2008a), The Effect of Initial Location, Aspirations, and Resources on Likelihood of First Sale in Nascent Firms, in: *Journal of Small Business Management*, Vol. 46(2), 159-182.
Brush, C.G.; Manolova, T.S. & Edelmann, L. (2008b), Properties of Emerging Organisations: An Empirical Test, in: *Journal of Business Venturing*, Vol. 23(5), 547-566.
Bryk, A.S. & Raudenbush, S.W. (1992), *Hierarchical Linear Models*, Newbury Park, CA: Sage.
Bunderson, J.S. (2005), Team Member Functional Background and Involvement in Management Teams: Direct Effects and the Moderating Role of Power Centralization, in: *Academy of Management Journal*, Vol. 46(4), 458-474.
Bunderson, J.S. & Sutcliffe, K.M. (2002), Comparing Alternative Conceptualizations of Functional Diversity in Management Teams: Process and Performance Effects, in: *Academy of Management Journal*, Vol. 45(5), 875-893.
Bunnis, S. & Kelly, D.R. (2008), The Unknown becomes the Known‘: Collective Learning and Change in Primary Care Teams, in: *Medical Education*, Vol. 42(12), 1185-1194.
Burt, R.S. (1992), *Structural Holes: The Social Structure of Competitions*, Cambridge, Mass.: Harvard University Press.
Burt, R.S. (2000), The Network Structure of Social Capital, in: Sutton, R.I.; Staw, B.M. (Eds.), *Research in Organizational Behavior*, Greenwich: JAI Press, Vol. 22, 345-423.
Bygrave, W.D. (1989), The Entrepreneurship Paradigm (I): A Philosophical Look at Its Research Methodologies, in: *Entrepreneurship Theory and Practice*, Vol. 14(1), 7-26.
Byrne, D.E. (1971), *The Attraction Paradigm*. New York: Academic Press.
Cantner, U.; Goethner, M. & Stuetzer, M. (2010), *Disentangling the Effect of New Venture Team Functional Background Heterogeneity on New Venture Performance*, in: *Jena Economic Research Papers*, Vol. 4, Nr. 29, retrieved Mai 8, 2010, from http://zs.thulb.uni-jena.de/servlets/MCRFileNodeServlet/jportal_derivate_00188156/wp_2010_029.pdf.
Carter, N.M.; Gartner, W.B. & Reynolds, P.D (1996), Exploring Start-up Event Sequences, in: *Journal of Business Venturing,* Vol. 11(3), 151-166.
Caspi, A.; Moffitt, T.E.; Thornton, A.; Freedman, D.; Amell, J.W.; Harrington, H.; Smeijers, J. & Silva, Phil A. (1996), The Life History Calendar: A Research and Clinical Assessment Method for Collecting Retrospective Event-History

Data, in: *International Journal of Methods in Psychiatric Research*, Vol. 6(2), 101-114.
Caspi, A.; Roberts, B.W. & Shiner, R.L. (2005), Personality Development: Stability and Change, in: *Annual Review of Psychology*, Vol. 56(1), 453-484.
Chandler, G.N. & Hanks, S.H. (1994), Founder Competence, the Environment, and Venture Performance, in: *Entrepreneurship Theory and Practice*, Vol. 18(3), 77-89.
Chandler, G.N.; Honig, B. & Wiklund, J. (2005), Antecedents, Moderators and Performance Consequences of Membership Change in New Venture Teams, in: *Journal of Business Venturing*, Vol. 20(5), 705-725.
Chandler, G.N. & Lyon, D.W. (2009), Involvement in Knowledge-Acquisition Activities by Venture Team Members and Venture Performance, in: *Entrepreneurship Theory and Practice*, Vol. 33(3), 571-592.
Chatman, J.A. & Flynn, F.J. (2001), The Influence of Demographic Composition on the Emergence and Consequences of Cooperative Norms in Work Teams, in: *Academy of Management Journal*, Vol. 44(5), 956-974.
Cho, T.S. & Hambrick, D.C. (2006), Attention as the Mediator Between Top Management Team Characteristics and Strategic Change: The Case of Airline Deregulation, in: *Organization Science*, Vol. 17(4), 453-469.
Chowdhurry, S. (2005), Demographic Diversity for Building an Effective Entrepreneurial Team: Is it Important?, in: *Journal of Business Venturing*, Vol. 20(6), 727-746.
Clarke, P.J. (2008), When Can Group Level Clustering be Ignored? Multilevel Models Versus Single-level Models with Sparse Data, in. *Journal of Epidemiology and Community Health*, Vol. 62(8), 752-758.
Cohen, W.M. & Levinthal, D.A. (1990), Absorptive capacity: A New Perspective on Learning and Innovation, in: *Administrative Science Quarterly*, Vol. 35(1), 128-152.
Coleman, J.S. (1988), Social Capital in the Creation of Human Capital, in: *American Journal of Sociology*, Vol. 94 (S), 95-120.
Coleman, J. (1990), *Foundations of Social Theory*, Cambridge, MA: Harvard University Press.
Colombo, M.G. & Grilli, L. (2005), Founders' Human Capital and the Growth of New Technology-based Firms: A Competence-based view, in: *Research Policy*, Vol. 34(6), 795-816.
Colombo, M.G. & Grilli, L. (2009), On Growth Drivers of High-tech Start-ups: Exploring the Role of Founders' Human Capital and Venture Capital, in: *Journal of Business Venturing*, Vol. 25(6), 610-626.
Cooper, A.C. & Bruno, A.V. (1977), Success Among High-Technology Firms, in: *Business Horizons*, Vol. 20(2), 16-22.
Cooper, A.C.; Gimeno-Gascon, F.J. & Woo, C.Y. (1994), Initial Human and Financial Capital as Predictors of New Venture Performance, in: *Journal of Business Venturing*, Vol. 9(5), 371-395.
Cox, T., & Blake, S. (1991), Managing Cultural Diversity: Implications for Organizational Competitiveness, in: *Academy of Management Executive*, Vol. 5(3), 45-56.
Creditreform & Bureau van Dijk (2009), *MARKUS database*, retrieved January 10, 2009, from www.creditreform.de/Deutsch/Creditreform/Produkte_ und_Leistungen/Direktmarketing/Business_Marketing/MARKUS_Firmen profile.jsp.
Cyr, L., Johnson, D.E., & Welbourne, T.M. (2000), Human Resources in Initial Public Offering Firms: Do Venture Capitalists Make a Difference?, in: *Entrepreneurship Theory and Practice*, Vol. 25(1), 77-91.
Davidsson, P. (2006), Nascent Entrepreneurship: Empirical Studies and Developments, in: *Foundations and Trends in Entrepreneurship*, Vol. 2(1), 1-79.

