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1. INTRODUCTION

This work is concerned with nascent entrepreneurial teams and how their composition evolves during the early years. The aim is to find an underlying mechanism that explains the occurrence of team changes to a significant extent. A team change can happen in two ways: Adding or dropping a member. Although these two events might have entirely different motivations, both events can be affected by the same systematic when observing a large number of changes.

It is assumed that in a population of young entrepreneurs individual Human Capital levels are fixed and teams are forming to create new ventures. Human Capital describes the quantity and quality of skills and abilities an individual has. Based on the theory by Fabel (2004), it has been shown that only individuals with relatively similar levels meet to form a team. When observing existing entrepreneurial teams, a structure of "Human Capital homogeneity" is apparent (Sonderegger, 2009).

Starting from a snapshot of young existing teams which were already diagnosed to follow the Human Capital homogeneity principle, this work goes one step ahead and analyzes team changes in the years after the first observation. The hypothesis is that team entries and exits in the following period will also be guided by the mechanism of ability-matching, meaning that in the end homogeneity will be even higher than at the beginning.

The first part gives a basic idea of early-stage entrepreneurship and explains why inputs in the form of Human, Financial and Social Capital are important. Literature combining these areas of research is summarized, heading to studies that are closely related to this work; it finishes with a detailed explanation of the theory which

introduced the idea of Human Capital homogeneity. The second part starts directly with the analysis, gives a detailed insight to the applied methodology and presents unexpected results. Human Capital homogeneity is not observed in the later stage; exits are rather driven by team size and a strong U-shaped relationship to social acquaintance. The findings are summarized in the conclusion, followed by an outlook for future research.

The aim of this work is to give a small contribution for understanding entrepreneurial team evolution. This research area crosses the borderlines between sociology and economy. Besides focusing on the economic point of view, the work attempts not to neglect different explanations and approaches to the same complex topic. Once properly understood, the insights will be useful for perceiving entrepreneurial teams less as "black boxes" and more as important and logically interacting systems in the whole economic context; after all, business ventures are still gaining importance as the key driver for innovation and constantly revolutionize not only branches, but often society as a whole.

2. LITERATURE

2.1. EARLY-STAGE ENTREPRENEURSHIP

In innovation-driven economies of western countries, the creation of new businesses is a typical way to exploit opportunities that emerge primarily through the expansion of the service sector. The increasingly sophisticated needs of a wealthy society let established, efficient companies be challenged by risk-taking new ventures (Bosma & Levie, 2009). Successful young companies typically address the needs with creative products or services, and they are often rewarded with high returns and quick growth. A significant part of the risk they bear is resulting from their "liabilities of newness" (Stinchcombe, 1965), such as their lack of routine, the dependence upon strangers (especially within the founding team itself) and hostile market forces including strong competition or customer's and supplier's negotiation power. Ventures that have better access to viable resources or are able to hedge the risks efficiently tend to outperform the others, even if this just means staying alive instead of failure. Before resources are addressed in greater detail, a typical founding process is illustrated.

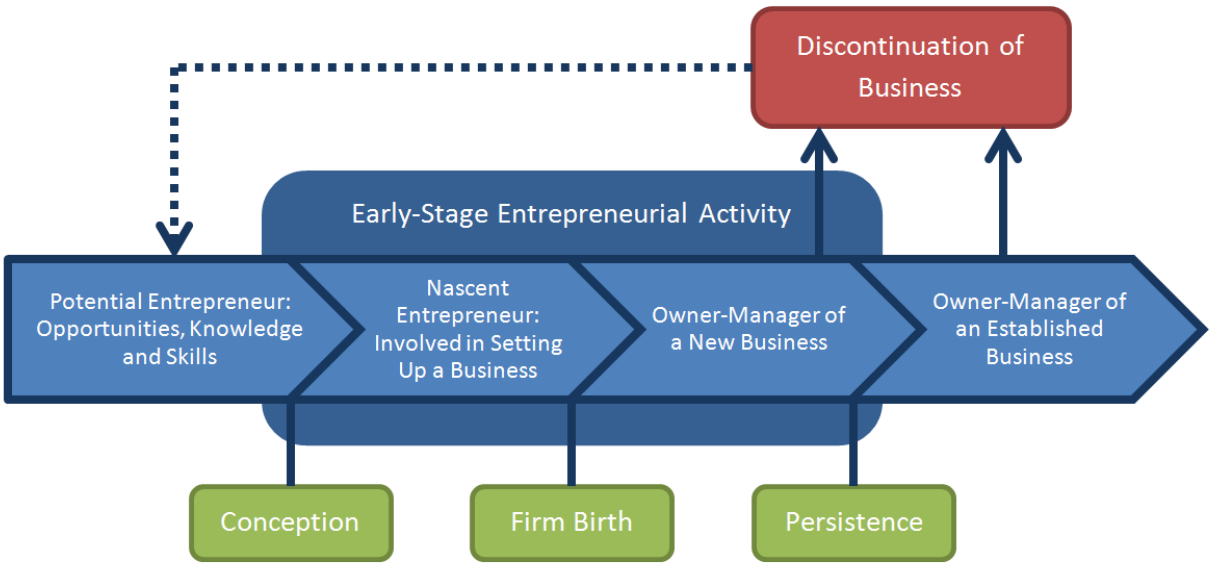

Illustration 1: Stages of Venture Evolution (Bosma & Levie, 2009)

This work focuses on the phase between conception and firm birth, where firm founders are often referred to as nascent entrepreneurs. They may come from different social and educational spheres. The term also includes people who have had many years of branch experience or people who have already founded firms before. The insight of experienced founders often helps them to identify a very specific business opportunity which is best exploited by creating a new venture. Many start-ups emerge as spin-offs from existing companies.

During the phase of early-stage entrepreneurial activity, basic organizational- and resource structures are defined. This is of utmost importance for the future success and leaves an "organizational imprint" on the enterprise (Stinchcombe, 1965). Many businesses are founded by only one person as single ventures, but the focus of this work is on team foundations. At this stage, some of the issues owners regularly have to decide about are the following: Should the business idea be rather conventional or more innovative? Which market entry strategies are promising for the specific industry? What is the optimal capital structure? And how should the start-up team be

composed in terms of qualification? (Mellewigt & Witt, 2002) Scholars, consultants and other experts offer extensive advice for these questions, but right answers may be impossible to give in advance.

It should be noted that the phases of the founding process are often not clearly differentiable. A team of nascent entrepreneurs completes many milestones and slowly transforms into a top management team while the venture matures and becomes a fully operational business. The definitions of "firm birth" vary in the literature, reaching from the time when the firm becomes an "independent commercial actor in the economy, affecting the prices and quantities of goods traded in the market" to the achievement of a "monthly cash flow covering all expenses and owner's salaries" for several periods (Reynolds & Curtin, 2008). The rather easy-to-determine second criterion being satisfied for 6 or more out of 12 months is used to separate relevant start-ups and already operational businesses in the underlying dataset of this work.

2.2. SUCCESS FACTORS

What are the factors that account for venture success? Many empirical studies deal with the vital resources young businesses strive for. The three main topics are Financial Capital, Human Capital and Social Capital, which also influence each other in different ways. Before empirical findings are presented, each type of capital is defined.

2.2.1. FINANCIAL CAPITAL

Financial Capital is to be interpreted straightforwardly. It is monetary funding, provided either by the founders themselves or by external parties. Depending on the type of business, less restriction for investment in assets or more liquidity for covering expenses is clearly an advantage. A key role is played by venture capitalists (VC): They are institutions who provide capital for promising young businesses. Typically, they participate as equity holders themselves, becoming owners of the business with decision rights. This means in case of a failure, they have their whole investment at stake, which can make up to several hundred millions of dollars. For bearing this risk, they expect high returns when they sell their part of the business after a few years. Best selling prices are usually achieved via initial public offering (IPO), i.e. selling the equity at the stock exchange. The challenging task for a VCs is the decision on which venture to support. An average VC can receive several thousand business plans from different ventures per year, but invests in only 1-4% of applicants (Metrick, 2007).

The expertise and experience of the VC industry is worth a closer look. Their success is directly tied to the success of the ventures they invest in, and therefore their core competence is to evaluate the chances of ventures in advance. There are several studies that examine the criteria VCs see as the most important when assessing a venture team and their business plan. Franke et al. (2004) performed a conjoint-analysis to summarize results of 16 studies from the US and one from Germany. It revealed that the most important factor for VCs is the founder team's branch experience. The team's level of education, type of education and togetherness were identified as other main factors. Interestingly, the business plan itself is an inferior

criterion. There is a popular saying that gets it to the heart: “I would rather invest in strong management with an average business plan than in average management with a strong business plan”. It shows that in some cases, the access to capital (in the form of venture capital funding) is determined by the second important resource, Human Capital. Also for the acquisition of debt “It is quite conceivable that banks and other capital suppliers use education as a means to screen prospective entrepreneurs for whom little information is observed.” (van der Sluis, van Praag, & Vijverberg, 2004)

2.2.2. HUMAN CAPITAL

Human Capital is general term that describes the amount of skills, abilities and knowledge an individual possesses. The amount of Human Capital of a person has a serious impact on his or her performance in many aspects. The role of Human Capital as an important input factor was already recognized by Adam Smith (1776), who described it as one part of “the fixed capital, of which the characteristic is, that it affords a revenue or profit without circulating or changing masters”. The relationship that better education leads to higher income was verified by several empirical studies (Walsh, 1935). For a student, the gathering of Human Capital through schooling does not only incur tuition fees, but it also has an opportunity cost: If he decided to start a job already, he could instead earn income through labor. Nobel-Prize winner Gary Becker (1964) formalized that Human Capital investment brings returns, as any other resource, and integrated the idea into the microeconomic context.

2.2.3. SOCIAL CAPITAL

"It's not what you know, it's who you know." Social Capital can be interpreted broadly, but its general aim is to measure the potential access to persons or communities that can benefit the venture in different ways, directly or indirectly. Important persons could be venture capitalists or banks who provide financial support, customers, suppliers, providers of information, or potential new team members with skills helpful for the advance of the business; in that sense it has strong influence on access to the other types of capital. Direct measures are often the number or strength of social ties, whereas indirect measures use reputation or social achievements.

Trouble starts with defining "access": it is not clear in advance how "useful" a contact will turn out to be when it is needed, and if it keeps its promise. A researcher will often have to rely on subjective self-assessment of the target. There is no general way to operationalize and measure Social Capital: Some authors determine the strength of social ties by considering frequency of interactions or the type of relationship like "family" or "colleagues from work"; others additionally identify networks the target is involved in (Davidsson & Honig, 2003), or in a case of accounting firms, the number of ties to clients (Pennings, Lee, & van Witteloostuijn, 1998). Baron & Markman (2003) go "beyond Social Capital" and differ between Social Capital (in their case "favorable reputations, an established record in the field, a degree from an excellent university, work experience with 'good' employers") and social competence. The latter they evaluate via questionnaires. Social networks, they argue, are a primary factor for gaining access to high-profile employees. In a second level, the financial outcomes are determined by social competence, influencing the quality of the relationships.

Social competence is also a direct reason for entry or exit decisions, when it comes to the role of interpersonal attraction. Social competence as a "soft skill" is required to a certain extent for collaboration in any context, and when choosing teammates, it may serve as an asset that outweighs other factors.

2.3. REVIEW OF EMPIRICAL STUDIES

Because this study's main idea is based on the concept of Human Capital, this section mainly presents empirical works that focus on this topic and its relevance for success. Existing literature covers several relations between different investments in Human Capital, such as schooling or work experience and entrepreneurial success. Results are ambiguous in some points, but they point in a common direction.

On an individual level, a basic attribute is becoming an entrepreneur or not. This is referred to as *selection* or *entrepreneurial entry*. Robinson & Sexton (1994) analyze census data and find that each additional year of education increases the probability of becoming an entrepreneur by 0.8%. Together with the number of years an individual has worked after schooling, the impact on *financial returns*, a variable that measures success given entrepreneurial entry, is strongly significant. Kim, Aldrich & Keister (2006) conclude that Human Capital (education and work experience), unlike financial and cultural capital, is a strong driver for entrepreneurial entry. The term cultural capital means that the individual has entrepreneurship involved in his familial background: Indeed, a positive relationship seems plausible at first glance. Entrepreneurial activity demands much implicit knowledge which can only be attained on the job (see section 3.2.3. for a detailed explanation). This is confirmed by

the significant positive influence of entrepreneurial experience on success (Delmar & Shane, 2006). Lacking such experience may constitute an entry barrier that can be resolved more easily if useful knowledge is already in the family, which is therefore quickly accessible and transferrable.

Also Davidsson & Honig (2003) identify previous entrepreneurial experience as a significant selection criterion and classify it as a part of what they define as tacit knowledge. Their findings about Social Capital are that strong ties have more benefit for selection, while at later stages weak ties, such as business networks, become important and benefit the gestation process and sales. A result that contradicts the works presented in the previous paragraph is found by van der Sluis, van Praag & Vijverberg (2004). Their meta-analysis reveals that schooling has no effect on selection, only on success. They blame their finding on a publication bias: Authors and journals are less likely to publish articles if they do not find a significant relationship for education. Van Praag (2006) adds that education is rarely subdivided in terms of faculty, suggesting that business-related education may have more benefits than business-unrelated education. Dickson, Solomon & Weaver (2008) account for this objection and find positive, although ambiguous evidence that business-related types of education push entry probability.

Not to neglect the importance of Financial Capital, Cooper, Gimeno-Gascon & Woo (1994) clearly show its positive impact (besides Human Capital) on venture growth and survival in their analysis. Bates (1990) underlines that both human and Financial Capital as well as higher financial leverage are indicators for business longevity.

2.4. TEAM FORMATION AND COMPOSITION

The previous section presented assets relevant for success. In order to maximize expected returns and given a choice, rational individuals want to join with others that provide highest levels of Human, Financial or Social Capital. They want to be rid of team members that contribute very little capital but reap an equal share of rewards. However, research on team formation in entrepreneurship points out additional important dimensions. An overview of existing literature on entrepreneurial team formation and factors associated with changes is given in order to classify this work in a broader context.

Forbes et al. (2006) sum up three basic reasons for existing teams (or individuals) to add members. The first one, resource seeking behavior, is directly rational. It includes the need for a special function in the team, such as an accountant or a technician. The second motivation, interpersonal attraction, is guided by sociological principles of social ties and homophily. It has also a rational component: social ties hedge against the risk of distrustfulness. The better two persons know each other, the more they are able to overcome information asymmetry regarding their true skill and motivation. Finally, but merely to capture the full picture, they mention team additions against the will of the team. They may be caused by resolutions from outside institutions such as governments, banks, unions or other important stakeholders.