Davidsson, P. (2008), *The Entrepreneurship Research Challenge*, Cheltenham (UK): Edward Elgar.
Davidsson, P. & Gordon, S.R. (2009), *Nascent Entrepreneur(ship): A Review*, Unpublished Working Paper, retrieved October 10, 2009, from http://eprints.qut.edu.au/19622/1/c19622.pdf.
Davidsson, P. & Honig, B. (2003), The Role of Social and Human Capital Among Nascent Entrepreneurs, in: *Journal of Business Venturing*, Vol. 18(3), 301-331.
Davidsson, P.; Low, M. & Wright, M. (2001), Editors' Introduction: Low & MacMillan Ten Years on – Achievements and Future Directions for Entrepreneurship Research, in: *Entrepreneurship Theory and Practice*, Vol. 25(4), 81-99.
Davidsson, P.; Steffens, P.R.; Gordon, S.R. & Senyard, J.M. (2008a), *Characteristics of High-potential Start-ups : Some Early Observations from the CAUSEE project*, Unpublished Working Paper, retrieved May 5, 2009, from http://eprints.qut.edu.au/19649/1/c19649.pdf.
Davidsson, P.; Steffens, P.R.; Gordon, S.R. & Reynolds, P. (2008b), Anatomy of New Business Activity in Australia: Some Early Observations from the CAUSEE Project, Technical Report, retrieved June 1, 2008, from http://eprints.qut.edu.au/13613/1/13613c.pdf.
Davidsson, P. & Wiklund, J. (1997), Values, Beliefs and Regional Variations in New Firm Formation Rates, in: *Economic Psychology*, Vol. 18(2-3), 179-199.
Davidsson, P. & Wiklund, J. (2001), Levels of Analysis in Entrepreneurship Research: Current Research Practice and Suggestions for the Future, in: *Entrepreneurship Theory and Practice*, Vol. 25(4), 81-100.
De Dreu, C.K.W. & Weingart, L.R. (2003), Task Versus Relationship Conflict, Team Performance, and Team Member Satisfaction: A Meta-Analysis, in: *Journal of Applied Psychology*, Vol. 88(4), 741-749.
De Dreu, C.K.W. & West, M.A. (2001), Minority Dissent and Team Innovation: The Importance of Participation in Decision Making, in: *Journal of Applied Psychology*, Vol. 86(6), 1191-1201.
DeCarolis, D.M. & DeEds, D.L. (1999), The Impact of Stocks and Flows of Organizational Knowledge on Firm Performance: An Empirical Investigation of the Biotechnology Industry, in: *Strategic Management Journal*, Vol. 20(10), 953-968.
Delmar, F. & Gunnarsson, J. (2000), How Do Self-Employed Parents of Nascent Entrepreneurs Contribute?, in: *Frontiers of Entrepreneurship Research*, Wellesley: Babson.
Digman, J.M. (1990), Personality Structure: Emergence of the Five-Factor Model, in: *Annual Review of Psychology*, Vol. 41(1), 417-440.
Dittmar, J. (2010), *Information Technology and Economic Change: The Impact of the Printing Press, Working paper*, retrieved October 23, 2010, from http://www.jeremiahdittmar.com/files/dittmar_printing_6.17.2010.pdf.
Drach-Zahavy, A. & Somech, A. (2001), Understanding Team Innovation: The Role of Ream Processes and Structures, *Group Dynamics, in: Theory, Research, and Practice*, Vol. 5(2), 111-123.
Ensley, M. D., & Hmieleski, K.M. (2005), A Comparative Study of New Venture Top Management Team Composition, Dynamics and Performance Between University-based and Independent Start-ups, in: *Research Policy*, Vol. 34(7), 1091-1105.
Eisenhardt, K.M. & Schoonhoven, C.B. (1990), Organizational Growth: Linking Founding Team, Strategy, Environment and Growth Among U.S. Semiconductor Ventures, 1978-1988, in: *Administrative Science Quarterly*, Vol. 35(3), 504-529.
Eisenhardt, K.M., Kahwajy, J.L. & Bourgeois III, L.J. (1997), Conflict and Strategic Choice: How Top Management Teams Disagree, in: *California Management Review*, Vol. 39(2), 42-62.

Elfring, T. & Hulsink, W. (2003), Networks in Entrepreneurship: The Case of High-Technology Firms, in: *Small Business Economics*, Vol. 21(4), 409-422.
Ensley, M.D., Carland, J.W. & Carland, J.C. (1998), The Effect of Entrepreneurial Team Skill Heterogeneity and Functional Diversity on New Venture Performance, in: *Journal of Business and Entrepreneurship*, Vol. 10(1), 1-14.
Ensley, M.D. & Pearce, C.L. (2001), Shared Cognition in Top Management Teams: Implications for New Venture Performance, in: *Journal of Organizational Behavior*, Vol. 22(2), 145-160.
Ensley, M.D., Pearson, A.W. & Amason, A.C. (2002), Understanding the Dynamics of New Venture Top Management Teams: Cohesion, Conflict and New Venture Performance, in: *Journal of Business Venturing*, 17(4), 365-386.
Etzioni, (1987), Entrepreneurship, Adaptation and Legitimation: A Macro-behavioral perspective, in: *Journal of Economic Behavior and Organisation*, Vol. 8(2), 175-189.
Evans, D.S. & Leighton, L.S. (1989), Some Empirical Aspects of Entrepreneurship, in: *American Economic Review*, Vol. 79(3), 519-535.
Fayol, H. (1916), *Administration Industrielle et Générale*. Paris: Dunod.
Feldman, M.P. (2001), The Entrepreneurial Event Revisited: Firm Formation in a Regional Context, in: *Industrial and Corporate Change*, Vol. 10(4), 861-891.
Fiet, J.O., Clouse, V.G.H. & Norton, W.I., Jr. (2004), Systematic Search by Repeat Entrepreneurs. In J.E. Butler (Ed.), *Opportunity Identification and Entrepreneurial Behavior.* Greenwich, CT: Information Age Publishing.
Florida, R.L. (2004), *The Rise of the Creative Class*. Revised paperback edition. New York: Basic Books.
Florin, J.; Lubatkin, M. & Schulze, W. (2003), A Social Capital Model of High-Growth Ventures, in: *Academy of Management Journal*, Vol. 46(3), 374-384.
Foo, M.D.; Wong, P.K. & Ong, A. (2005), Do Others Think You Have a Viable Business Idea? Team Diversity and Judges' Evaluation of Ideas in a Business Plan Competition, in: *Journal of Business Venturing*, Vol. 20(3), 385-402.
Forbes, D.P., Borchert, P.S., Zellmer-Bruhn, M.E. & Sapienza, H.J. (2006), Entrepreneurial Team Formation: An Exploration of New Member Addition, in: *Entrepreneurship Theory and Practice*, Vol. 30(2), 225-248.
Francis, D.H. & Sandberg, W.R. (2000), Friendship Within Entrepreneurial Teams and its Association with Team and Venture Performance, in: *Entrepreneurship Theory and Practice*, Vol. 25(2), 5-25.
Franklin, S., Wright, M. & Lockett, A. (2001), Academic and Surrogate Entrepreneurs in University Spin-out Companies, in: *Journal of Technology Transfer, Vol.* 26 (1-2), 127-141.
Freedman, D.; Thornton, A.; Camburn, D.; Alwin, D. & Young-DeMarco, L. (1988), The Life History Calender: A Technique for Collecting Retrospective Data, in: *Sociological Methodology*, Vol. 18, 37-68.
Frenken, K. & Boschma, R.A. (2007), A Theoretical Framework for Evolutionary Economic Geography – Industrial Dynamics and Urban Growth as a Branching Process, in: *Journal of Economic Geography*, Vol. 7(5), 1-15.
Frese, M., Krauss, S. I., Keith, N., Escher, S., Grabarkiewicz, R., Luneng, S. T., Heers, C., Unger, J. M., & Friedrich, C. (2007), Business Owners' Action Planning and Its Relationship to Business Success in Three African Countries, in: *Journal of Applied Psychology*, Vol. 92(6), 1481-1498.
Fritsch, M. (2004), Entrepreneurship, Entry, and Peformance of New Businesses in Two Growth Regimes: East and West Germany, in: *Journal of Evolutionary Economics*, Vol. 14(5), 525-542.
Fritsch, M. & Brixy, U. (2004), The Establishment File of the German Social Insurance Statistics, in: *Schmollers* Jahrbuch*/Journal of Applied Social Science Studies*, Vol. 124(1), 183-190.

Fritsch, M. & Falck, O. (2007), New Business Formation by Industry Over Space and Time: A Multi-Dimensional Analysis, in: *Regional Studies*, Vol. 41(2), 157-172.
Fritsch, M. & Mueller, P. (2004), Effects of New Business Formation on Regional Development over Time, in: *Regional Studies*, Vol. 38(8), 961-975.
Fritsch, M. & Mueller, P. (2007), The Persistence of Regional New Business Formation Activity over Time - Assessing the Potential of Policy Promotion Programs, in: *Journal of Evolutionary Economics*, Vol. 17(3), 299-315.
Fritsch, M. & Mueller, P. (2008), The Effect of New Business Formation on Regional Development over Time: The Case of Germany, in: *Small Business Economics*, Vol. 30(1), 15-29.
Fritsch, M. & Rusakova, A. (2010), Entrepreneurship and Cultural Creativity, in: *Jena Economic Research Papers*, 2010-001.
Fritsch, M. & Schroeter, A. (2007), Why does the Effect of New Business Formation Differ Across Regions?, in: *Jena Economic Research Papers*, 2007-077.
Fritsch, M. & Stuetzer, M. (2007), Die Geographie der Kreativen Klasse in Deutschland [The Geography of Creative People in Germany], in: *Raumforschung und Raumordnung*, Vol. 65(1), 15-29.
Fritsch, M. & Stuetzer, M. (2009), The Geography of Creative People in Germany, in: *International Journal of Foresight and Innovation Policy*, Vol. 5(1-3), 7-23.
Garnsey, E. & Hefferman, P. (2005), High-technology Clustering through Spin-out and Attraction: The Cambridge Case, in: *Regional Studies*, Vol. 39(8), 1127-1144.
Gartner, W.B. (1985), A Conceptual Framework for Describing the Phenomenon of New Venture Creation, in: *Academy of Management Review*, Vol. 10(4), 696-706.
Gartner, W.B. (1988), "Who Is an Entrepreneur?" Is the Wrong Question, in: *Entrepreneurship Theory and Practice*, Vol. 12(4), 11-32.
Gartner, W.B. (1990), What We Are Talking About When We Talk About Entrepreneurship?, in: *Journal of Business Venturing*, Vol. 5(1), 15-28.
Gartner, W.B. (1993), Words Lead to Deeds: Towards an Organizational Emergence Vocabulary, in: Journal of Business Venturing, Vol. 8(3), 231-239.
Gartner, W.B. & Carter, N.M. (2004), Overview: The Start-up Process, in: Gartner, W.B.; Shaver, K.G.; Carter, N.M. & Reynolds, P.D. (Eds.), *Handbook of Entrepreneurial Dynamics: The Process of Business Creation* (pp. 237-243), Thousand Oaks, California: Sage Publication.
Gartner, W.B., Shaver, K.G., Gatewood, E. & Katz, J.A. (1994), Finding the Entrepreneur in Entrepreneurship, in: *Entrepreneurship Theory and Practice*, Vol. 18(3), 5-10.
Gartner, W.B.; Shaver, K.G.; Carter, N.M. & Reynolds, P.D. (2004), *Handbook of Entrepreneurial Dynamics: The Process of Business Creation*, Thousand Oaks, CA: Sage.
Gertler, M.S. (2003), Tacit Knowledge and Economic Geography of Context, or The Undefinable Tacitness of Being There, in: *Journal of Economic Geography*, Vol. 3(1), 75-99.
Gimmon, E. & Levie, J. (2010), Founder's Human Capital, External Investment, and the Survival of New High-Technology Ventures, in: *Research Policy*, Vol. 39(9), 1214-1226.
Glaeser, E.L; Laibson, D. & Sacerdote, B. (2002), An Economic Approach to Social Capital, in: *Journal of Economic Literature*, Vol. 112(483), 437-458.
Glaeser, E.L.; Laibson, D.; Scheinkman, J.A. & Soutter, C.L. (2000), Measuring Trust, in: *Quarterly Journal of Economics*, Vol. 115(3), 811-846.
Gompers, P. & Lerner, J. (2004), *The Venture Capital Cycle*, Cambridge, MA and London: MIT Press.

Granovetter, M.S. (1973), The Strength of Weak Ties, in: *American Journal of Sociology*, Vol. 78(6), 1360-1380.
Granovetter, M.S. (1985), Economic Action and Social Structure: The Problem of Embeddedness, in: *American Journal of Sociology*, Vol. 91(3), 481-493.
Granovetter, M.S. (1990), The Old and The New Economic Sociology: A History and an Agenda, in: Friedland, R. & Robertson, A. (Eds.), *Beyond the Market Place: Rethinking Economy and Society*, New York: Walter de Gruyter, 89-112.
Granovetter, M.S. (1992), Problems of Explanation in Economic Sociology, in Nohria, N. & Eccles, R.(Eds), *Networks and Organizations: Structure, Form and Action* (pp. 25-56), Boston, MA: Harvard Business School Press.
Greene, W. (2003). *Econometric Analysis*. 5th edition, Englewood Cliffs: Prentice-Hall.
Griliches, Z. (1990). Patent statistics as economic indicators: A survey. *Journal of Economic Literature*, 28(4), 1661-1707.
Grilo, I. & Irigoyen, J. (2006), Entrepreneurship in the EU: To Wish and Not to Be, in: *Small Business Economics*, Vol. 26(4), 305-318.
Grupp, H.; Jungmittag; A.; Schmoch, U. & Legler, H. (2000), Hochtechnologie 2000: Neudefinition der Hochtechnologie für die Berichterstattung der technologischen Leistungsfähigkeit Deutschlands. Karlsruhe/Hannover: Fraunhofer-Institut für Systemtechnik und Innovationsforschung (ISI) und Niedersächsisches Institut für Wirtschaftsforschung (NIW).
Guiso, L. & Schivardi, F. (2005), *Learning to Be an Entrepreneur*, in: CERP Discussion Paper, No. 5290.
Hall, B. H. & Ziedonis, R. H. (2001), The Patent Paradox Revisited: An Empirical Study of Patenting in the Semiconductor Industry, 1979-1995, in: *Rand Journal of Economics*, Vol. 32(1), 101-128.
Hambrick, D.C., Cho T.S. & Chen, M. (1996), The Influence of Top Management Team Heterogeneity on Firms´ Competitive Moves, in: *Administrative Science Quarterly*, Vol. 41(4), 659-684.
Hambrick, D.C. & Mason, P.A. (1984), Upper Echelons: The Organization as a Reflection of Its Top Managers, in: *Academy of Management Review*, Vol. 9(2), 193-206.
Harrison, D.A. & Klein, K.J. (2007), What's the Difference? Diversity Constructs as Separation, Variety or Disparity in Organizations, in: *Academic Management Review*, Vol. 32(4), 1199-1228.
Hart, D.M. (2003), Entrepreneurship Policy: What It Is and Where It Came from, in: Hart, D.M. (Ed.), *The Emergence of Entrepreneurship Policy: Governance, Start-ups, and Growth in the US Knowledge Economy* (pp. 3-20), Cambridge: Cambridge University Press.
Haug, P. (1995), Formation of Biotechnology Firms in the Greater Seattle Region: An Empirical Investigation of Entrepreneurial, Financial, and Educational Perspectives, in: *Environment and Planning A*, Vol. 27(2), 249-267.
Hausman, J.A.; Hall, B.H. & Griliches, Z. (1984), Econometric Models for Count Data with an Application to the Patents-R&D Relationship, in: *Econometrica*, Vol. 42(4), 909-938.
Hayton, J.C. & Zahra, S.A. (2005), Venture Team Human Capital and Absorptive Capacity in High Technology New Ventures, in: *International Journal of Technology Management*, Vol. 31(3-4), 256-274.
Hébert R. & Link, A. (1989), In Search of the Meaning of Entrepreneurship, in: *Small Business Economics*, Vol. 1(1), 39-49.
Herfindahl, O. (1950), *Concentration in the Steel Industry*, Unpublished Ph.D. Dissertation, Columbia University.
Hill, M.O. (1973), Diversity and Evenness: A Unifying Notation and Its Consequences, in: *Ecology*, Vol. 54(2), 427-432.