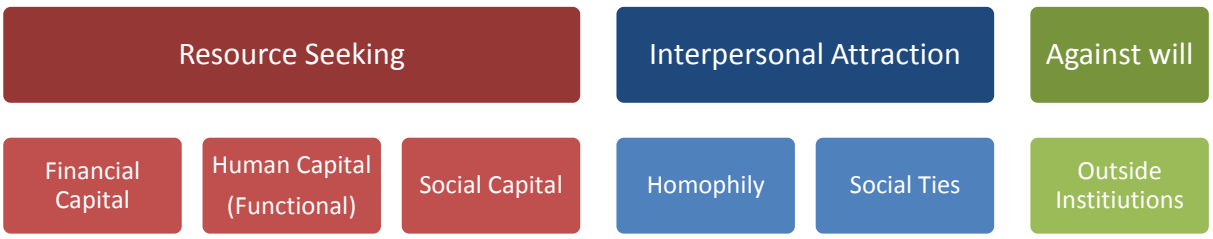

Illustration 2: Reasons for adding Members (Forbes et al., 2006)

The choice for a particular member will often be influenced by more than one criterion. No matter which motivation is predominant, the addition or removal of a team member can always be explained as a matter of expected costs and benefits. Imagine the choice is between two candidates. It may contribute to total utility when deciding for a more sympathetic candidate than for one with higher operative skills. More sympathetic candidates may make up for a lack of capital input because they offer higher expected joy of teamwork or easier decision-making as a benefit. Not only for firm-internal matters, but also when it comes to interaction with outside parties, social competence can push higher returns through easier access to customers or negotiation power. Baron and Markman (2003) particularly identify the accuracy in perceiving others (social perception) and the ability to express emotions and feelings in an appropriate manner (expressiveness) as important social attributes. For team formation, this implicates that sympathetic candidates have better chances not for just "irrational" reasons, especially as sympathy can serve a signal for social competence.

The following paragraphs present selected common findings about team formation and team turnover. Research findings for entrepreneurial teams are often similar to those concerning top management teams. This seems plausible, since in general the metamorphosis from one state of evolution into the other is rather blurry.

In order to give a better structure, research results are classified into three main topics, but the discussed articles do not exclusively cover the single issue they are listed below. The different approaches towards this complex matter make it difficult to pick out and define general empirical facts.

2.4.1. HOMOPHILY

This effect is prevalent throughout the literature that deals with team composition and formation. “Birds of a feather flock together” is what the term basically means. “Homophily occurs when people with similar characteristics are attracted to one another, especially within distinct social boundaries, such as language and nationality, and when the structure of the social world makes it difficult for people with dissimilar characteristics to associate with one another” (Kim & Aldrich, 2005a). Thus, a certain share of homophily results out of basic conditions: when observing large samples of entrepreneurial teams, many teams are characterized by certain attributes that their members have in common. The probably most obvious tendencies are found with regard to the demographics ethnicity and gender. According to Hinds, Carley, Krackhardt & Wholey (2000), the choosing of workgroup members among students is guided by similarity of ethnicity as one of the most noticeable effects. Other, but less obvious reasons are the reputation for being competent (a signal for Human Capital) and ties from former working relationships, which has a similar logic to the above noted social ties. Ruef, Aldrich & Carter (2003) further find evidence that homophily also occurs when observing “achieved characteristics” such as occupation – meaning that people who had the same job are likely to be found within a team. In this context, they also discover low-status persons (“blue-collar workers”), women and ethical minorities to be underrepresented in the entrepreneurial community. The evolution of teams, meaning the adding and dropping of members during later periods of the gestation process, is guided by homophily rather than (functional) diversity (Kim & Aldrich, 2005b). Section 2.4.3. presents studies contradicting these statements.

2.4.2. STABILITY VERSUS TURNOVER

The topic of some studies is the effect of team turnover on success. Arguments as well as empirical findings are ambiguous (Kim, Aldrich, & Ruef, 2005): On the one hand, team turnover may represent a reason for slower progress, when thinking of the consequences. Every entry and exit is associated with work of coordination. If a member exits, it leaves a gap and takes at least parts of the capital that it brought into the venture with it. Two examples are knowledge about the firm's processes as a form of special Human Capital and a good relationship to customers and clients as a form of Social Capital. If a person joins, it takes time for him or her to fully integrate and adapt to the organization and the social setting within the venture, sometimes called the "business culture". This may lead to a delay in achieving entrepreneurial milestones (Kim, Aldrich, & Ruef, 2005). On the other hand, turnover can be a positive signal, when considering its reasons: It may implicate that a team addresses the needs for additional resources that can only be obtained with the addition of new members (the three types of capital). Also, exits may be a result of rigorous firing of badly performing members, while other teams hesitate with such firm action and thus perform worse (Beckman, Burton, & O'Reilly, Early teams: The impact of team demography on VC financing and going public, 2007). In order to evaluate the impact of a change on success, case-specific scenarios must be analyzed to estimate what would have happened if there had been a change (or no change).

2.4.3. FUNCTIONAL DIVERSITY AND TRANSITION TO A TOP MANAGEMENT TEAM

The term "Human Capital diversity" is sometimes used as a synonym for "functional diversity". It must be noted that this refers to the qualitative aspect, addressing specific functional skills and knowledge ("outcomes" of Human Capital). It is appropriately used for describing teams whose members have done different apprenticeships or worked in other branches and hence have a broad spectrum of know-how available. It is different to "Human Capital heterogeneity" which this study primarily focuses on. It relates Human Capital to investments necessary for achieving skills and knowledge ("value" of Human Capital), not task-related outcomes of this investment (Unger, Rauch, Frese, & Rosenbusch, 2009). See section 3.2.1 for further discussion.

Some scholars see functional diversity as a major key to entrepreneurial success (Brettel, Heinemann, Sander, Spieker, Strigel, & Weiß, 2009). The perfect start-up team consists of one expert in every area that challenges young businesses. Other studies suggest that too high diversity of functional background has downsides that outweigh benefits, mainly due to higher conflict potential and problems with implementation of key decisions (Ensley, Carland, & Carland, 1998). Similarly, one of the major findings of Knight et al. (1999) is that functional diversity leads to interpersonal conflict and less strategic consensus.

The transition from the start-up team to a top management team is further investigated by Beckman & Burton (2004). A main discovery is that founding teams with lower experience transform into a weaker top management team than founding teams with high experience. This is not only because in general many founders stay

within their venture, but also because experienced founders are more likely to receive Venture Capital. VCs then improve the team and their managerial capabilities. Later, VC backing as well as functional diversity in the team leads to faster IPOs. The finding that high experienced entrepreneurs attract high profile managers is in compliance with the principle of Human Capital homogeneity, which will be understood after the following section.

2.4.4. HUMAN CAPITAL HOMOGENEITY

All empirical work presented previously concerns teams that have already started entrepreneurial activity and analyzes how they change. Finding a pattern for change events is also the aim of this work. But in order to understand the explanation offered here and to see the different theoretical approach, the view is now taken to the beginning, when a multitude of individuals and potential founders regroup themselves to active teams.

Given that there exist firms and entrepreneurial partnerships, Fabel (2004) proofs that the allocation of individuals to organizations results in equilibrium. As noted above, a major success factor for outcomes of entrepreneurial projects is the combined Human Capital of the founding team. Since compensation of the owner-managers in entrepreneurial partnerships is directly tied to economic returns, every rational individual will try to join the team with highest average ability levels. On the other side, also every already existing group will try to attract individuals with highest possible abilities for the same reason. When hiring low-quality individuals, the chance of failure for the venture increases. Assuming that Human Capital of

individuals is classified into levels, potential entrepreneurs will end up in a team that exactly matches their level: they would be rejected when trying to join a higher average-level team, and they themselves would not want to join a lower average-level team. This leads to an allocation of ability-matched teams – or Human Capital homogeneity.

The compensation of human resource managers in established firms is fixed and therefore not (or only very little via the risk of failure and variable compensation systems) tied to their hiring decisions, thus they hire randomly. As a result of the random Human Capital mix, their returns are also too small to afford the wage of high-quality individuals – they will only attract low-quality individuals, which further lower the overall firm level. The final allocation is such that low-quality individuals are hired by firms, while high-quality individuals join homogenous entrepreneurial teams.

Sonderegger (2009) finds empirical evidence for this effect when observing teams of nascent entrepreneurs in a large dataset. Ability matching seems to apply to team formation, an exception being teams where close familial ties are involved. A trust-bonus seems to compensate for differences in (or a lack of) Human Capital. In his work, an index represents a relative measure of individual ability levels, since Human Capital consists of various factors. In order to measure team homogeneity, the standard deviation of the team members' ability levels is a used as a tool. The result is that the standard deviation of the Human Capital index in existing teams is lower than if the same participating individuals were matched to teams randomly.

Sonderegger (2009) observes a snapshot where teams have passed a small fraction of the pre-founding process. It is the idea of this work now to take a dynamic

perspective over a period of several following years. From the initial decision to found a Start-up, many teams find themselves in a constant process of evolution. An especially relevant factor for the ability profile is that nascent entrepreneurs leave and people from outside join. With every change of team composition, not only the available set of Human Capital alters – also homogeneity is directly affected with team entries and exits, because individuals have various scores for their ability indices.

If the logic leading to Human Capital homogeneity applies, it is reasonable to expect that the existent homogeneity of the indices will further increase during the observed years. The pre-founding evolution just continues with the same systematic of reorganization that led to the team allocation at the time of the first observation. Additionally, information about true ability levels of team members increases over time and new members with matching ability levels may appear. It is expected that members with relatively low values are expelled from the team and above-the-(team-)average members can find better outside opportunities in teams with a similar higher level.

If team composition and resulting Human Capital homogeneity of the same set of entrepreneurial teams are measured at later points in time, the underlying process will have reached an advanced state. The system will converge towards a state of best matched teams in terms of Human Capital, so that at each point in time, Human Capital homogeneity of teams that exchanges members will be smaller than at the previous point. The following third section builds a framework for analysis and tests this idea.

3. ANALYSIS

This section gives an overview and a summary of how the research is done, and the subsequent sections present methods and results in detail.

First, universal Human Capital indices are constructed. They consist of weighted averages of several components such as years of education or years of work experience. Second, index values are calculated for each member of every team observed. The PSEDII Dataset provides all relevant information. Then, the standard deviation of these index values within each team is used as the basis for the dynamic analysis. After every year, differences are resolved if a team changes members.

The first part finishes with a statistical analysis of several changes of standard deviation, but results show only a non-significant decline (which corresponds to an increase in homogeneity). Following this, other reasons and possible drivers for change events are investigated. First, team-specific demographics are compared between teams that change their composition and teams that do not. Then, focus is put on the individual level. Respectively, all members that were present at the first observation but exit at a later stage are compared to those who stay. Human Capital deviation is found to play a minor role as compared to other factors. The unexpected result is that the variable indicating the number of years the members know each other has a strong U-shaped influence on the probability of exit. The results do not support the hypothesis of growing Human Capital homogeneity during the Start-up phase, but they give new insights and ideas for further research in a different direction.

3.1. DATA

The analysis is based on the Panel Study of Entrepreneurial Dynamics II (PSEDII), published by the University of Michigan.[1] Starting with telephone interviews in late 2005, 1214 nascent entrepreneurs were identified. They were "person[s] who (a) considered themselves in the firm creation process; (b) had been engaged in some behavior to implement a new firm - such as having sought a bank loan, prepared a business plan, looked for a business location, or taken other similar actions; (c) expected to own part of the new venture; and (d) the new venture had not yet become an operating business" (Reynolds & Curtin, 2008). "Becoming operational" was defined as having achieved a cash flow that covered expenses and salaries for at least 6 months during a period of 12. Of each identified venture, the study collected a considerable amount of data, including type and state of the business, activities, finances, motivation, owner demographics and information about legal entity owners. Follow-up interviews were done every year, when the same respondents were asked about interim changes in their ventures. So far (September 2010), four yearly "waves" were published. The relevant parts for this study are those about team composition, team changes and demographics of old and new owners.

The major downside of the dataset is that many samples are incomplete. Often, single important values are reported as missing, or even worse, ventures stop taking part in the interview or skip one or two waves. Reasons remain unclear and many samples must be dropped from the analysis because of this. Section 3.3.1. deals with systematic error handling. Also, many variables are only referring to the person who answers the questions. Personal relationships, for example, are recorded

[1] available at http://www.psed.isr.umich.edu/psed/home (accessed on 20.10.2010)

corresponding to the interviewee, but in groups of more than two people it constitutes a severe limitation to ignore the other owner's relationships to each other. There is also no hint that the interviewee represents a "leading" figure in the team, which would allow giving his or her relationships a special meaning. For single ventures or two person teams, which account for over 88% of observations, this interview design flaw is irrelevant. But it is especially harmful for this analysis, since it depends on the remaining fraction of observations with two or more members. Another hurdle is that in the primary owner directory juristic persons are sometimes mixed together with natural persons. In this case it is a challenge to find out how many natural persons are currently members in the team, especially after delusive information is given on who left in a certain wave.

More information about the initial assessment of the PSEDII is available in Reynolds and Curtin (2008).

3.2. THE HUMAN CAPITAL INDICES

The section about owner demographics in the PSEDII contains the data necessary to construct the Human Capital indices. The aim is to measure an individual's Human Capital level relatively to others. Modifying the approach of Sonderegger (2009), three indices are built instead of one main index (Education, Work Experience and Entrepreneurial Experience). They are based on the same six sub-indices. Each sub-index consists of one to three weighted variables taken directly from the PSEDII.

Illustration 3: Human Capital Indices (first Row) and Sub-Indices (second Row)

In order to create a comparable score for each variable, every variable value is z-transformed (standardized). The transformed value represents an individual outcome relatively to all others.

$$z_i = \frac{X_i - X_{Industry}}{s_{Industry}}$$

Because different industries may have different standards or entry barriers for experience, each score is set specifically for the industry the current individual's firm is operating in. This means that in the formula, the mean X and standard deviation s are derived only from the samples of this industry. For example, founders of ventures in the construction industry have an average of 13.7 years of education while entrepreneurs in communication have 15.6 (see Appendix 1 for industry averages of each variable).

An advantage of standardization is that outliers have less influence on the score than with Sonderegger's (2009) method of transformation on the minimum-maximum range. However, outliers will take values smaller than -1 and larger than +1 instead of being restricted by the interval [-1, 1]. Interpreting the values in years is no longer possible. After the transformation, a value below zero means under-average and above zero means over-average score. Shifting the mean to zero is in general referred

to as *centering*. An additional benefit for regression models is that if the variable is used as an independent, the constant terms (and coefficients in non-linear models) are valid at the mean instead of arbitrary or even meaningless zero-points (Kohler & Kreuter, 2009).

3.2.1. EDUCATION

Education is probably the most recognized element of Human Capital. Becker (1964) notes that across all developed and underdeveloped countries, "highly educated and skilled persons almost always tend to earn more than others" (Becker, 1964). Educated employees and workers bring higher rates of return to enterprises and are attracted and awarded with higher compensation. Furthermore, unemployment is strongly negatively related to education.

For the first of the three indices the years of education are used to represent the level of education an individual experienced. It can only be used as a proxy because equal years of education do not exactly account for an equal level of knowledge. This is generally true for all index factors: a certain amount of time an individual invests for the growth of its Human Capital do not necessarily reflect the actual skills acquired. "Experience should not be equated with knowledge because experience may or may not lead to increased knowledge." (Unger, Rauch, Frese, & Rosenbusch, 2009) There is a difference between investments in Human Capital and outcomes.

For education in particular, this is reflected by the fact that there are different schools as well as different types of students. Schools and universities have different faculties, which may provide different qualities and more or less relevant kinds of knowledge

(see the criticism of Van Praag, 2006, presented in Section 2.3). Even two pupils attending the same schools and classes may have different success in acquiring the provided knowledge.