Hirschman, A.O. (1964), The Paternity of an Index, in: *American Economic Review*, Vol. 54(5), 761-762.
Hoang, H. & Antoncic, B. (2003), Network-based Research in Entrepreneurship: A Critical Review, in: *Journal of Business Venturing*, Vol. 18(2), 165-187.
Hodgson, G.M. (1993), *Economics and Evolution: Bringing Life Back Into Economics,* Cambridge, UK and Ann Arbor, MI: Polity Press and University of Michigan Press.
Hogg, M.H. & Abrams, D. (1988), *Social Identifications: A Social Psychology of Intergroup Relations and Group Processes*. London: Routledge.
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, in: *Journal of Educational Psychology*, Vol. 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, in: *Journal of Career Development*, Vol. 19(3), 221-229.
Honig, B.; Lerner, M. & Raban, J. (2006), Social Capital and the Linkages of High-Tech Companies to the Military Defense System: Is there a Signaling Mechanism, in: *Small Business Economics*, Vol. 27(4-5), 419-437.
Hox, J.J. (2010), *Multilevel Analysis*, 2nd edition, New York: Routledge.
Jackson, J.E. & Rodkey, G. (1994), The Attitudinal Climate for Entrepreneurial Activity, in. *Public Opinion Quarterly*, Vol. 58(3), 358-380
Jehn, K.A. (1995), A Multimethod Examination of the Benefits and Detriments of Intragroup Conflict, in: *Administrative Science Quarterly*, Vol. 40(2), 256-282.
Jehn, K.A., Northcraft, G.B. & Neale, M.A. (1999), Why Differences Make a Difference: A Field Study of Diversity, Conflict, and Performance in Workgroups, in: *Administrative Science Quarterly*, Vol. 44(4), 741-763.
Kamm, J.B.; Schuman, J.C.; Seeger, J.A. & Nurick, A.J. (1990), Entrepreneurial Teams in New Venture Creation: A Research Agenda, in: *Entrepreneurship Theory and Practice*, Vol. 14(4), 7-17.
Kaplan, S.N. & Strömberg, P. (2004), Charachteristics, Contracts and Actions: Evidence From Venture Capitalist Analysis, in: *Journal of Finance*, Vol. 59(5), 2177-2210,
Katz, J., & Gartner, W. B. (1988), Properties of Emerging Organizations, in: *Academy of Management Review*, Vol. 13(3), 429-441.
Keck, S. L. & Tushman, M. L. (1993), Environmental and Organizational Context and Executive Team Structure, in: *Academy of Management Journal*, Vol. 36(6), 1314-1344.
Kim, P.H. & Aldrich, H.E. (2005), Social Capital and Entrepreneurship, in: *Foundations and Trends in Entrepreneurship*, Vol. 1(2), 55-104.
Kirzner, I. (1973), *Competition and Entrepreneurship*, Chicago: University of Chicago Press.
Knack, S. & Keefer, P. (1997), Does Social Capital Have an Economic Pay-off? A Cross Country Investigation, in: *Quarterly Journal of Economics*, Vol. 112(4), 1251-1288.
Knight, F. (1921), *Risk, Uncertainty and Profit*, New York: Houghton Mifflin.
Kohn, M. L. & Schooler, C. (1982), Job Conditions and Personality: A Longitudinal Assessment of their Reciprocal Effects, in: *American Journal of Sociology*, Vol. 87(6), 1257-1286.
Kösters, S. (2009), Policy Support for Innovative Entrepreneurship – An Empirical Evaluation, Dissertation, retrieved October 23, 2010, from http://www.db-thueringen.de/servlets/DerivateServlet/Derivate-21129/K%C3%B6sters/Dissertation.pdf.
Krugman, P. (1991), *Geography and Trade*. Cambridge, MA: MIT Press.

Lazarus, R.S. & Folkman, S. (1984), *Stress, Appraisal and Coping*, New York: Springer.
Lazear, E.P. (2004), Balanced Skills and Entrepreneurship, in: *American Economic Review*, Papers and Proceedings, Vol. 94(2), 208-211.
Lazear, E.P. (2005), Entrepreneurship, in: *Journal of Labor Economics*, Vol. 23(4), 649-680.
Lechler, T. (2001), Social Interaction: A Determinant of Entrepreneurial Team Venture Success, in: *Small Business Economics*, Vol. 16(4), 263-278.
Lechner, C. & Dowling, M. (2003), Firm Networks: External Relationships as Sources for the Growth and Competitiveness of Entrepreneurial Firms, in: *Entrepreneurship & Regional Development*, Vol. 15(1), 1-26.
Lee, S.Y.; Florida, R. & Acs, Z. (2004), Creativity and Entrepreneurship: A Regional Analysis of New Firm Formation, in: *Regional Studies*, Vol. 38(8), 879-891.
Lent, R.W., Brown, S.D., & Hackett, G. (1994), Toward a Unifying Social Cognitive Theory of Career and Academic Interest, Choice, and Performance, in: *Journal of Vocational Behavior,* Vol. 45(1), 79-122.
Liao, J., Li, J. & Gartner, W. (2009), The Effects of Founding Team Diversity and Social Similarity on Venture Formation, in: *Journal of Business Venturing*, doi:10.1016/j.jbusvent.2009.10.002.
Liao, J. & Welsch, H. (2003), Social Capital and Entrepreneurial Growth Aspirations: A Comparison of Technology- and Non-technology-based Nascent Entrepreneurs, in: *Journal of High Technology Management Research*, Vol. 14(1), 149-170.
Liao, J. & Welsch, H. (2008), Patterns of Venture Gestation Process: Exploring the Differences between Tech and Non-tech Nascent Entrepreneurs, in: *Journal of High Technology Management Research*, 19(2), 103-113.
Lichtenstein, B.B.; Carter, N.M.; Dooley, K.C. & Gartner, W.B. (2007), Complexity Dynamics of Nascent Entrepreneurship, in: *Journal of Business Venturing*, Vol. 22(2), 236-261.
Lin, N. & Dumin, M. (1986), Access to Occupations Through Social Ties, in: *Social Networks*, Vol. 8(4), 365-385.
Lin, N. (2001), *Social Capital: A Theory of Social Structure and Action*, New York: Cambridge University.
Lovelace, K.; Shapiro, D.L. & Weingart, L.R. (2001), Maximizing Cross-functional New Product Teams' Innovativeness and Constraint Adherence: A Conflict Communications Perspective, in: *Academy of Management Journal*, Vol. 44(4), 779-793.
Low, M. & MacMillan, I.C. (1988), Entrepreneurship: Past Research and Future Challenges, in: *Journal of Management*, Vol. 14(2), 139-161.
Lumpkin, G.T., & Dess, G.G. (2001), Linking Two Dimensions of Entrepreneurial Orientation to Firm Performance: The Moderating Role of Environment and Industry Life Cycle, in: *Journal of Business Venturing*, Vol. 16(5), 429-451.
Lüthje, C. & Prügl, R. (2006), Preparing Business Students for Co-operation in Multi-disciplinary New Venture Teams: Empirical Insights from a Business-planning Course, in: *Technovation*, 26 (X), 211-219.
Maltz, E. & Kohli, A. (1996), Market Intelligence Dissemination Across Functional Boundaries, in: *Journal of Marketing Research*, Vol. 33(1), 47-61.
Manigart, S.; de Waele, K.; Wright, M.; Robbie, K.; Desbierres, P.; Sapienza, H.J. & Beekman, A. (2002), Determinants of Required Return in Venture Capital Investments: A Five-country Study, in: *Journal of Business Venturing*, 17(4), 291-312.
Mansfield, E., Schwartz, M. & Wagner, S. (1981), Imitation Costs and Patents: An Empirical Study, in: *The Economic Journal*, Vol. 91(364), 907 -918.
Markman, G.D. (2003), Entrepreneurs' Competencies, in: Baum, R.; Frese, M. & Baron, R. (Eds.), *The Psychology of Entrepreneurship* (pp. 67-92), Mahwah, NJ: Erlbaum.

Marsden, P.V. & Campbell, K.E. (1984), Measuring Tie Strength, in: *Social Forces*, Vol. 64(2), 482-501.
Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. A. (2000), The Influence of Shared Mental Models on Team Process and Performance, in: *Journal of Applied Psychology*, Vol. 85(2), 273-283.
McCallister, L. & Fischer, C.S. (1978), A Procedure for Surveying Personal Networks, in: *Sociological Methods and Research*, Vol. 7(2), 415-444.
McClelland, D.C. (1961), *The Achieving Society,* Princeton: Van Nostrand.
McCrae, R.R. & John, O.P. (1992), An Introduction to the Five-Factor Model and Its Application, in: *Journal of Personality*, Vol. 60(2), 175-215.
Mesmer-Magnus, J.R. & DeChurch, L.A. (2009), Information Sharing and Team Performance: A Meta-analysis, in: *Journal of Applied Psychology*, Vol. 94(2), 535-546.
Milgram, R.M. & Hong, E. (1999), Multipotential Abilities and Vocational Interests in Gifted Adolescents: Fact or Fiction, in: *International Journal of Psychology*, Vol. 34(2), 81-93.
Milliken, F.J. & Martins, L.L. (1996), Searching for Common Threads: Understanding the Multiple Effects of Diversity in Organizational Groups, in: *Academy of Management Review*, Vol. 21(2), 402-433.
Minniti, M. (2005), Entrepreneurship and Network Externalities, in: *Journal of Economic Behavior & Organization*, Vol. 57(1), 1-27.
Minniti, M.; Bygrave, W.D. & Autio, E. (2005), Global Entrepreneurship Monitor: 2005 Executive Report, retrieved October 22, 2010, from http://www.gemconsortium.org/about.aspx?page=pub_gem_global_reports.
Mintzberg, H. (1973), *The Nature of Managerial Work*, New York: Harper & Row.
von Mises, L. (1949), *Human Action*, New Haven (CT): Yale University Press.
Mitchell, R.K.; Busenitz, L.; Lant, T.; McDougall, P.P.; Morse, E.A. & Smith, B. (2002), Entrepreneurial Cognition Theory: Rethinking the People Side of Entrepreneurship Research, in: *Entrepreneurship Theory and Practice*, Vol. 27(2), 93-104.
Mosey, S. & Wright, M. (2007), From Human Capital to Social Capital: A Longitudinal Study of Technology-Based Academic Entrepreneurs, in: *Entrepreneurship Theory & Practice*, Vol. 31(6), 909-935.
Mosey, S. & Wright, M. (2007), From Human Capital to Social Capital: A Longitudinal Study of Technology-Based Academic Entrepreneurs, in: *Entrepreneurship Theory and Practice*, Vol. 31(6), 909-935.
Mueller, P. (2006a), Exploring the Knowledge Filter: How Entrepreneurship and University-Industry Relations Drive Economic Growth, in: *Research Policy*, Vol. 35(10), 1499-1508.
Mueller, P. (2006b), Entrepreneurship in the Region: Breeding Ground for Nascent Entrepreneurs?, in: *Small Business Economics*, Vol. 27(1), 41-58.
Mueller, P. (2007), Exploiting Entrepreneurial Opportunities: The Impact of Entrepreneurship on Growth, in: *Small Business Economics*, Vol. 28(4), 355-362.
Munson, W.M & Savickas, M.L. (1998), Relation between Leisure and Career Development of College Students, in: *Journal of Vocational Behavior*, Vol. 53(2), 245-253.
Murray, A.I. (1989), Top Management Group Heterogeneity and Firm Performance, in: *Strategic Management Journal*, Vol. 10(S), 125-141.
Naffziger, D.W., Hornsby, J.S. & Kuratko, D.F. (1994), A Proposed Research Model of Entrepreneurial Motivation, in: *Entrepreneurship Theory and Practice*, Vol. 18(3), 29-42
Nahapiet, J. & Goshal, S. (1998), Social Capital, Intellectual Capital, and the Organizational Advantage, in: *The Academy of Management Review*, Vol. 23(2), 242-266.