Keeping these limitations in mind, an argument for the use of education is its signalling value. For the aim of observing team employment, it is helpful enough. Employers, irrespectively if they decide on behalf of a large firm or a small team, have to evaluate an individual's educational knowledge based on data they display in their résumés. When deciding who to invite to a job interview, they have only a little more information about education than the PSEDII shows. Rather than knowing exactly which skills and knowledge a potential new member has, they also use the candidate's educational background as a proxy. However, they will have a closer look at grades or use the interview to gain a better image; in some cases, they may have better information because they have already known the individual before; or, there is even a special trust-building relationship involved, such as friendship or recommendation.

It is assumed that the highest level of education represents an employer's perception of an individual's schooling and university experience, which directly influences his decision whether to hire. Therefore, if the team change process is examined, the variable will be a useful signal for Human Capital.

In the literature review of Unger et al. (2009), general education was used in 69 out of 70 studies that linked entrepreneurial success to Human Capital. "Years of education" was taken in 11 out of these 69 studies (see also Robinson and Sexton, 1994). The remaining mostly got along with differently modelled "Levels of education", an example being Cooper et al. (1994), who use a dummy variable that indicates a

bachelor's degree or higher. In their Meta-analysis, van der Sluis, van Praag & Vijverberg (2004) point out that many authors arbitrarily assign scores or dummies to certain levels of education or degrees, harming comparability to other studies. To obtain a plausible relative estimation of different levels of education, the PSEDII-variable "highest level of education" (coded as *AH6*[2] in the dataset) is transformed into "years of education", according to the official US Department of Education's key (see Appendix 2).

The number of years that corresponds to an individual's reported level of education are standardized and form the first index, *Edu*:

$$Edu_i = z(Years\ of\ education_i)$$

3.2.2. WORK EXPERIENCE

The second index consists of three equally weighted variables, here followed by their abbreviation (in brackets) and the codename in the PSEDII:

- Years of Work Experience in the industry where the new business will compete (YWEI) – *AH11*
- Years of full-time, paid Work Experience, regardless of industry (YPWE) – *AH20*
- Years of tenure in managerial, supervisory, or administrative responsibilities (YMSAR) – *AH21*

[2] Names of the PSEDII variables are included here because most readers have probably worked with the dataset themselves.

Since there is no further explanation, one could assume that *AH11* does not include the years reported in *AH20*. But taking a look at the dataset shows that the value of the second variable is not necessarily greater or equal to the first. Many respondents would violate this requirement as they report higher numbers for *AH11* than for *AH20* (the same is true for *AH21*). Obviously, the first variable includes also years without a full-time (and/or paid) tenure.

Work Experience is clearly a useful indicator for Human Capital. Many important skills for all business-related applications can only be learned by doing. The first variable (YWEI) is an indicator for practical knowledge about a certain industry's processes, markets or business culture. It may be of higher value in the same branch that it originates from than in others. Therefore, it brings Becker's (1964) definition of Specific training to mind. It is "training that has no effect on the productivity of trainees that would be useful in other firms" (Becker, 1964). Some authors strictly classify years of work experience as general and years of industry experience as specialized Human Capital (Brüderl et al., 1992, Pennings et al., 1998). There are some arguments against this classification. First, there is no kind of knowledge that can be classified either as perfectly specific or general at the time of acquisition. There might appear another use for assumedly specific knowledge in a different area. Also, "general" skills gathered may turn out to match the definition of specific knowledge at a later point in time, an example being programming skills that are soon obsolete or only used for very specific applications. And second, in every year reported in this variable, different kinds of skills are learned at the same time, many of which are clearly beneficial in a general way (for instance the basic use of a computer).

It would also be wrong to assume that the second variable (YPWE) qualifies for Becker's (1964) definition of "General knowledge". If a person had two years of Work Experience the automotive industry, and one year of the two was full-time and paid, the value reported for the "general" variable *AH20* would be one. However, in this case the gained knowledge cannot be classified differently than the first variable.

Arguments for the importance of industry experience are also found in Delmar and Shane (2006). They analyse the impact of Human Capital and other factors on performance of new ventures. Industry experience has three main benefits for firm performance: First, information on customer demand in a certain industry is often only accessible by industry participation. Only previous collaboration reveals special needs and sales opportunities that offer a strategic advantage for a new venture. Second, some skills necessary for technical and industry-specific business processes are learned only on-the-job in the regarding branch. And third, social ties to suppliers, distributors and customers are established over time and brought into the new venture for benefit. This represents an asset of Social Capital, but is assumed to be strongly related to industry tenure. Since the effects of Social Capital are not tested for in this study, many of its factors will remain consolidated in the monitored variables.

Similar to the first index, there are limitations when using years of tenure to represent Work Experience. There are many other ways how Work Experience can be operationalized. An overview of various methods used in the literature for linking Work Experience to job performance are found in the review of Quinones et al. (1995). More exact measures refer to specific tasks: they range from the total number of tasks or the number of times a specific task is performed by an individual to the difficulty of the specific task. Such data is not available for entrepreneurs and would

go beyond the scope of this analysis (it is available in other areas, for example when recruits of the US Air Force are trained – it is important to classify experience of jet pilots in detail). A less exact method is just assessing the type or counting the number of organizations an individual worked with. Table 1 shows how Quinones et al. (1995) differ between measurements of work experience. The horizontal axis represents the unit of measurement and the vertical axis shows the level of specifity. In this case, specifity means how close work experience is examined, from its organizational context down to a high differentiation of exact tasks. The approach in this study is time (years) spent in an organization or on a job, highlighted red. The next section introduces also the number of organizations (green) as a proxy for entrepreneurial experience.

Level of Specifity	Measurement Mode		
	Amount	Time	Type
Org	number of organizations	org. tenure/ seniority	type of org. (e.g. R&D, public)
Job	# jobs or aggregate # of tasks	job tenure/ seniority	job complexity
Task	# times performing a task	time on task	Task difficulty complexity criticality

Table 1: Measurement of Work Experience (Quinones et al., 1995)

Unger et al. (2009) say that out of their 70 reviewed studies, 22 included "Specific Industry Experience", 12 "Work Experience" and 21 "Management experience" in their analyses. A closer look is taken only on "Management experience" (YMSAR): only 5 used the number of years as an indicator; the others used a binary value (yes or no), or the "level" of management.

In their meta-analytical part, Delmar and Shane (2006) show that Industry-specific experience of entrepreneurial teams is found to be positively related to survival in 8 out of 11 previous studies. In their own investigation they go deeper into detail: By using the natural logarithm of the time variables, they test for positive declining marginal returns of the years of experience. This sounds reasonable, because learning curves for workers and employees may mostly be steeper in the first year of employment than at a later point in time. Because $ln(1) = 0$, they add 1 to every value, in order to obtain a zero to zero transformation (otherwise, a tenure of zero years would not be defined in the logarithmic transformation). With linear regression, they find positive significant impact of the transformed variable to sales, which supports their assumption of declining marginal returns.

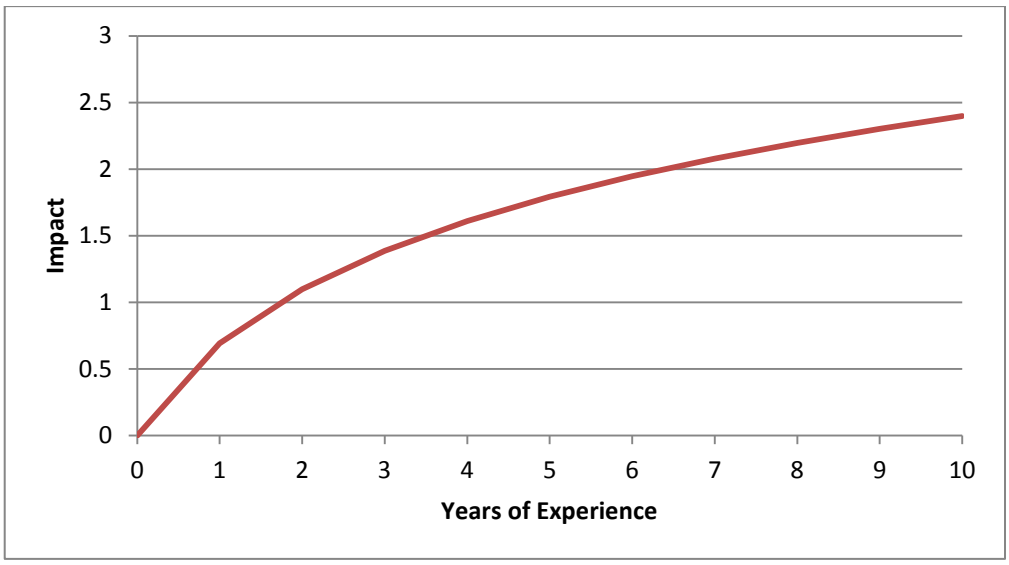

Illustration 4: The Effect of ln-Transformation

If Years of Industry Experience have a positive logarithmic impact on venture sales, it seems fair to argue that the same logarithmic effect will appear in the analysis here. When teams evaluate potential new members, they probably do it in a way that an additional year of experience has a relatively greater benefit for a person with only a few that for one with many years. However, it is assumed that when deciding for

member employment, the linear relationship is sufficient and ln-transformation will therefore not be applied here (in fact, the logarithmic transformation was performed but revealed similar results).

INTERNAL CONSISTENCY

Attention is now given to the relative weights of each of the three variables. In order to estimate them, reliability of each variable is assessed. If they all are a reliable measure the property Work Experience, all three must (at least tend to) be higher for individuals that receive a higher score. It is necessary to take a look into every individual's variables YWEI, YPWE and YMSAR – the so-called internal consistency can be tested with Cronbach's Alpha:

$$\alpha = \frac{N^2 cov}{s_{item}^2 + \quad cov_{item}}$$

N is the number of items, followed by the average covariance between the items. The lower part of the fraction is the sum of all Elements in the variance-covariance matrix (Field, 2009). In Stata, the command line *alpha* followed by the variable's names results in the desired output. The rest of the command line eliminates samples with missing values (in Stata, missing values are commonly coded as a dot, which has an infinitely high value), and the option *std*, which performs the z-transformation.

```
. alpha AH11 AH20 AH21 if (AH11 <. & AH20 <. & AH21 <.), std

Test scale = mean(standardized items)

Average interitem correlation:      0.4545
Number of items in the scale:            3
Scale reliability coefficient:      0.7142
```

The scale reliability coefficient in the last row with a value of 0.71 is Cronbach's alpha. A value of 1 means perfect reliability when all correlations equal 1, while a value of 0 means no reliability at all. Often, values of at least 0.7 are recommended to assume reliability (Janssen & Laatz, 2010). For a discussion about values and interpretation of Cronbach's Alpha see Field (2009). Here, the found coefficient of internal consistency allows equal weighting each variable for the Work Experience sub-index; this is different to Sonderegger's (2009) approach, which applies principal component analysis to estimate weights. The same proceeding is used for the sub-index of Entrepreneurial Experience (see below).

The following formula is used to calculate the second index, Work Experience:

$$WE_i = \frac{1}{3} z\ YWEI_i + \frac{1}{3} z\ YPWE_i + \frac{1}{3} z\ YMSAR_i$$

3.2.3. ENTREPRENEURIAL EXPERIENCE

The third index accounts for experience which the owner gathered with other ventures than the observed one. Some authors refer to "Start-Up Experience". In the PSEDII it is addressed with the variable AH12, "Numbers of other start-ups helped starting" (NSU). The second variable observed here is AH13, "Number of other Businesses owned" besides the Business discussed in the interview (NB). It may include also ventures that the entrepreneur joined at a later stage. "Entrepreneurial Experience" is therefore defined more broadly than "Start-Up Experience".

A wide range of skills and abilities that are vital for start-up success can only be gained via direct confrontation with real-life problems. The range of organizational

and operational challenges for entrepreneurs is endless and probably very different for every single young firm. The owners are nevertheless able to learn how to manage the issues occurring, be it legal requirements, acquisition of Financial Capital, hiring employees, development of products or dealing with stakeholders. Even in the case of business failure, substantial parts of the knowledge will be acquired by trial-and-error.

On a psychological level, experience is necessary for the improvement of communication- and leadership skills or the ability to cope with stressful situations. Decision making, identifying information channels and opportunities also requires a development of intuition or what one would call an entrepreneurial "gut feel".

Another asset that grows with the years of entrepreneurial tenure is the social network. Equally with the Social Capital gained through work experience, existing ties to investors, customers, suppliers, or partners are transferred and helpful the new venture. (Delmar & Shane, 2006)

After education, Start-Up experience is the second most often used type of Human Capital indicators in Unger et al. (2009). In their review, 31 out of 70 studies include it as a highly task-related factor. Delmar and Shane (2006) apply the same logarithmic transformation to start-up experience as they do for years of industry experience, which again induces declining marginal returns of additional venture experience. Their conclusion is that small amounts of entrepreneurial experience have a positive effect just on venture survival. Only if the owners founded four or more previous start-ups, the amount of experience is also enough to significantly boost sales.

Again, Cronbach's alpha shows high internal consistency, which allows equal-weighting (see the above section for a more detailed explanation).

```
. alpha AH12 AH13 if (AH12 <. & AH13 <.), std

Test scale = mean(standardized items)

Average interitem correlation:      0.5675
Number of items in the scale:            2
Scale reliability coefficient:      0.7241
```

The last index, Entrepreneurial Experience, is therefore calculated with

$$EE_i = \frac{1}{2} z\ NSU_i + \frac{1}{2} z\ NB_i$$

3.3. MEASURING HUMAN CAPITAL HOMOGENEITY

The PSEDII issues four Waves A, B, C and D. In yearly intervals, the same respondents are interviewed again to report changes of their situation, milestones completed and demographics about new owner-members and information on who left the team. Each year, a team might consist of different individuals with different Human Capital indices. The person interviewed is assumed to remain the same, since there is never a hint suggesting otherwise. In this section, possible changes and the concept of homogeneity are explained, as well as how to treat different situations where data is missing.

3.3.1. POSSIBLE CHANGES AND ERRORS

The following illustration represents four exemplary teams that capture all possible events that occur during the transitions. Teams evolve from left to right over three waves. For easier understanding, the last wave D is left out here.

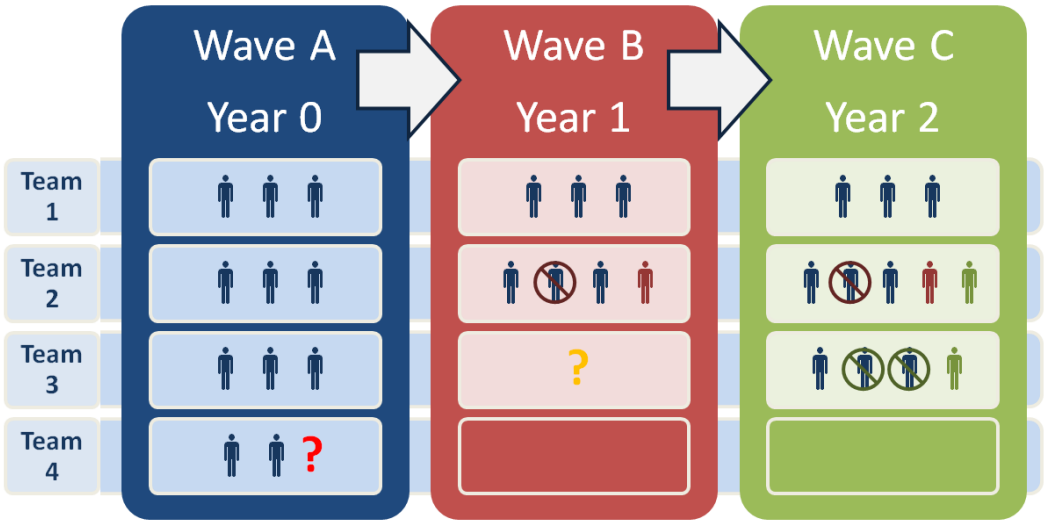

Illustration 5: Possible Transformations

TEAM 1

Team 1 (three blue persons) stays the same during all three waves. This requires that in each wave the interviewee reports "no change" in the PSEDII question *XG0a*[3]: "In our (previous/last) interview, you indicated that you (alone/and [...]) (would) own the new business. Is this still correct?" Because wave A represents the initial situation, no change is documented there. Since there is no difference in homogeneity, such teams have no impact on the analysis.