Nedelkoska, L. (2010), Occupations at Risk: The Task Content and Job Security, in: *Jena Economic Research Papers, 2010-050.*
Nelson, R.R. & Winter, S.G. (1982), *An Evolutionary Theory of Economic Change*, Cambridge, Mass: Belknap Press of Harvard University Press.
Newbert, S.L. (2005), New Firm Formation: A Dynamic Capability Perspective, in: *Journal of Small Business Management*, Vol. 43(1), 55-77.
Ng, T.W.; Sorensen, K.L.; Eby, L.T. & Feldman, D.C. (2007), Determinants of Job Mobility: A Theoretical Integration and Extension, in: *Journal of Occupational and Organizational Psychology*, Vol. 80(3), 363-386.
Oberschachtsiek, D. (in press), The Experience of the Founder and Self-Employment Duration: A Comparative Advantage Approach, in: *Small Business Economics*. doi:10.1007/s11187-010-9288-1.
Obschonka, M.; Silbereisen, R.K. & Schmitt-Rodermund, E. (2010), Entrepreneurial Intention as Developmental Outcome, in: *Journal of Vocational Behavior*, Vol. 77(1), 63-72.
Obschonka, M., Silbereisen R. K., & Schmitt-Rodermund, E. (in press), Entrepreneurial Success as Developmental Outcome: A Path Model From a Life Span Perspective of Human Development, in: *European Psychologist.*
Ocasio, W. (1997), Towards an Attention-based View of the Firm, in: *Strategic Management Journal*, Vol. 18(Special Issue), 187-206.
Ostendorf, E. (1990), *Sprache und Persönlichkeitsstruktur: Zur Validität des Fünf-Faktoren-Modells der Persönlichkeit* [Language and Personality Structure: Toward the Validation of the Five-factor Model of Personality]. Regensburg, Germany: S. Roeder Verlag.
Parker, S.C. (2004), *The Economics of Self-Employment and Entrepreneurship*, Cambridge, UK: Cambridge University Press.
Parker, S.C. (2009), Why do Small Firms Produce the Entrepreneurs, in: *Journal of Socio-Economics*, Vol. 38(3), 484-494.
Parker, S.C.; Belghitar, Y. (2006), What Happens to Nascent Entrepreneurs? An Econometric Analysis of the PSED, in: *Small Business Economics*, Vol. 27(1), 81-101.
Pastor, R. & Corominas, A. (2007), Job Assignment, in: Nembhard, D.A. (Ed.), *Workforce Cross Training* (pp. 65-86). Boca Raton: CRC Press.
Peeters, M.A.; van Tuijl, J.F.; Rutte, C.G. & Reymen, I.M. (2006), Personality and Team Performance: A Meta-Analysis, in: *European Journal of Personality*, Vol. 20(5), 377-396.
Pelled, L.H., Eisenhardt, K.M. & Xin, K.R. (1999), Exploring the Black Box: An Analysis of Work Group Diversity, Conflict, and Performance, in: *Administrative Science Quarterly*, Vol. 44(1), 1-28.
Pfeffer, J. (1983), Organizational Demography, in: Cummings, L.L. & Staw, B.M. (Eds.), *Research in Organizational Behavior*. Vol. 5, (pp. 299-357), Greenwich, CT: JAI Press.
Pinquart, M. & Silbereisen, R. K. (2004), Human Development in Times of Social Change: Theoretical Considerations and Research Needs, in: *International Journal of Behavioral Development,* Vol. 28(4), 289-298.
Podsakoff, P.M. & Organ, D.W. (1986), Self-reports in Organizational Research: Problems and Prospects, in: *Journal of Management*, Vol. 12(4), 531-544.
Polanyi, M. (1966), *The Tacit Dimension*, Garden City, NY: Doubleday.
Politis, D. (2005), The Process of Entrepreneurial Learning: A Conceptual Framework, in: *Entrepreneurship Theory and Practice*, Vol. 29(4), 399-424.
Porter, M.E. (1990), *Competitive Advantage: Creating and Sustaining Superior Performance*, New York: Free Press.
Presutti, M.; Boari, C. & Fratocchi, L. (2007), Knowledge Acquisition and the Foreign Development of High-tech Start-ups: A Social Capital Approach, in: *International Business Review*, Vol. 16(1), 23-46.

Putnam, R. (2000), *Bowling Alone: The Collapse and Revival of American Community*. New York, NY: Simon & Schuster.
Putnam, R.; Leonardi, R. & Nanetti, R.Y. (1993), *Making Democracy Work*. Princeton, NJ: Princeton University Press.
Randel, A.E. & Jaussi, K.S. (2003), Functional Background Identity, Diversity, and Individual Performance in Cross-functional Teams, in: Academy of Management Journal, Vol. 46(6), 763-774.
Rauch, A. & Frese, M. (2007), Born to Be an Entrepreneur? Revisiting the Personality Approach to Entrepreneurship, in: Baum, R.J., Frese, M. & Baron, R.A. (Eds.), *The Psychology of Entrepreneurship* (pp. 41-65). Mahwah (NJ): Erlbaum.
Renzulli, L.A. & Aldrich, H.E. (2005), Who Can You Turn to? Tie Activation within Core Business Discussion Networks, in: *Social Forces*, Vol. 84(1), 323-341.
Reynolds, P.D. (2007a), *Entrepreneurship in the United States*. New York: Springer.
Reynolds, P.D. (2007b), New Firm Creation in the United States: A PSED I Overview, in: *Foundations and Trends in Entrepreneurship*, Vol. 3(1), 1-150.
Reynolds, P.D.; Bosma, N.; Autio, E.; Hunt, S.; De Bono, N.; Servais, I.; Lopez-Garcia, P. & Chin, N. (2005), Global Entrepreneurship Monitor: Data Collection Design and Implementation 1998-2003, in: *Small Business Economics*, Vol. 24(3), 205-231.
Reynolds, P.D.; Miller, B. & Maki, W.R. (1995), Explaining Regional Variation in Business Births and Deaths: U.S. 1976-1988, in: *Small Business Economics*, Vol. 7(5), 205-231.
Reynolds, P.D. & White, S.B. (1992), Finding the Nascent Entrepreneur: Network Sampling and Entrepreneurship Gestation, in: N. Churchill et al. (Eds.) Frontiers of Entrepreneurship Research, Wellesley: Babson College.
Roberts, J. (1996), *A History of Europe*, London; Penguin.
Ronstadt, R. (1988), The Corridor Principle, in: *Journal of Business Venturing*, Vol. 3(1), 31-40.
Rosenbusch, N.; Brinckmann, J. & Bausch, A. (2010), Is Innovation Always Beneficial? A Meta-Analysis of the Relationship between Innovation and Performance in SMEs, in: *Journal of Business Venturing*, doi:10.1016/j.jbusvent.2009.12.002.
Roure, J.B. & Maidique, M.A. (1986), Linking Prefunding Factors and High-technology Venture Success: An Exploratory Study, in: *Journal of Business Venturing, Vol.* 1(3), 295-306.
Ruef, M., Aldrich, H.E. & Carter, N.M. (2003), The Structure of Founding Teams: Homophily, Strong Ties, and Isolation among U.S. Entrepreneurs, in: *American Sociological Review*, Vol. 68(2), 195-222.
Sampson, R.C. (2007), R&D Alliances and Firm Performance: The Impact of Technological Diversity and Alliance Organization on Innovation, in: *Academy of Management Journal*, Vol. 50(2), 364-386.
Samuelsson, M. & Davidsson, P. (2009), Does Venture Opportunity Variation Matter? Investigating Systematic Differences Between Innovative and Imitative New Ventures, in: *Small Business Economics*, Vol. 33(2), 229-255.
Sapienza, H.J., Smith, K.G. & Gannon, M.J. (1988), Using Subjective Evaluations of Organizational Performance in Small Business Research, in: *American Journal of Small Business*, Vol. 12(3), 45-53.
Sarasvathy, S.D. (2001), Causation and Effectuation: Toward a Theoretical Shift From Economic Inevitability to Entrepreneurial Contingency, in: *Academy of Management Review,* Vol. 26(2), 243-263.
Sarasvathy, S. (2004), The Questions We Ask and the Questions We Care About, in: *Journal of Business Venturing*, Vol. 19(5), 704-714.
Saxenian, A.L. (1994), *Regional Advantage: Culture and Competition in Silicon Valley and Route*, Vol. 128, Harvard University Press, Cambridge, MA.