[3] X is to be replaced with the corresponding letter of the waves B, C or D. Henceforth the letter X is ignored when referring to variable names – the particular wave reference letter should be clear from context.

TEAM 2

In wave B, owner number 2 leaves the venture; this is indicated by the red cancel icon. Also, a new member is added; this is represented by the red person symbol at the end. In wave C, one additional member enters (the green symbol). Note that the changes of wave B are still displayed. The structure of the PSEDII allows the recording of data for up to five slots per team, where each slot can be filled with data of one individual. In wave B, one additional slot was established. This means that teams larger than five persons in wave A or larger than six persons after wave B cannot be fully reported; in this case, at least one person's data is missing. Also if a person leaves the team, his or her now empty slot is for some reason not filled with a new member's data. This is a substantial limitation to the whole dataset and the analysis. See below how such errors are handled.

TEAM 3

For some reason, this team has not reported data in wave B. This is referred to as *Error 1*. Normally, an *Error 1* would mean the venture is not kept track of any more by the PSEDII. However, in wave C, the team again did take part in the interview, it just skipped wave B. This special occurrence allows further use of the sample: It is assumed that all changes reported in wave C happened in the year directly before the last interview (indicated as green signs). Since it is not important when exactly changes occur, teams with *Error 1* are not immediately dropped from the analysis.

TEAM 4

An example for *Error 2* is illustrated: here, data of one team member is missing partially or totally. Since the index cannot be calculated if, for instance, the level of education is not reported, the standard deviation of the team cannot be

reconstructed. Another example for the severe *Error 2* is when the previous Team number three would not report any data after Wave A. Assuming the venture has failed is not legit, because there is no proof for that. First, there is an own dedicated variable that indicates venture failure (which in many of these cases is not reported); second, it could be possible that the interviewee simply decided not to respond or could not be reached. Probably the team is not traced anymore because person number 1, who was contacted for the previous interviews, left the venture. If an Error 2 occurs for whatsoever reason, the whole team must be dropped from the sample.

3.3.2. FEASIBLE OBSERVATIONS

The following diagram gives an overview of how many of the 1214 observations in the sample were inflicted by errors:

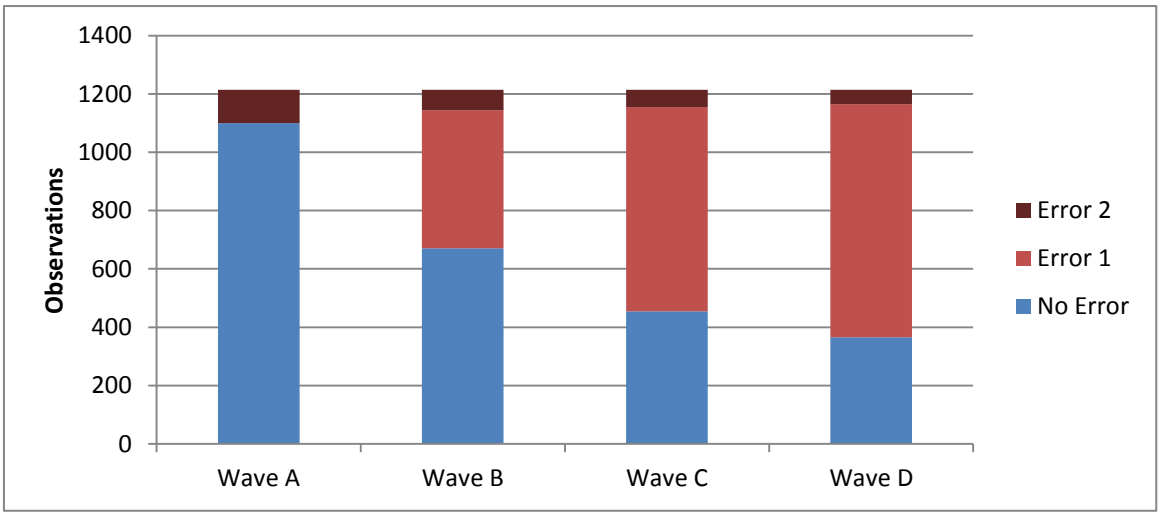

Illustration 6: Fractions of Samples containing Errors

Samples that have *Error 2* occurring are immediately dropped; *Error 1* samples can be used if, for example, only waves B and C are missing, but A and D are fully

available. In order to identify relevant samples for the analysis, another limitation is fundamental: If a venture is owned only by a single entrepreneur, no standard deviation can be calculated. A similar situation is constituted by cases when there is only one owner left after a change. The following frequency table shows team sizes in the first wave.

Wave A Team sizes			
Team size	Freq.	Percent	Cum.
1	647	53.29	53.29
2	423	34.84	88.14
3	74	6.10	94.23
4	41	3.38	97.61
5	11	0.91	98.52
6	3	0.25	98.76
7	1	0.08	98.85
8	2	0.16	99.01
9	2	0.16	99.18
10	5	0.41	99.59
11	1	0.08	99.67
15	2	0.16	99.84
30	1	0.08	99.92
95	1	0.08	100.00
Total	1,214	100.00	

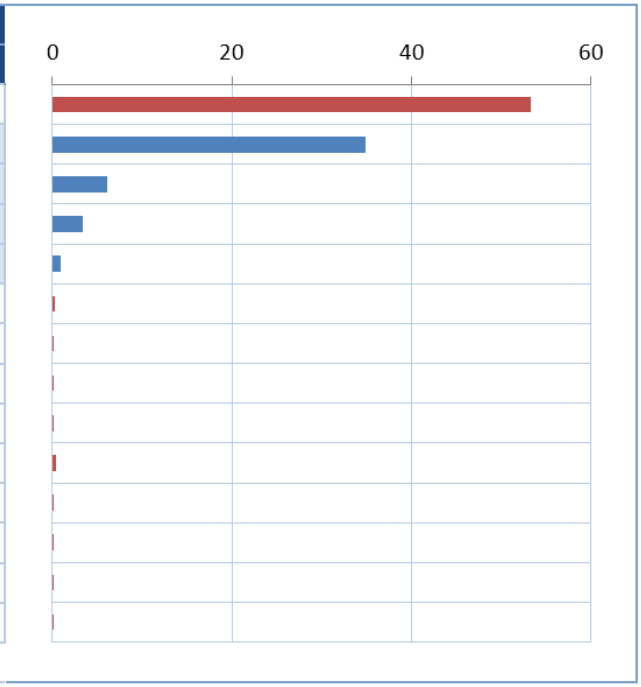

Table 2: (Initial) Team Sizes in the PSEDII

More than half of the teams start as single individual enterprises. Because of the five available slots, team sizes larger than five automatically constitute an *Error 2*. The real homogeneity cannot be derived in such cases. Some solo entrepreneur may form a team at a later stage, and some team ventures may be left with only one person. These cases are accounted for in the sample. The most important and largest restriction for the sample is, however, that changes can only be observed where changes actually occur.

The 1214 samples cover three "transitions" between the four waves, during which changes of team homogeneity could be realized. This results in 3642 possible events of change within the teams. Summing up, the following restrictions limit this pool:

- Transitions without changes – This includes teams that stopped providing data (most of the *Error 1* teams)
- Transitions that involve only one person before or after
- Transitions after a team provided incomplete data (*Error 2*)

These restrictions limit the sample size to only 44 feasible and measureable events of change. All different versions of change events are explained in the preceding section. They are also indicated by the PSEDII variable *XG0a*, which has four possible realizations:

- Added member(s)
- Deleted member(s)
- Both of the above
- No change

3.3.3. HOMOGENEITY

In each of the four waves, a team has a certain constellation of members. Section 3.2 explained how the three indices are calculated for each individual. For the remaining ventures in the sample, standard deviation of the indices is now derived for each reported state as a measure for homogeneity, or correctly speaking, heterogeneity.

$$\sigma_{Index} = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2}$$

N is the current number of team members, x_i is a member's value of the observed index, and μ is the current mean of the index in the observed team. Ceteris paribus, a higher standard deviation means lower homogeneity.

The aim is to analyze the development of the Human Capital homogeneity represented by three indices. It is assumed that homogeneity will increase over the observed period. The standard deviations of the indices should therefore decrease. The illustration shows why this is expected to happen.

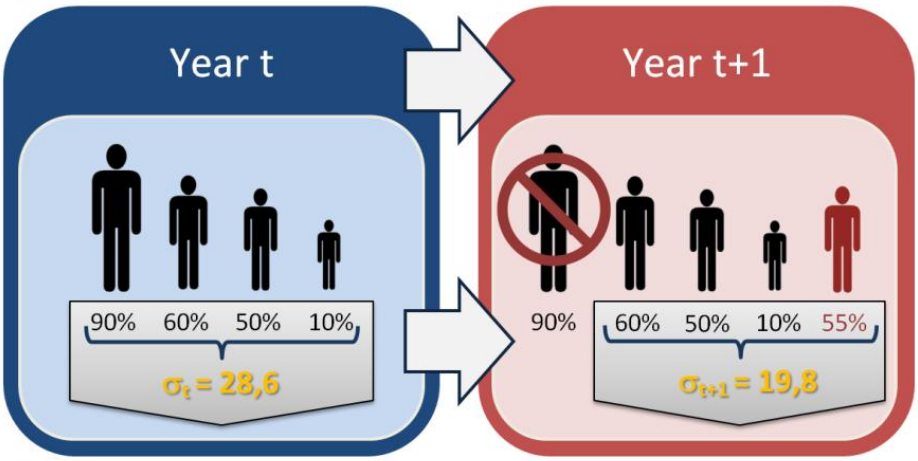

Illustration 7: Example for an expected Team Change Event

In the example, one of the three indices is observed in year t and in the following year t+1. Index scores are symbolized by the size of the figure and displayed below as a percentage of the maximum. The person with the highest indices leaves during the transition. There is also another person, whose index is almost equal to the team's average, joining the team. Both the departure and the arrival constitute factors that decrease the standard deviation of the index. The same effect would occur if the

person with the minimum index (the smallest one) leaves the venture. This leads to the following hypotheses:

Hypothesis 1: The standard deviation of the index for education will decrease after adding or dropping a member.

Hypothesis 2: The standard deviation of the index for work experience will decrease after adding or dropping a member.

Hypothesis 3: The standard deviation of the index for entrepreneurial experience will decrease after adding or dropping a member.

To test the hypotheses, every change is observed closely and the change in the standard deviation calculated.

$$\Delta\sigma_w = \sigma_w - \sigma_{w-1}$$

According to the hypotheses, $\Delta\sigma_w$ of all three indices should tend to be negative. A first impression is given by the histogram of all calculated changes of the dataset.

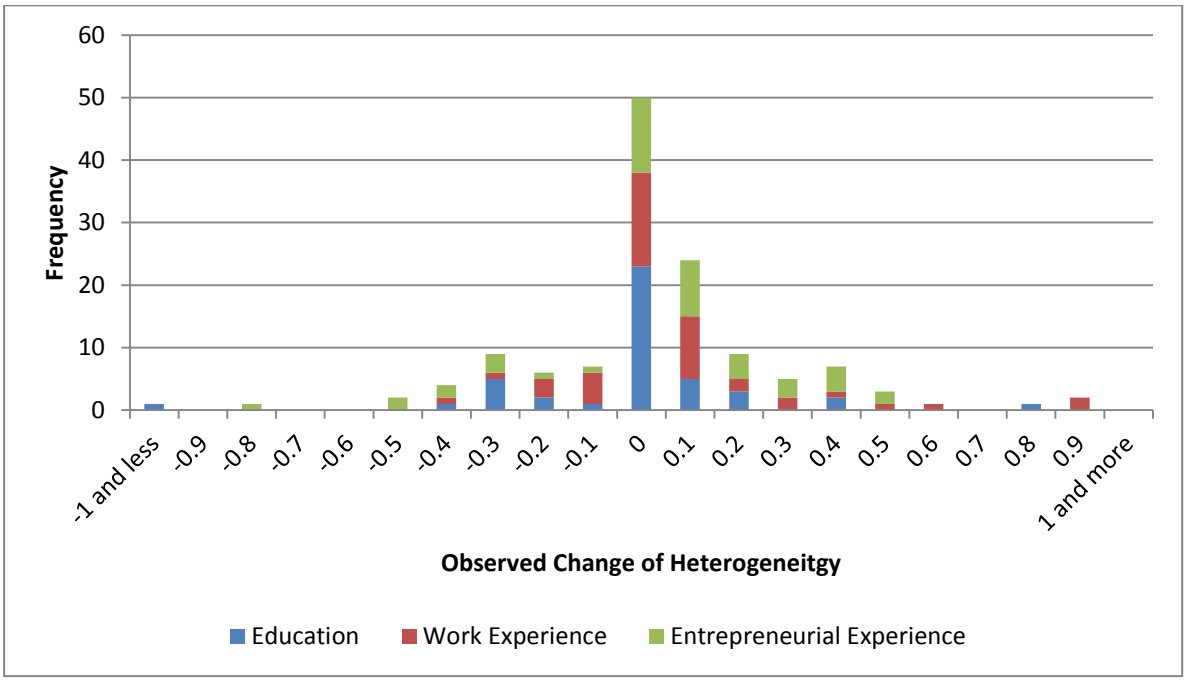

Illustration 8: Observed Changes of Standard Deviation (Histogram)

Because all changes are values relative to their absolute scale, it is not inappropriate to fit all three variables into one graph. It shows that the differences are almost symmetrically distributed around zero, so there is no obvious tendency. A t-test for the mean being zero gives the detailed insight. The Stata command *ttest* is followed by the variable name and "*== 0*" (which simply reads "equals zero"). Technically, the correct hypothesis is "the mean of the changes is zero", which means that the event of a team change generally does not affect the Human Capital Homogeneity in either direction. If the results do not support this hypothesis, the alternative would be that there exists a significant tendency.

```
. ttest delta_Edu == 0

One-sample t test
------------------------------------------------------------------------------
Variable |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
delta_~u |      44    -.054142     .044104    .2925528   -.1430862    .0348022
------------------------------------------------------------------------------
    mean = mean(delta_Edu)                                        t =  -1.2276
Ho: mean = 0                                     degrees of freedom =       43

    Ha: mean < 0                 Ha: mean != 0                 Ha: mean > 0
 Pr(T < t) = 0.1131         Pr(|T| > |t|) = 0.2263          Pr(T > t) = 0.8869
```

```
. ttest delta_WE == 0

One-sample t test
------------------------------------------------------------------------------
Variable |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
delta_WE |      44    .0310505    .0390969    .2593398    -.047796     .109897
------------------------------------------------------------------------------
    mean = mean(delta_WE)                                         t =   0.7942
Ho: mean = 0                                     degrees of freedom =       43

    Ha: mean < 0                 Ha: mean != 0                 Ha: mean > 0
 Pr(T < t) = 0.7843         Pr(|T| > |t|) = 0.4314          Pr(T > t) = 0.2157
```

```
. ttest delta_EE == 0

One-sample t test
------------------------------------------------------------------------------
Variable |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
delta_EE |      44   -.0131878     .043296    .2871933   -.1005026    .0741269
------------------------------------------------------------------------------
    mean = mean(delta_EE)                                         t =  -0.3046
Ho: mean = 0                                     degrees of freedom =       43

    Ha: mean < 0                 Ha: mean != 0                 Ha: mean > 0
 Pr(T < t) = 0.3811         Pr(|T| > |t|) = 0.7621          Pr(T > t) = 0.6189
```

First reported means come to attention. They are slightly negative for Education and Entrepreneurial Experience, therefore supporting the idea of shrinking standard deviation, and slightly positive for Work Experience (contradicting the expectation). But a look at the 95% confidence interval in the summary statistics gives more insight. Its interpretation is that if many random samples were drawn out of the population and for each one the mean and the confidence interval estimated, 95% of all intervals would contain the population's real mean.[4] Depending on the distribution and the number of observations, the boundaries of the interval vary. Because in all three cases it contains zero, the basic hypothesis – that the mean is equal to zero – cannot be rejected at this level of confidence.

The last section of the output shows the *p-values* (written as "Pr(T < t)"), here is how to interpret them. A confidence level of 95% can be derived from $1-\alpha = 95\%$, where α is called the significance level. Because their values are all larger than usual values of α of 0.05 or even 0.1, it cannot be assumed that the mean is lower, higher, or simply unequal to zero.[5]

The results do not support the whole idea of increasing Human Capital homogeneity. However, it must be noted that confidence intervals shrink if the sample size is larger. Perhaps gathering more data could lead to a clearer and different picture.

A different approach using Sonderegger's (2009) combined single index is found in Appendix 3. It was conducted as an earlier version of the current analysis and uses three levels of assumptions in order to include samples with errors. Nevertheless the results are the same as reported here.

[4] http://psydok.sulb.uni-saarland.de/volltexte/2004/268/html/node146.html (accessed on 20.9.2010)
[5] http://www.ats.ucla.edu/stat/stata/output/ttest_output.htm (accessed on 20.9.2010)

3.4. TEAM LEVEL FACTORS FOR ENTRY AND EXIT

3.4.1. HYPOTHESES

If the suggested mechanism that leads to Human Capital homogeneity is not as important for entrepreneurial team change, there might be another explanation. In this section, the analysis focuses on variables that characterize entrepreneurial ventures at the team level. Perhaps, there is a difference in the teams that change in comparison to teams that do not. For the structured investigation it is also sensible to differ between events of team exits and entries, as in Ucbasaran et al. (2003). Two binary dummy variables are introduced, one that is equal to "1" if the team experiences an exit and "0" if it does not, and one that does the same for an entry. The standard deviations of the indices and the means are again included in the checked variables.

Higher means of the Human Capital indices account for highly experienced (professional) teams. More experience may increase the chance for team changes in both directions. This is reasonable because professional teams may know better when outside knowledge is needed; they may have a larger and better social network that allows sourcing members for potential entry; professionals in a team may be quicker to identify outside opportunities to change to, and their social network facilitates access; finally, they may realize problems with active members earlier and react with expulsion if necessary. A conflicting argument was discussed in section 2.4.2.: team stability has advantages for performance. Coordination issues associated with member entry and exit may take time and slow down the founding process (Kim,

Aldrich, & Ruef, 2005). A professional team might anticipate these problems and start with the right team from the beginning.

A higher standard deviation means more heterogeneity. In the previous section, no evidence was found indicating that teams tend to decrease or increase it with team changes. This, however, does not tell anything about the relationship between diversity and probability of team change. Perhaps, diversity pushes team turnover, but who to recruit or expel is more the outcome of a random process regarding Human Capital attributes. Diverse founder teams consist of people of different levels of education, work- and entrepreneurial experience and probably have a different social background. It is possible that there is a cluster of entrepreneurial teams that tend to form spontaneously when the right people meet (or by "entrepreneurial casting" of an institution), as opposed to teams of friends that know each other from college or work – which would more likely share similar skill levels. The "spontaneous" team may be exposed to more internal social friction.

On the other hand, if the personal relationship is a long-time friendship or even partnership, it may compensate for lack of hard skills as a prime "trust bonus" (Sonderegger, 2009). To investigate the impact of personal relationships, the PSEDII offers the variable *H7* which reports for how many years the interviewee has known each member of the team. On a team level, this effect can be tested only on an average basis – the mean of the years the interviewee has reported to know his or her teammates. It is more plausible to assess the personal relationships on an individual level; this follows in the next section.

The average age of the team may especially lead to exits into retirement, and is therefore included. Also here, an individual test for exit probability seems promising.

Technically, it is reasonable to assume that with increasing team size the probability of a team exit gets bigger. The straightforward logic is that each member is exposed to ambiguous events that influence his or her decision to quit. The average probability for a member to exit can be determined. As a result, with each additional member in a team the combined probability that just one of them leaves increases. A less technical reason for member exit may be that a larger team might face growing organizational and structural difficulties. But in contrast, handling more work, advanced processes or an extended customer network even requires more people. Ucbasaran et al. (2003) find support that smaller teams report entries more often than larger teams. As an explanation, they suggest that they have limited functional diversity and need new members to fill those gaps.

3.4.2. LOGISTIC REGRESSION

All available variables are included in a logistic regression. Its aim is to identify systematics between independent variables and a dichotomous dependent variable, in this case a dummy for a realized team change. Contrary to linear regression, the relationship to the independent variables is interpreted as the logarithmic chance of the dependent event happening. The natural logarithm of the odds ratio allows the probability coefficient to stay in within the [0, 1] interval. It is further appropriate to center all continuous variables. Because the logarithmic relationship leads to different coefficients at different values of the variable (unlike in a linear relationship), it is reasonable to observe the coefficient at a "meaningful point" (Kohler & Kreuter, 2009). Note that "meaningful points" could also be others than the

mean, for instance if the sample is heavily clustered: Effects on "typical observations" could then be estimated when centering the variables on their cluster means. Some argue that best practice would be to even calculate the coefficients at every observed value and report the mean of them (Hoetker, 2007).

For both regressions, all independent variables are taken from the state in wave A. The dependent dummy variables, *exit* and *entry*, are set to 1 if there is a corresponding team change reported in any wave thereafter. Also, the sample is limited to observations with more than one person in wave A as well as to errorless ones.

Independent variables (for correlation tables, see Appendix 4):

- *cMean_Edu_1, cMean_WE_1, cMean_EE_1*: centered means of the three Human Capital Sub-indices in wave A
- *cStd_Edu_1, cStd_WE_1, cStd_EE_1*: centered standard deviations of the Sub-indices in wave A
- *cMean_YK*: centered mean years the founder knows his or her partners
- *cteamsize*: centered team size
- *cMean_Age*: centered mean age of the owners

```
Logistic regression                               Number of obs   =        125
                                                  Wald chi2(8)    =      29.13
                                                  Prob > chi2     =     0.0003
Log pseudolikelihood = -40.338027                 Pseudo R2       =     0.2428
```

exit	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
cMean_Edu_1	.4806936	.3808332	1.26	0.207	-.2657258	1.227113
cMean_WE_1	.4024032	.5600368	0.72	0.472	-.6952489	1.500055
cMean_EE_1	-.6758555	.5804984	-1.16	0.244	-1.813611	.4619004
cStd_Edu_1	.4805177	1.084126	0.44	0.658	-1.644331	2.605366
cStd_WE_1	-1.024177	.896493	-1.14	0.253	-2.781271	.7329174
cStd_EE_1	.6293954	.8269689	0.76	0.447	-.9914338	2.250225
cMean_YK	-.0132113	.0307339	-0.43	0.667	-.0734485	.047026
cteamsize	1.55092	.4285023	3.62	0.000	.7110711	2.390769
_cons	-2.089226	.3285133	-6.36	0.000	-2.7331	-1.445352

```
Logistic regression                               Number of obs   =        125
                                                  Wald chi2(8)    =      18.88
                                                  Prob > chi2     =     0.0155
Log pseudolikelihood = -29.451036                 Pseudo R2       =     0.2091
```

entry	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
cMean_Edu_1	-.4755848	.3673843	-1.29	0.195	-1.195645	.2444751
cMean_WE_1	.2089916	.7914642	0.26	0.792	-1.34225	1.760233
cMean_EE_1	.4759327	.7873326	0.60	0.546	-1.067211	2.019076
cStd_Edu_1	2.496994	1.042989	2.39	0.017	.4527727	4.541216
cStd_WE_1	1.885078	1.382552	1.36	0.173	-.8246753	4.594831
cStd_EE_1	-.2893571	1.482861	-0.20	0.845	-3.195711	2.616997
cMean_YK	.0007107	.022083	0.03	0.974	-.0425711	.0439925
cteamsize	.4874731	.423351	1.15	0.250	-.3422795	1.317226
_cons	-3.006204	.4813772	-6.25	0.000	-3.949686	-2.062722

A positive coefficient is interpreted as the rise in logarithmic odds if the variable increases by one. For an interpretation with probabilities, the nonlinear relationship is best understood by visualizing it with a graph. The probability of the event *exit* occurring in a team is predicted for each value of an independent variable. For team size, the only variable which has highly significant impact on *exit* with a p-value of 0.000 (found in the fifth column of the variables table), this looks as follows:

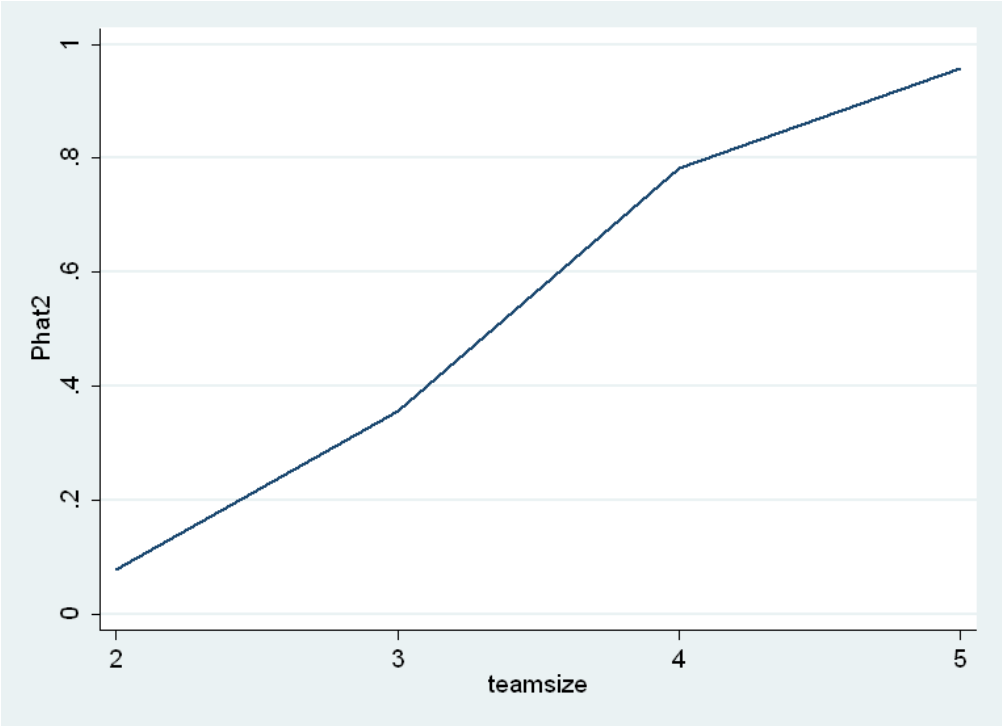

Illustration 9: Predicted Probability of an Exit-Event (Phat2) with Team Size

Because it is not a continuous function, it is obvious that the probability difference between 2 and 3 team members is smaller than the difference between 3 and 4, where the line is steeper. Anyways, the relationship is almost linear, and it seems that additional team members increase chances of an exit appearing just as an effect of summation, as suggested. Because all variables were centered, the constant term in the last row of the output represents the logarithmic odds of a hypothetical all-average team to experience a team change. It can be transferred into a probability with

$$\Pr\ Y = 1\ = \frac{e^L}{1 + e^L}$$

where L is the coefficient and Y the dependent variable. It equals an overall chance of 11% for exit and 5% for entry.

There is also a p-value for the whole model, found in the third row of the output's upper right section. Compared to usual levels of α (0.1, 0.05, 0.01), it is very low in the first model and a little higher at the second, which indicates a proper model fit.

The second model has one significant variable: *cStd_Edu_1*. This shows that the odds for entry increase for teams with higher diversity in the education index. This deserves a closer look. Appendix 5 shows a list with all teams that experience an entry, sorted by deviation in the highest level of education of the owners. It shows that the teams with the highest deviations are almost always teams with partners or relatives involved. This is in accord with the finding that the "trust-bonus" resulting from personal relationships can compensate for differences in Human Capital (Sonderegger, 2009). An explanation for the higher entry probability might be that "family ventures" built on trust will sooner or later realize that external knowledge is needed, or that other members of the family are brought into the venture. Ucbasaran et al. (2003) already investigated this hypothesis but did not find support. The impact of personal relationships is examined on the individual level in the next section.

3.5. INDIVIDUAL FACTORS FOR EXIT

Here, the aim is to find significant specifications of persons that leave nascent entrepreneurial teams. It is a chance to get the most detailed look into personal reasons for team exits. Therefore, all individuals of wave A who reportedly stay or leave are compared with logistic regression.

The first step is to rearrange the PSEDII dataset in a proper manner. Rather than groups of individuals being observed, every individual becomes a sample now.

Demographics are taken from wave A, and again, a dummy variable is introduced that marks if the individual is reported as leaving the team in one of the subsequent waves. This is determined by the PSEDII question *G4c* "Is owner X still an owner?". The interviewees therefore also have to give a positive statement if the person has not left. Only in this case, the dummy variable is assigned zero.

For every variable, it is now possible to calculate an individual's difference from its colleagues' mean. This method is best suited to quantify the characteristics of a person compared to the others, without having him or her influence the mean. The following example illustrates a possible proceeding in an exemplary team for the variable *age*:

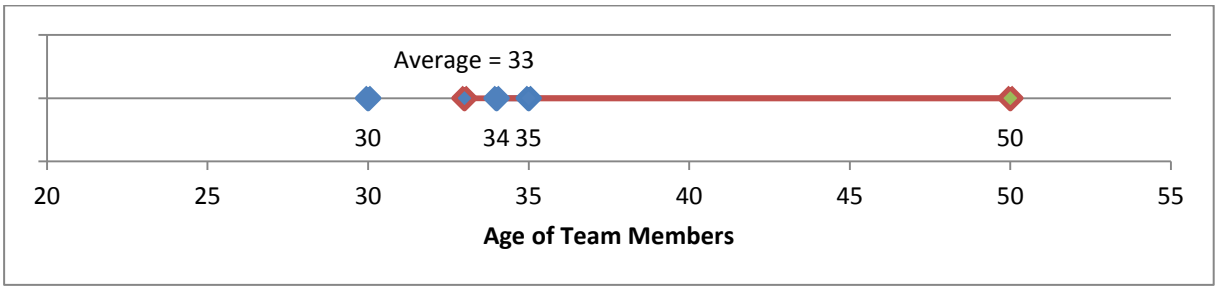

Illustration 10: Average Difference of Age

Here, the team consists of four people with the ages 30, 34, 35 and 50. Their ages are marked on the horizontal "age" line. The age difference is calculated for the oldest member (the green square). First, the mean of the remaining members is marked as 33 (the blue squares). Then, the length of the red line symbolizes the average difference to the oldest member. Its length is 17. The same calculation is done for every member and other variables with the help of Excel VBA.