Schmitt-Rodermund, E. (2004), Pathways to Successful Entrepreneurship: Parenting, Personality, Competence, and Interests, in: *Journal of Vocational Behavior*, Vol. 65(3), 498-518.
Schmitt-Rodermund, E. (2007), The Long Way to Entrepreneurship. Personality, Parenting, Early Interests and Competencies for Entrepreneurial Activity Among the Termites, in: Silbereisen, R.K. & Lerner, R.M. (Eds.), *Approaches to Positive Youth Development* (pp. 205-224). Thousand Oaks: Sage.
Schmitt-Rodermund, E. & Vondracek, F.W. (1999), Breadth of Interests, Exploration, and Identity Development in Adolescence, in: *Journal of Vocational Behavior*, Vol. 55(3), 298-317.
Schröder, E. & Schmitt-Rodermund, E. (2006), Crystallizing Enterprising Interests among Adolescents through a Career Development Program: The Role of Personality and Family Background, in: *Journal of Vocational Behavior*, Vol. 69(3), 494-505.
Schultz, T.W. (1980), Investment in Entrepreneurial Ability, in: *Scandinavian Journal of Economics*, Vol. 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.
Schwarz, G. (1978), Information Criteria for Astrophysical Model Selection, in: *Annals of Statistics*, Vol. 6(2), 461-464.
Seibert, S.E. & Kraimer, M.L. (2001), The Five-Factor Model of Personality and Career Success, in: *Journal of Vocational Behavior*, Vol. 58(1), 1-21.
Senyard, J.; Baker, T. & Davidsson, P. (2009), Entrepreneurial Bricolage: Towards Systematic Empirical Testing, in: *Frontiers of Entrepreneurship Research*: Vol. 29(5).
Sethi, R., Smith, D.C. & Park, W. (2001), Cross-functional Product Development Teams, Creativity, and the Innovativeness of New Consumer Products, in: *Journal of Marketing Research*, Vol. 38(1), 73-85.
Shane, S.A. (2000), Prior Knowledge and the Discovery of Entrepreneurial Opportunities, in: *Organization Science*, Vol. 11(4), 448-469.
Shane, S.A. (2003), A General Theory of Entrepreneurship: The Individual-Opportunity Nexus, Cheltenham (UK): Edward Elgar.
Shane, S.A. (2004), *Academic Entrepreneurship: University Spinoffs and Wealth Creation*, Cheltenham: Edward Elgar Publishing.
Shane, S.A. (2009), Why Encouraging More People to Become Entrepreneurs is Bad Public Policy, in: *Small Business Economics*, Vol. 33(2), 141-149.
Shane, S.A. & Cable, D. (2002), Network Ties, Reputation, and the Financing of New Ventures, in: *Management Science,* Vol. 48(3), 364-381.
Shane, S.A. & Delmar, F. (2004), Planning for the Market: Business Planning Before Marketing and the Continuation of Organizing Efforts, in: *Journal of Business Venturing*, Vol. 19(6), 767-785.
Shane, S.A., Locke, E. A., & Collins, C. J. (2003), Entrepreneurial Motivation, in: *Human Resource Management Review*, Vol. 13(2), 257-279.
Shane, S.A. & Stuart, T. (2002), Organizational Endowments and the Performance of University Start-ups, in: *Management Science*, Vol. 48(1), 154-170.
Shane, S.A. & Venkataraman, S. (2000), The Promise of Entrepreneurship as a Field of Research, in: *Academy of Management Review*, Vol. 25(1), 217-226.
Shannon, C.E. (1948), A Mathematical Theory of Communication, in. *Bell System Technical Journal*, Vol. 27(July and October), 379-423 and 623-656.
Shepherd, D.A.; Douglas, E.J. & Shanley, M. (2000), New Venture Survival: Ignorance, External Shocks, and Risk Reduction Strategies, in: *Journal of Business Venturing*, Vol. 15(5-6), 393-410.
Shepherd, D.A. & Krueger, N.F. (2002), An Intentions-Based Model of Entrepreneurial Teams' Social Cognition, in: *Entrepreneurship Theory and Practice*, Vol. 27(2), 167-185.

Shrader, R. & Siegel, D.S. (2007), Assessing the Relationship Between Human Capital and Firm Performance: Evidence From Technology-based New Ventures, in: *Entrepreneurship Theory and Practice*, Vol. 31(6), 893-908.
Silva, O. (2007), The Jack-of-all-Trades Entrepreneur: Innate Talent or Acquired Skill, in: *Economic Letters*, Vol. 97(2), 118-123.
Simons, T.L. & Peterson, R.S. (2000), Task Conflict and Relationship Conflict in Top Management Teams: The Pivotal Role of Intragroup Trust, in: *Journal of Applied Psychology*, Vol. 85(1), 102-111.
Smith, K.G., Collins, C.J. & Clark, K.D. (2005), Existing Knowledge, Knowledge Creation Capability, and the Rate of New Product Introduction in High-technology Firms, in: *Academy of Management Journal*, Vol. 48(2), 346-357.
Snijders, T.A.B. & Bosker, R.J. (1999), *An Introduction to Basic and Advanced Multilevel Modelling*, London: Sage Publications
Sorenson, O & Audia, P.G. (2000), The Social Structure of Entrepreneurial Activity: Geographic Concentration of Footwear Production in the United States 1940-1989, in: *American Journal of Sociology*, Vol. 106(2), 424-462.
Sorenson, O. & Stuart, T.E. (2001), Syndication Networks and the Spatial Distribution of Venture Capital Investment, in: *American Journal of Sociology*, Vol. 106(6), 1546-1588.
Stam, E. & Schutjens, V. (2006), The Fragile Success of Team Startups, in: Groen, A.; Oakey, R.P.; Sijde, P. van der; Kauser, S. (Eds.), *New Technology-based Firms in the New Millennium* (pp. 219-233), 5th Edition, Amsterdam: Elsevier.
Stam, E. (2007), Why Butterflies Don't Leave: Locational Behavior of Entrepreneurial Firms, in: *Economic Geography*, Vol. 83(1), 27-50.
Statistisches Bundesamt (2008), *Bevölkerung mit Migrationshintergrund – Ergebnisse des Mikrozensus 2007 [Population with Migration Background – Results of the Micro-census 2007]*. Wiesbaden, Germany: Statistisches Bundesamt.
Sternberg, R. (2009), Regional Dimensions of Entrepreneurship, in: *Foundations and Trends in Entrepreneurship*, Vol. 5(4), 211-340.
Sternberg, R.; Brixy, U. & Hundt, C. (2007), *Global Entrepreneurship Monitor. Länderbericht Deutschland 2006*, Hannover: Institut für Wirtschafts- und Kulturgeographie, Universität Hannover, Nürnberg: Institut für Arbeitsmarkt- und Berufsforschung der Bundesagentur für Arbeit (IAB).
Sternberg, R. & Rocha, H.O. (2007), Why entrepreneurship is a regional event: Theoretical arguments, empirical evidence and policy consequences, in: Rice, M.P & Habbershon, T.G. (Eds.), *Entrepreneurship: The Engine of Growth (*pp. 215-238). Westport/CT, London: Praeger.
Sternberg, R. & Wagner, J. (2005), Zur Evidenz regionaler Determinanten im Kontext individueller Gründungsaktivitäten: Empirische Befunde aus dem Regionalen Entrepreneurship Monitor (REM), in: *Zeitschrift für Wirtschaftsgeographie*, Vol. 49(3-4), 167-184.
Stewart, R. (1976), To Understand the Manager's Job: Consider Demands, Constraints, and Choices, in: *Organizational Dynamics*, Vol. 4(4), 22-32.
Super, D.E. (1984), Leisure: What Is and Might Be, in: *Journal of Career Development*, Vol. 10(2), 71-79.
Tajfel, H., & Turner, J. C. (1986), The Social Identify Theory of Intergroup Behavior, In: Worchel, S. & Austin, W. G. (Eds.), *Psychology of Intergroup Relations* (pp. 7-24), Chicago: Nelson-Hall Publishers.
Tamásy, C. (2006), Determinants of Regional Entrepreneurship Dynamics in Contemporary Germany: A Conceptual and Empirical Analysis, in: *Regional Studies*, Vol. 40(4), 364-384.
Teachman, J.D. (1980), Analysis of Population Diversity, in: *Sociological Methods & Research*, Vol. 8(3), 341-362.