3.5.1. HYPOTHESES

After these arrangements it is possible to develop new hypotheses. First, the effect of age can be assessed on an individual basis. It seems plausible that old owners will tend to quit and probably leave into retirement. Also, the effect of average age difference to his or her colleagues (the example from the previous section) could lead to an exit: If a member is much older or younger than the rest of the venture, it might become difficult to match individual aims. Older members might become more risk-averse or less interested in keeping track of new developments.

A similar argument is applicable for each Human Capital sub-index. Also here, the average difference on the scale is assessed. As argued at the beginning, it might seem reasonable for rational higher-than-average owners to search outside opportunities, as well as for whole teams to expel lower-than-average members. However, this would inevitably lead to the same negative impact on the indices' standard deviations as tested for in the first analysis (Human Capital homogeneity), which no evidence was found for. In compliance with the above results, it is reasonable to assume that there will be no significant effect of these three variables.

If there is an effect regarding gender, it can be traced with the dummy variable *male*, which is set to one for men and zero for women. Although a topic of recent controversy is introduced here, it can be hypothesized that women are still more likely to leave because of pregnancy or child care.

As already discussed above, the personal relationship might have a strong influence, because of the development of a so-called "trust-bonus" via social ties. It can be misleading that there is no information about the other owner's interpersonal

relationships. However, a long-term acquaintanceship might well have a negative influence on the chance for exit. It is further reported what exact relationship the interviewee has to each other individual. Here, the following ordinal categories are created out of the PSEDII information from question *H8* (in brackets) as dummies:

- Partners ("Spouses" and "Partners sharing a household")
- Relatives ("Relatives living in the same household" and "Partners living in different households")
- Friends ("Friends or acquaintances from work" and "Friends or acquaintances you have not worked with")
- Strangers ("Strangers before joining the new business team")

The proximity of the relationships is sorted in a decreasing order. It is suspected that nearer relationships such as "Spouses" account for less probability of the corresponding person leaving.

The last variable of interest concerns how much effort the person has put in the venture. *H14* reports "how many hours in total [the individual] has devoted to the new business". Close examination of this variable reveals that some individuals have reported up to 60000 hours. Perhaps, owners tend to overestimate their effort, because this value is absurd: if one would assume even twelve working hours a day seven days a week, this would still mean over 13 years of permanent work without one single day off. See a histogram of the variable:

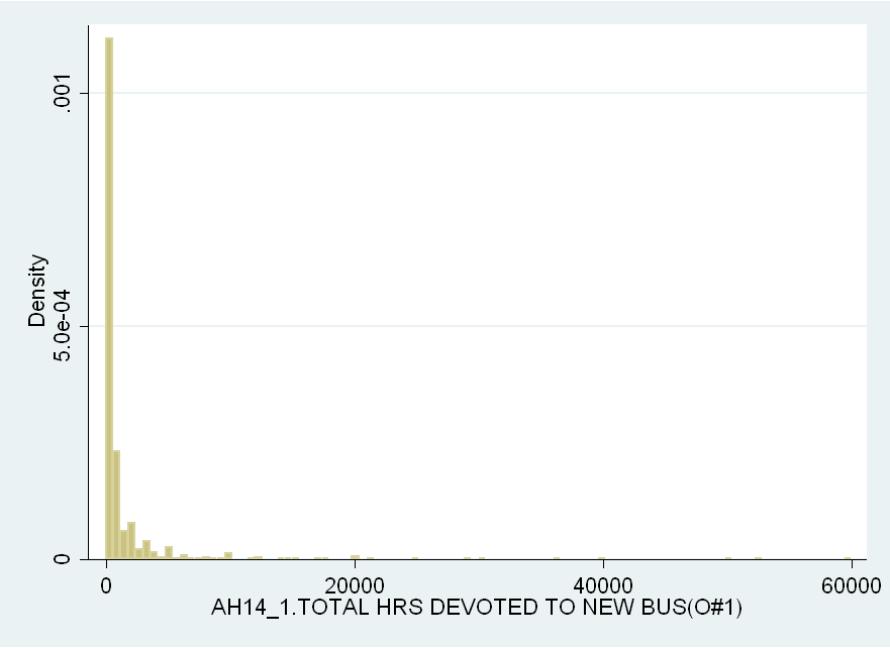

Illustration 11: Total Hours Devoted to New Business (Histogram)

Since there are only very little extreme values, it is reasonable to cut the distribution at 10000 and create a category that catches all values above (10000 and higher). This will limit the effect of these extreme outliers. If many working hours limit the chance of exit, the relationship will still be observable.

3.5.2. LOGISTIC REGRESSION

Again, all variables are standardized for the sake of a more general interpretation of the coefficients. A logistic regression is conducted with exit as a dependent dummy variable and all others as independents. Observations are not any more teams but individuals. The sample is limited to owners whose whereabouts are traceable[6] and to owners other than number 1 (the interviewee). This is necessary since data about the interviewee's relationship to him- or herself is neither sensible nor available. Also,

[6] See Appendix 6 for a logistic regression where members, who are not explicitly reported as leaving, are assumed to stay

there is never an exit of owner 1 reported (which lets assume that samples in the PSEDII were dropped if the interviewee was not available in later waves). Keeping owner 1 in the sample would distort the result towards fewer exits.

Independent variables (for correlation tables, see Appendix 4):

- *zage*: centered age of the owner
- *zagedist*: centered average difference to other owner's ages
- *zEdudiff, zWEdiff, zEEdiff*: centered standard deviations of the Sub-indices in wave A
- *zYK*: centered number of years the founder knows the owner
- *male*: dummy variable for gender
- *partner, relative, friend, stranger*: dummy variables that indicate the personal relationship to owner 1
- *zhoursComm*: centered total hours the owner has devoted to the business

```
Logistic regression                               Number of obs   =        169
                                                  LR chi2(11)     =      25.09
                                                  Prob > chi2     =     0.0088
Log likelihood = -104.09664                       Pseudo R2       =     0.1075
```

leave	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
zage	.1658894	.2314769	0.72	0.474	-.287797	.6195759
zagediff	.3098428	.2957745	1.05	0.295	-.2698645	.8895501
cEdudiff	.0679976	.1571079	0.43	0.665	-.2399283	.3759235
cWEdiff	-.1560642	.295992	-0.53	0.598	-.7361979	.4240696
cEEdiff	.031194	.1479201	0.21	0.833	-.2587241	.321112
zYK	-.0341229	.2536211	-0.13	0.893	-.5312112	.4629653
male	-.3891864	.404438	-0.96	0.336	-1.18187	.4034974
partner	-1.632062	.7817943	-2.09	0.037	-3.164351	-.0997734
relative	-.6611385	.871244	-0.76	0.448	-2.368745	1.046468
friend	-.2031426	.6458448	-0.31	0.753	-1.468975	1.06269
stranger	(omitted)					
zhoursComm	-.8937862	.3756448	-2.38	0.017	-1.630036	-.1575359
_cons	.5401817	.6937584	0.78	0.436	-.8195597	1.899923

The most noticeable abnormality is that the variable stranger is omitted. Indeed, this is no error. It results from the fact that the relationship status is already defined only by the first three dummy variables: if a person is not a partner, relative of friend, he

must be a stranger. In this case, *stranger* always equals one and the regression model cannot be enhanced with this information. It is even impossible to calculate coefficients for this variable (Kohler & Kreuter, 2009).

The first few independent variables do not have significant influence in this model. Men seem to exit less often because of the negative coefficient, but not on a significant level. The first significant variable is *partner* with a p-value of 0.037. As hypothesized, closer relationships tend to have negative influence on exits – this is observable but not striking throughout all dummy variables. If the same logistic regression is run after dropping the dummies except *stranger*, its coefficient is positive with 0.5121 (not significant), which gives the idea that strangers have relatively higher odds to exit. See Appendix 7 for the output.

Another significant factor is the one regarding hours devoted to the business, at least at a 95% confidence interval. It strongly supports the hypothesis that more dedicated owners are less likely to exit.

3.5.3. ANALYSES USING LOWESS

It is worthwhile to go one step further. Stata comes with a powerful tool for plotting nonlinear relationships in (also dichotomous) scatterplots: The locally weighted scatterplot smoother (LOWESS). For small subsections of the scatterplot, functions are derived. Proximity of scatter points gives them stronger weights. It trades off high-degree with low-degree polynomials for a balance between fit and simplicity[7]. The user can choose this "smoothing parameter", which leads to either simpler

[7] http://www.itl.nist.gov/div898/handbook/pmd/section1/pmd144.htm (accessed on 25.09.2010)

graphs or less residuals. Especially scatterplots with one dichotomous variable can be advanced considerably, given there are enough data points.

When looking at all variables, the most interesting relationship is derived from the variable *zYK* (years owner 1 knows the individual):

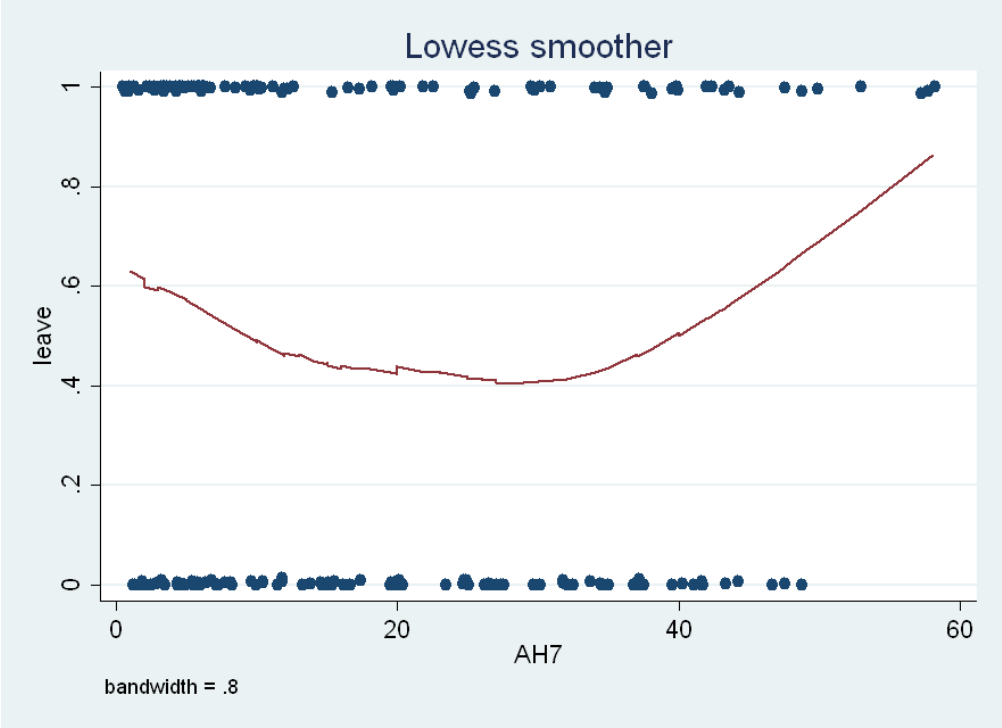

Illustration 12: Exit-Probability (Red Line) in Relation to Acquaintance in Years (AH7)

All observations are represented as blue points on the two horizontal lines indicating zero (for stay) and one (for leave). To get a slightly better image about their local density, they are jittered (randomly shifted on a small scale) vertically. The red line is the LOWESS function, and it clearly shows a U-shaped relationship. The interpretation is as follows: Owners who are not known for very long have a higher probability to leave; the probability decreases as the time of acquaintanceship increases, but then, approximately at a time of thirty years, increases again. To model this quadratic relationship, it is necessary to square the independent variable *zYK* and

include it in the regression together with the base. Then, the model looks a little different:

```
Logistic regression                               Number of obs   =        169
                                                  LR chi2(12)     =      37.33
                                                  Prob > chi2     =     0.0002
Log likelihood = -97.975079                       Pseudo R2       =     0.1600
```

leave	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
zage	.1022778	.2364994	0.43	0.665	-.3612525	.5658081
zagediff	.1135734	.3085707	0.37	0.713	-.491214	.7183608
cEdudiff	.1113296	.1654087	0.67	0.501	-.2128655	.4355246
cWEdiff	.0626226	.3140043	0.20	0.842	-.5528146	.6780598
cEEdiff	.0592988	.1514417	0.39	0.695	-.2375215	.3561191
zYK	-.6687415	.3223628	-2.07	0.038	-1.300561	-.0369221
zYKs	.6885826	.2225703	3.09	0.002	.2523528	1.124812
male	-.5371392	.4309148	-1.25	0.213	-1.381717	.3074384
partner	-.6701018	.8374221	-0.80	0.424	-2.311419	.9712153
relative	-.0804042	.9182149	-0.09	0.930	-1.880072	1.719264
friend	.3149769	.6807135	0.46	0.644	-1.019197	1.649151
stranger	(omitted)					
zhoursComm	-1.003535	.4144404	-2.42	0.015	-1.815823	-.1912467
_cons	-.6610205	.7929312	-0.83	0.404	-2.215137	.8930961

The new variable, *zYKs*, is strongly significant. Its positive coefficient results from the convexity of the function. The model fit, represented by the model p-value and the pseudo R2 in the upper right section, is better than the fit of the previous model, because the p-value is smaller and the pseudo R2 is higher (Kohler & Kreuter, 2009).

The challenging task is now to interpret the U-shaped relationship. The first half could be explained as follows: people who know each other only for a short while have incomplete information about each other. Only after a while they gain a better impression of their true characteristics. The chance is high that they go separate ways after they find out that they cannot work together as frictionless as it seemed when they met. But why do long acquaintances also imply higher probability of exit? The first idea that comes to mind brings age into play. If people know each other very long, they are probably older, but the correlation between the two variables only equals 0.46. Since age was not identified as a significant factor for exit, it is again reasonable to look for a nonlinear relationship with LOWESS.

Illustration 13: Exit-Probability (Red Line) in Relation to Age (AH2)

The relationship is clearly not linear. It also seems to have a U-shaped relationship, but it may be driven by a few outliers on the right where the sample density is not very high. It does not surprise that all owners older than 75 years exit during the 4 years of the observed period. If the squared variable is added as *zages* in the regression, the following output results:

```
Logistic regression                               Number of obs   =        169
                                                  LR chi2(13)     =      38.27
                                                  Prob > chi2     =     0.0003
Log likelihood = -97.507835                       Pseudo R2       =     0.1640
```

leave	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
zage	.0664083	.2425066	0.27	0.784	-.4088959	.5417125
zages	.1382422	.1456928	0.95	0.343	-.1473104	.4237948
zagediff	.1044157	.3147763	0.33	0.740	-.5125344	.7213659
cEdudiff	.1290005	.1669956	0.77	0.440	-.1983049	.4563058
cWEdiff	.0763384	.3164437	0.24	0.809	-.5438798	.6965567
cEEdiff	.0587686	.1512429	0.39	0.698	-.237662	.3551993
zYK	-.611351	.3275334	-1.87	0.062	-1.253305	.0306026
zYKs	.6885682	.2266314	3.04	0.002	.2443789	1.132758
male	-.5458194	.4323697	-1.26	0.207	-1.393248	.3016096
partner	-.6654086	.837648	-0.79	0.427	-2.307168	.9763512
relative	-.2515843	.9333635	-0.27	0.788	-2.080943	1.577775
friend	.263543	.6822487	0.39	0.699	-1.07364	1.600726
stranger	(omitted)					
zhoursComm	-1.026829	.4134629	-2.48	0.013	-1.837202	-.2164568
_cons	-.7279546	.7962681	-0.91	0.361	-2.288611	.8327021

The variable shows that the relationship is not significant. Moreover, the variables measuring acquaintance are still at a high level of significance. The indicators for model fit show an ambiguous picture: compared to the previous model the p-value declined while pseudo R2 increased on a small scale. The graph suggested that older owners, as well as very young ones, have a higher probability to quit. But there might be other factors distorting this relationship.

But first, both age and the variable indicating years of acquaintance have a similar U-shaped relationship. To find out if the age explains the U-shaped relationship, it is necessary to relate observations to both variables. A special scatterplot might give an idea. Age is represented on the horizontal and acquaintance on the vertical axis. Now, owners that exit are plotted as hollow circles, and owners that stay as red triangles.

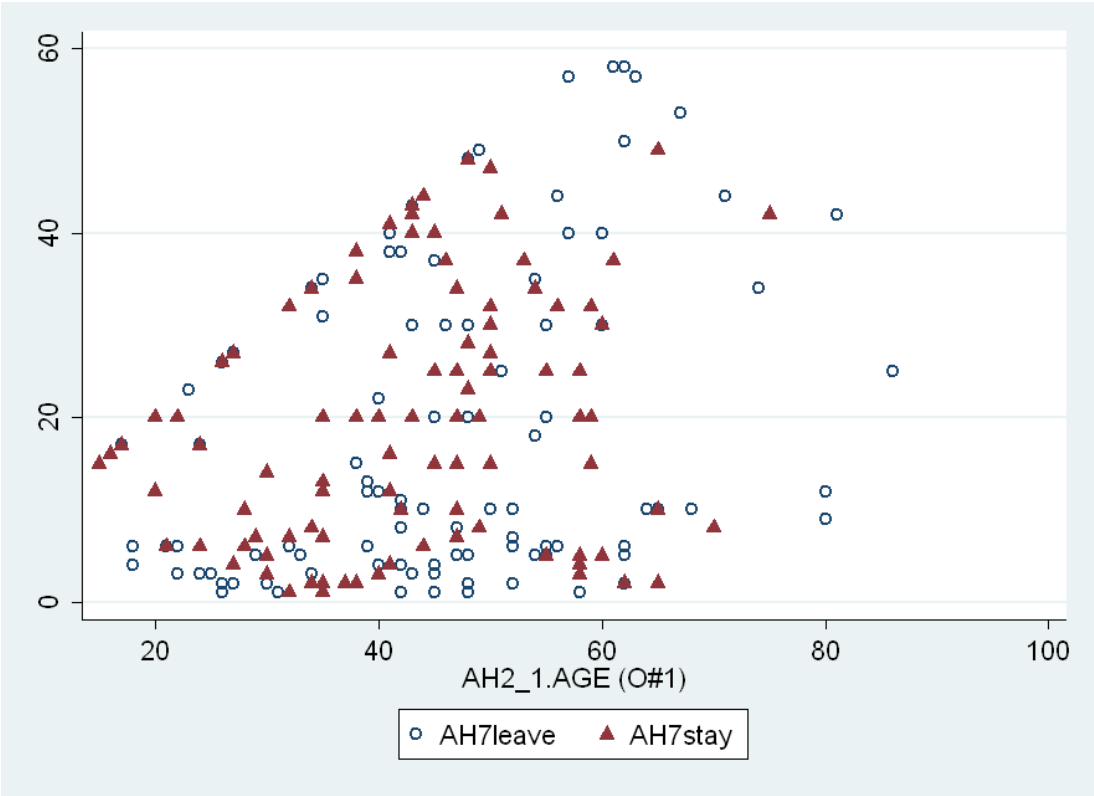

Illustration 14: Acquaintance (vertical) vs Age (horizontal) - Scatterplot

The sharp line from the lower left side to the high middle results from the restriction that an acquaintance cannot last longer than the person's age. Owners at this line

reported to know each other their whole lifetime and most of them stay in the team (since most symbols on the line are red triangles). The exceptions are at the very top. These people know each other very long, but are about 60 years old and leave. Also, the center of the triangles is shifted more to the left, and there are some circles on the upper right area. This shows that as expected some older owners leave in spite of knowing each other for a long time, probably because of age. The concentration of blue circles at the lower part of the graph is also noteworthy. These are the samples that account for the observed higher exit probability of people that do not know each other for long.

This explanation of the U-shaped relationship of acquaintance and exit results only from a visual analysis and it might easily be objected. There might be a very different logic behind the effect.

Rational nascent entrepreneurs seek to co-operate with the best available team members. They source among their whole social network, which consists of different levels of acquaintance. Some potential candidates are known for a very short time, others, like relatives, are known for a whole lifetime.

Both individuals have incomplete information about each other at the time when they first meet. Before, it was argued that they only later gain a better understanding about each other's character, which causes an increased likelihood to separate because of social frictions. This argumentation is also sensible if character is replaced with anticipated skills and abilities. When two potential partners meet first, they both only obtain information about each other's formal education and years of work experience. Because these formal variables are only proxies to business-relevant skills, they can only guess the exact skill level. Also having worked together in a non-

entrepreneurial framework may not serve as a reliable signal. Revealing more precise information is a time-consuming process and only actual co-operation might be a proper way of achieving it. It is likely that one of the two parties over-estimated the other's attributes. If disappointment crosses a certain limit of tolerance, the higher-skilled entrepreneur may decide to break the collaboration. Either he leaves due to more profitable outside opportunities, or he is in the position to expel the other entrepreneur.

The longer friendships and relationships have lasted before, the more complete is both individuals' information in advance of the decision to collaborate. They know what they are getting with their partner, therefore are less likely to separate because of disappointment. The argumentation until here can explain the initial negative slope of the *H7* LOWESS graph.

After knowing each other for quite a long time, a "trust bonus" develops together with the affirmation of social ties. The trust bonus compensates for lack of Human Capital in the initial founding phase: teams with spouses or close relatives involved are often characterized by a higher deviation of abilities (Sonderegger, 2009). But there is no hint that these ventures are equally persistent as Human Capital homogenous non-family ventures that had no trust-bonus involved. Instead, a similar logic of disappointment may apply: after a while of collaboration, the higher-skilled entrepreneur may find that the trust-bonus had let him over-estimate his or her partner's skills at the beginning. He may conclude that he has better chances without his partner/friend. Also the trade-off between the feeling of social duties (not to break the collaboration) and individual profit maximization (break the collaboration) can cross the critical level of tolerance, and lead to a breakup of the team. This could be a mechanism that explains the second, upwards-sloping part of the LOWESS graph.

4. CONCLUSION

This work gives insights into systematics that lead to entries and exits of owner-members in teams of nascent entrepreneurs.

The principle of Human Capital homogeneity, which guides the team formation process, was not discovered in the following periods. First, every team change in the PSEDII was identified. Team-specific standard deviations of three Human Capital indices, respectively one for education, work experience and entrepreneurial experience, were calculated before and after every change. Homogeneity slightly increased, but far from a significant level.

Team size, however, was found to be a factor driving exits. This may be due to the simple reason that with each additional person, individual risks to leave the venture sum up at the team level. A factor driving entry was identified to be the heterogeneity of the education index. The possible explanation that educationally diverse teams will later need to fill gaps lacks further confirmation. A hint might be that such teams seem to involve close social ties more often.

Finally, the dataset was rearranged to find factors (for exits only) on the individual level. The closeness of the social relationship prevents exit. Owners that devote much time to the new business are also likely to stay there. The most interesting relationship was discovered with the variable that indicates how many years the members have known each other. It was U-shaped: both shortest and longest acquaintances were associated with higher probability of exit. The downward slope for short acquaintances was suggested to result of initial information asymmetries regarding true characteristics. This concerns social and operational competence. Even

a high formal Human Capital (degree accomplished, years of branch experience, businesses owned) can mean that true competences are less than expected. Longer relationships diminish this asymmetry in advance and collaborations are therefore more stable. The upward slope, starting at approximately 30 years, must have another background. The idea that the age and retirement were the ultimate cause for the tendency could not be confirmed. Alternatively, a considerable fraction of the exits of members known for a long time may be explained by an overrated trust-bonus: after having known each other for many years, individuals trust each other and decide to form a venture. Only on the job it is revealed that skills necessary for entrepreneurial success are lacking, and collaboration quits.

The suggested explanations offered here are subject to some restrictions. First, the sample size had to be reduced considerably. Only team foundations with complete data could be used. More than half of the observations in the PSEDII are single ventures, and only 125 samples fulfilled the requirements to be included in the second part of the analyses. Only 44 teams experienced a fully traceable change, allowing standard deviations for the first analysis to be determined. Second, the PSEDII design had a major disadvantage regarding personal relationships: Length and type of social ties are reported just from the view of the interviewee.

It seems that social ties dominate the observed team changes. Further research might help to track down the U-shaped relationship of acquaintance and exit probability. More datasets, for example the PSEDI, can be checked for similar results. The exact influence of age on exits should be determined. Also, individual characteristics of entering members may be worthwhile an investigation. There are many facts left to be discovered in the field of entrepreneurial team formation.

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APPENDIX 1

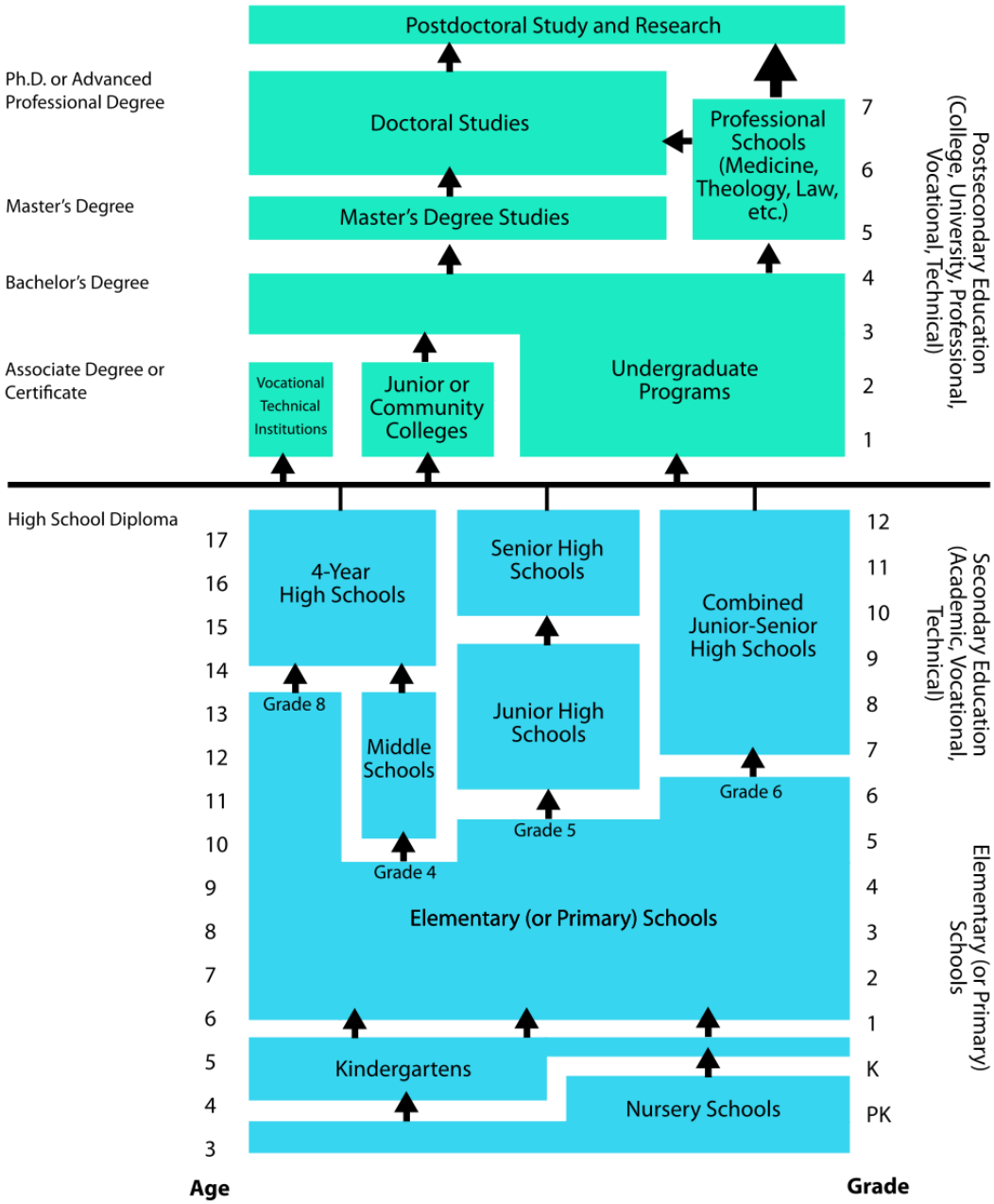
Industry averages of owner demographics used for Index calculations:

Industry	Years Edu	YWEI	YPWE	YMSAR	NSU	NB
Agriculture	14.1	11.5	21.6	13.7	0.8	0.4
Communication	15.6	10.2	24.0	12.5	0.9	0.4
Construction	13.7	10.3	17.4	9.7	0.7	0.4
Customer-. Consumer- & Business Consulting Or Service	14.5	8.1	19.9	9.7	1.0	0.3
Financial & Insurance Activities	14.9	8.6	18.4	10.2	0.7	0.4
Health. Education or Social Services	15.1	8.9	20.5	11.6	1.0	0.5
Manufacturing. Mining & Utilities	14.5	10.6	25.6	13.7	1.2	0.5
Real Estate	15.1	8.2	20.2	12.7	1.2	0.5
Retail. Restaurant. Wholesale Distribution & Transportation	14.0	6.8	20.0	9.3	1.0	0.4
Global	Years Edu	YWEI	YPWE	YMSAR	NSU	NB
All Industries	14.4	8.4	20.3	10.4	1.0	0.4

APPENDIX 2

Transformation of "Highest Level of Education" to "Years of Education"

Diagram of the US education system:



Original image: Institute of Education Sciences (IES) within the U.S. Department of Education
Vectorized version: James Hare, Wikimedia Commons
http://upload.wikimedia.org/wikipedia/commons/8/81/Education_in_the_United_States.svg (accessed on 25.09.2010)

PSEDII, Question AH6_1

What is the highest level of education (you have/[NAME] has) completed – (up to the eighth grade, some high school, high school degree, technical or vocational degree, some college, community college degree, a bachelor's degree, some graduate training, a master's degree, or a law degree, medical degree, or Doctorate?)

Highest Level of Education (Answer in PSEDII)	Years of Education (Transformation)
01. Up to eighth grade	8
02. Some high school	10
03. High school degree	12
04. Technical or vocational degree	14
05. Some college	14
06. Community college degree	14
07. Bachelor's degree	16
08. Some graduate training	17
09. Master's degree	17,5
10. Law, MD, PHD, EDD, degree	19

APPENDIX 3

Here, an earlier approach to analyze the development of Human Capital homogeneity after team changes is presented.