Teece, David J.; Pisano, G. & Shuen, A. (1997), Dynamic Capabilities and Strategic Management, in: *Strategic Management Journal*, Vol. 18(7), 509-533.
von Thünen, J.H. (1826), Der Isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie, Hamburg: Perthes.
Tornikowski, E.T. & Newbert, S.L. (2007), Exploring the Determinants of Organizational Emergence, in: *Journal of Business Venturing*, Vol. 22(2), 311-335.
Ucbasaran, D., Lockett, A., Wright, M. & Westhead, P. (2003), Entrepreneurial Founder Teams: Factors Associated with Member Entry and Exit, in: *Entrepreneurship Theory and Practice*, Vol. 28(2), 107-127.
Unger, J.M.; Rauch, A.; Frese, M. & Rosenbusch, N. (2009), Human Capital and Entrepreneurial Success: A Meta-Analytical Review, in: *Journal of Business Venturing*, doi:10.1016/j.jbusvent.2009.09.004.
Uzzi, B. (1997), Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness, in: *Administrative Science Quarterly*, Vol. 42(1), 35-67.
Van der Gaag, M.P.J. & Snijders, T.A.B. (2004), Proposals for the Measurement of Individual Social Capital, in: Flap, H., Völker, B. (Eds.), *Creation and Returns of Social Capital* (pp. 199-218), London: Routledge.
Van der Gaag, M.P.J. & Snijders, T.A.B. (2005), The Resource Generator: Social Capital Quantification with Concrete Items, in: *Social Networks*, Vol. 27(1), 1-29.
Van der Vegt, G.S. & Bunderson, J.S. (2005), Learning and Performance in Multidisciplinary Temas: The Importance of Collective Team Identification, in: *Academy of Management Journal*, Vol. 48(3), 532-547.
Van Gelderen, M.; Thurik, R. & Bosma, N. (2005), Success and Risk Factors in the Pre-Startup Phase, in: *Small Business Economics*, Vol. 24(4), 365-380.
Van Knippenberg, D., Lossie, N. & Wilkes, H. (1994), Ingroup Prototypicality and Persuasion: Determinants of Heuristic and Systematic Information Processing, in: *British Journal of Social Psychology*, Vol. 33(3), 289-300.
Vanaelst, I., Clarysse, B., Wright, M., Lockett, A., Moray, N. & S'Jegers, R. (2006). Entrepreneurial Team Development in Academic Spinouts: An Examination of Team Heterogeneity, in: *Entrepreneurship Theory and Practice*, Vol. 30(2), 249-271.
Venkataraman, S. (1997), The Distinctive Domain of Entrepreneurship Research: An Editor's Perspective, in: Katz, J. & Brockhaus, R. (Eds.), *Advances in Entrepreneurship, Firm Emergence and Growth* (pp. 119-138), Greenwich, CT: JAI Press.
Vinson, G. A.; Conelly, B.S. & Ones, D.S. (2007), Relationships between Personality and Organization Switching: Implications for Utility Estimates, in: *International Journal of Selection and Assessment*, Vol. 15(1), 118-133.
Vivarelli, M. (2004), Are All the Potential Entrepreneurs So Good?, in: *Small Business Economics*, Vol. 23(1), 41-49.
Vuong, Q.H. (1989), Likelihood Ratio Test for Model Selection and Non-nested Hypotheses, in: *Econometrica*, Vol. 57(2), 307-333.
Wagner, J. (2003), Testing Lazear's Jack-of-all-Trades View of Entrepreneurship with German Data, in: *Applied Economic Letters*, Vol. 10(11), 687-689.
Wagner, J. (2006a), Are Nascent Entrepreneurs Jack-of-all-Trades? A Test of Lazear's Theory of Entrepreneurship using German Data, in: *Applied Economics*, Vol. 38(20), 2415-2419.
Wagner, J. (2006b), Are Young and Small Firms Hothouses for Nascent Entrepreneurs? Evidence from German Micro Data, in: *Applied Economics Quarterly*, Vol. 50(4), 379-391.
Wagner, J. & Sternberg, R. (2004), Start-up Activities, Individual Characteristics, and the Regional Milieu: Lessons for Entrepreneurship Support Policies from German Micro Data, in: *Annals of Regional Science*, Vol. 38(2), 219-240.

Weick, K.E. (1996). Drop Your Tools: An Allegory for Organizational Studies, in: *Administrative Science Quarterly*, Vol. 41(2), 301-314.
Weick, K.E. & Roberts, K.H. (1993), Collective Mind in Organizations: Heedful Interrelating on Flight Decks, in: *Administrative Science Quarterly*, Vol. 38(3), 357-381
West, G.P. III (2007), Collective Cognition: When Entrepeneurial Teams, Not Individuals, Make Decisions, in: *Entrepreneurship Theory and Practice*, Vol. 31(1), 77-102.
Westhead, P.; Ucsbasaran, D. & Wright, M. (2005), Decisions, Actions, and Performance: Do Novice, Serial, and Portfolio Entrepreneurs Differ?, in: *Journal of Small Business Management*, Vol. 43(4), 393-417.
Wiersema, M. & Bantel, K. (1992), Top Management Team Demography and Corporate Strategic Change, in: *Academy of Management Journal*, Vol. 35(1), 91-121.
Wille, B.; de Fruit, P. & Feys, M. (2010), Vocational Interest and Big Five Traits as Predictors of Job Instability, in: *Journal of Vocational Behavior*, Vol. 76(3), 547-558.
Williams, K. & O'Reilly, C. (1998), Demography and Diversity in Organizations: A Review of 40 Years of Research. In: B.M. Staw & L.L. Cummings (Eds.), *Research in Organizational Behavior* (pp. 77-140). Greenwich, CT: JAI Press.
Willmott, H.C. (1987), Studying Managerial Work: A Critique and a Proposal, in: *Journal of Management Studies*, Vol. 24(3), 170-249.
Winkelmann, R. & Zimmermann, K.F. (1994), Count Data Models for Demographic Variables, in: *Mathematical Population Studies*, Vol. 4(3), 205-221.
Yli-Renko, H.; Erkko, A. & Sapienza, H.J. (2001), Social Capital, Knowledge Acquisition and Knowledge Exploitation in Young Technology-Based Firms, in: *Strategic Management Journal*, Vol. 22(6-7), 587-613.
Zacharakis, A.L. & Shepherd, D.A. (2005), A Non-Additive Decision-Aid for Venture Capitalists' Investment Decisions, in: *European Journal of Operational Research*, Vol. 162(3), 673-689.
Zahra, S.A.; Sapienza, H.J. & Davidsson, P. (2006), Entrepreneurship and Dynamic Capabilities: A Review, Model and Research Agenda, in: *Journal of Management Studies*, Vol. 43(4), 917-955.
Zimmermann, M.A. (2008), The Influence of Top Management Team Heterogeneity on the Capital Raised Through an Initial Public Offering, in: *Entrepreneurship Theory and Practice*, Vol. 32(3), 391-414.

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Jena, 01.12.2010

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