The index hci_i is constructed according to Sonderegger (2009). The primary difference is that it combines all three sub-indices (Education, Work Experience and Entrepreneurial Experience) to one main index (hci_i). Also, instead of using z-transformation, each variable is projected on its minimum-maximum range. The results of the fractions are scores strictly between zero and one (Zero, when the actual value equals the minimum; one, when it equals the maximum). The min and max values again refer to the specific industry.

The weights α, β and γ as well as the weights of the sub-indices β_1, β_2, β_3, γ_1 and γ_2 are also obtained specifically for each industry via principal-component analysis (see Sonderegger, 2009). Now, only one index value is calculated for each individual.

$$hci_i = \alpha \frac{YE_i - YE_{min}}{YE_{max} - YE_{min}} + \beta \quad \beta_1 \frac{YWEI_i - YWEI_{min}}{YWEI_{max} - YWEI_{min}} + \beta_2 \frac{YPWE_i - YPWE_{min}}{YPWE_{max} - YPWE_{min}} + \beta_3 \frac{YMSAR_i - YMSAR_{min}}{YMSAR_{max} - YMSAR_{min}} + \gamma \quad \gamma_1 \frac{NSU_i - NSU_{min}}{NSU_{max} - NSU_{min}} + \gamma_2 \frac{NB_i - NB_{min}}{NB_{max} - NB_{min}}$$

Then, standard deviation within team *j* in wave *w* is calculated with

$$\sigma_{jw} = \frac{\overline{{}_{i=1}^{n_{jw}} \; hci_i - \mu \; hci_i \;^2}}{n_{jw}}$$

where n_{jw} is the number of members of team *j* in wave *w*.

The difference $\Delta\sigma_j$ between two waves is now obtained via $\sigma_{jw} - \sigma_{j(w+1)}$. Note the difference to the method used in the main part: Again, positive and negative values result for differences in standard deviation. Here however, negative values appear when $\sigma_{jw} < \sigma_{j(w+1)}$, meaning an increase in homogeneity, and vice versa.

In order to increase the sample size, two additional datasets are constructed that treat occurring errors differently.

- D1 – Samples with *error 1* and *2* are dropped. 38 observations remain.
- D2 – It is assumed that missing data of an entire wave implicates no change. Because the assumption seems justified, the same set with 44 observations is used for the analysis in the main part.
- D3 – Includes samples with team changes, but *error 2* occurring. Industry averages are used if demographics data is not reported. According values are found in Appendix 1. For example, if the variable "Number of businesses owned" is missing for an individual of the Agricultural branch, it is set to 0.8. It is debatable if this method is justified. The sample size for D3 is 56.

Using SPSS, a one sample t-test for the value of zero is conducted for D1, D2 and D3. Note that the datasets do not refer to the three sub-indices, but to different handling of errors. Similar to the approach in section 3.3.3., the null hypothesis H0 states that the mean of the differences is equal to zero (i.e. no significant change happens, in either direction).

Although the mean of the differences in the hci_i is again slightly positive, which would support the hypothesis, evidence for a significant tendency cannot be found. 24 out of the 38 values in D1 are positive.

SPSS output for D1:

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
differencesD1	38	,0062939687	,03925789738	,00636847190

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
differencesD1	,988	37	,329	,00629396874	-,0066097810	,0191977185

SPSS output for D2:

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
differencesD2	44	,0028779817	,03793326531	,00571865491

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
differencesD2	,503	43	,617	,00287798168	-,0086547851	,0144107484

SPSS output for D3:

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
differencesD3	56	,0013695873	,03696567993	,00493974676

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
differencesD3	,277	55	,783	,00136958732	-,0085298864	,0112690611

It is notable that D1 has the highest mean and its confidence interval is located further to the right than those of D2 and D3. Therefore, D2 and D3 show even worse support for the hypothesis of increasing homogeneity.

APPENDIX 4

Correlation Tables:

	cMea~u_1	cMe~WE_1	cMe~EE_1	cStd~u_1	cStd_W~1	cSt~EE_1	cMean_YK	cteams~e
cMean_Edu_1	1.0000							
cMean_WE_1	0.1156	1.0000						
cMean_EE_1	0.2253	0.2452	1.0000					
cStd_Edu_1	-0.0361	0.0094	0.0527	1.0000				
cStd_WE_1	-0.0107	0.3485	0.0024	0.0111	1.0000			
cStd_EE_1	0.0179	0.0886	0.5807	-0.0028	0.1173	1.0000		
cMean_YK	-0.1232	0.2561	0.0170	-0.1023	0.2996	-0.0364	1.0000	
cteamsize	0.0492	-0.0226	0.1411	0.2244	0.0023	0.3684	-0.1683	1.0000

	zage	zages	zagediff	cEdudiff	cWEdiff	cEEdiff	zYK	zYKs	partner	relative	friend	stranger	zhours~m
zage	1.0000												
zages	0.1635	1.0000											
zagediff	0.5251	0.1615	1.0000										
cEdudiff	0.0585	-0.0355	0.1534	1.0000									
cWEdiff	0.2465	0.0743	0.6652	0.1000	1.0000								
cEEdiff	0.0822	0.0199	0.2524	0.0075	0.3258	1.0000							
zYK	0.4646	0.1599	0.0676	-0.0156	-0.0408	-0.0525	1.0000						
zYKs	0.3958	0.2979	0.0767	-0.0436	-0.0693	-0.0723	0.6400	1.0000					
partner	0.0755	-0.1894	0.0085	-0.0238	-0.0579	-0.0170	0.0172	-0.1541	1.0000				
relative	0.0489	0.1975	-0.0126	-0.0185	0.0492	-0.0199	0.4903	0.3229	-0.4635	1.0000			
friend	-0.1167	0.0442	0.0390	0.0553	0.0336	0.0745	-0.3541	-0.1330	-0.5829	-0.3434	1.0000		
stranger	-0.0196	-0.0360	-0.0831	-0.0295	-0.0338	-0.0863	-0.2316	0.0247	-0.1893	-0.1115	-0.1402	1.0000	
zhoursComm	0.0634	0.0084	0.0781	0.0283	0.1866	-0.0262	-0.0511	-0.0286	-0.0304	-0.0333	0.0118	0.1144	1.0000

APPENDIX 5

Samples with standard deviation (Std_Edu_1) of the education index are sorted in ascending order. In the first 5 lines with low standard deviation, there is only one team where a partnership is involved. In the last samples, 4 out of 5 involve a partnership. This suggests that the formation of educationally diverse teams is eased by social ties and a trust-bonus, which serves as a substitute to Human Capital.

	SAMPID	Std_Edu_1	partners	relatives	friends	strangers
12.	50209	0	0	0	1	0
52.	51407	0	1	0	0	0
79.	50771	0	0	1	0	0
113.	51247	0	0	1	0	0
149.	51160	0	0	0	1	0
161.	51022	0	0	0	1	0
173.	51448	0	0	0	1	0
217.	50398	.28709848	1	0	0	1
226.	51788	.33089564	0	1	1	0
270.	50509	.40601856	0	0	1	0
291.	50076	.44119419	0	0	1	0
294.	50163	.44201703	1	0	0	1
302.	51478	.44476186	1	0	0	0
304.	51447	.44476186	0	0	1	0
361.	51434	.46882986	0	0	1	0
368.	51245	.46882986	0	0	1	0
406.	50900	.46882986	1	0	0	0
416.	50640	.46882986	1	0	1	0
423.	51784	.48141844	0	1	0	0
430.	51601	.58309977	0	0	0	1
473.	50891	.81892493	0	0	1	0
489.	51377	.88952372	0	1	0	0
492.	51694	.88952372	1	0	0	0
508.	51430	.9359142	1	0	0	0
527.	50245	.95491424	1	1	0	0
532.	51019	.96283688	1	0	0	0
536.	50004	1.0863147	0	1	0	1
551.	50861	1.2375625	1	0	0	0
552.	51533	1.2665858	1	1	0	0
562.	50997	1.7548391	1	0	0	0

APPENDIX 6

Logistic regression output if owners, whose status (stay/leave) is not reported after entry, are assumed to stay. Note that there are now 620 instead of 169 observations. Social ties (especially partnership) and *hours committed* stay significant; the U-shaped relationship of *zAH7* is not any more traceable. Note *zAH7* and *zAH7s* are renamed to *zYK* and *zYKs* in the main part.

```
Logistic regression                               Number of obs   =        620
                                                  LR chi2(11)     =      69.06
                                                  Prob > chi2     =     0.0000
Log likelihood = -200.03871                       Pseudo R2       =     0.1472
```

assumestay	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
zage	.2772022	.1769764	1.57	0.117	-.0696652	.6240696
zagedist	.0402248	.2229474	0.18	0.857	-.3967441	.4771937
zAH7	-.0707934	.2170412	-0.33	0.744	-.4961863	.3545995
zAH7s	.1505048	.113985	1.32	0.187	-.0729018	.3739114
zedudist	.0908199	.1424117	0.64	0.524	-.1883019	.3699417
WEdist	-.0314306	.2348649	-0.13	0.894	-.4917574	.4288961
EEdist	-.1179083	.1217687	-0.97	0.333	-.3565706	.120754
partner	-2.767174	.6351293	-4.36	0.000	-4.012005	-1.522343
relative	-1.22246	.6585867	-1.86	0.063	-2.513266	.0683465
friend	-.5588315	.5130071	-1.09	0.276	-1.564307	.446644
stranger	(omitted)					
zhoursComm	-.8226238	.3379247	-2.43	0.015	-1.484944	-.1603036
_cons	-1.027645	.5515974	-1.86	0.062	-2.108756	.0534665

APPENDIX 7

Logistic regression output if all dummy variables indicating social relationship are dropped except *stranger*

```
Logistic regression                               Number of obs   =        169
                                                  LR chi2(9)      =      17.29
                                                  Prob > chi2     =     0.0443
Log likelihood = -107.99506                       Pseudo R2       =     0.0741
```

leave	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
zage	.1621045	.2195576	0.74	0.460	-.2682206	.5924295
zagediff	.2513418	.2860701	0.88	0.380	-.3093454	.8120289
cEdudiff	.0853381	.1512898	0.56	0.573	-.2111846	.3818607
cWEdiff	-.0774357	.2803694	-0.28	0.782	-.6269496	.4720783
cEEdiff	.005248	.1411981	0.04	0.970	-.2714951	.2819912
zYK	-.1620992	.174288	-0.93	0.352	-.5036973	.1794989
male	-.0102663	.3658753	-0.03	0.978	-.7273688	.7068361
stranger	.5121821	.6365811	0.80	0.421	-.7354938	1.759858
zhoursComm	-.9814969	.3843396	-2.55	0.011	-1.734789	-.2282051
_cons	-.3651333	.3244337	-1.13	0.260	-1.001012	.270745

ABSTRACT ENGLISH

The reasons for young ventures to exchange owner-members may be various. It is the aim of this work to find common underlying drivers for exits and entries of members. Focus is put on personal characteristics such as Human Capital. As regards initial team formation, empirical evidence suggests that members with relatively similar Human Capital levels join forces. The obvious assumption is that also in the following periods this principle will guide member change, further increasing Human Capital homogeneity over time. An empirical analysis of the PSEDII, a database that monitors the evolution of 1214 young ventures, does not support this hypothesis. Other factors seem to be more relevant, the most striking being a U-shaped relationship between member's exit probability and the time they have known each other. Among entrepreneurial teams, both the shortest and longest acquaintances seem to be cut more often. The reason may be distorted perception of other's true characteristics: Lack of information in short acquaintances and a socially motivated overestimation of skills in long ones.

ABSTRACT GERMAN

Unternehmen, die in der Vorgründungsphase Teammitglieder austauschen, mögen unterschiedliche Gründe dafür haben. Das Ziel dieser Arbeit ist es, zugrunde liegende, allgemeine Treiber für den Ausstieg und die Aufnahme von Mitgliedern zu finden. Insbesondere werden persönliche Charakteristika wie das Humankapital untersucht. Es gibt empirische Beweise dafür, dass Personen, die gemeinsam gründen, relativ ähnliche Humankapital-Levels aufweisen. Die naheliegende Vermutung ist, dass dasselbe Prinzip auch in der darauf folgenden Zeit für Teamänderungen gilt, was eine weitere Steigerung der Humankapital-Homogenität zur Folge hätte. Die empirische Analyse des PSEDII, einer Datenbank, die die Entwicklung 1214 junger Unternehmen verfolgt, unterstützt diese Hypothese nicht. Andere Faktoren scheinen relevanter zu sein, besonders sticht das U-förmige Verhältnis zwischen Ausstiegswahrsscheinlichkeit und der Zeit, wie lange die Mitglieder sich kennen, hervor. Die kürzesten und die längsten Bekanntschaften scheinen sich unter den Teams in der Vorgründungsphase am öftesten zu trennen. Die Ursache dafür kann eine Fehleinschätzung der wahren Eigenschaften des Anderen sein: Unvollständige Information bei kurzer und ein sozial begründetes Überschätzen der Fähigheiten bei langer Bekanntschaft.

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Curriculum Vitae

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Education

02/2009 - 06/2009	Semester abroad ISCTE Lisboa, Portugal
Since 10/2008	Study of Business Administration, Master level Focus: Controlling, Supply Chain Management University of Vienna Estimated graduation date: February 2011
09/2006	Language Course: Spanish, Level A Academia Malaga Plus, Malaga
10/2005 - 06/2008	Study of Business Administration, Bachelor level University of Vienna
09/1996 - 06/2004	BG/BRG St. Pölten – High School Branch of Natural Sciences

Achievements

01/2011	Merit scholarship of the Austrian Ministry of Science Grant for outstanding achievements in 2009/2010
01/2010	Merit scholarship of the Austrian Ministry of Science Grant for outstanding achievements in 2008/2009
01/2009	Merit scholarship of the Austrian Ministry of Science Grant for outstanding achievements in 2007/2008
11/2008	"Best of the Best 2008" 3rd Place among Business undergraduates
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Work Experience

10/2010 – 12/2010 — Rölfs MC Partner Management Consultants, Düsseldorf
Internship
- Business analysis center: Research
- Project: Re-organization of collection framework planning and distribution for an established German fashion chain

09/2009 – 07/2010 — Chair for Logistics und Supply Chain Management
Prof. Dr. Stefan Minner
University of Vienna
Research Assistant
- Stochastic modeling and optimization using AnyLogic

10/2008 - 02/2009 — Chair for International Personnel Management
Prof. Dr. Oliver Fabel
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Research Assistant
- Programming and analysis using Excel VBA

09/2007 - 10/2007 — Austrian Students' Union, University of Vienna
Tutorial for first-year students

08/2006 — Georg Fischer Druckguss, Herzogenburg
Die-casting, Production

01/2005 - 09/2005 — Military Service
Headquarters of Lower Austria, St. Pölten
Main Office
- Administration
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11/2004 - 12/2004 — MAN Turbo, Representative Office Malaysia, Kuala Lumpur
Internship
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Skills

Language Skills
German – mother tongue
English – fluent
Spanish, Portuguese – basics

IT Skills
Excellent knowledge – Office, VBA, AnyLogic
Basic knowledge – Java, C++, SAP ERP/APO, Stata, SPSS

Interests

Band since 2003 – independent label deal, international performances
IT & internet, skiing and travelling