Discussion Paper No. 07-046

Personal Experience: A Most Vicious and Limited Circle!?

On the Role of Entrepreneurial Experience for Firm Survival

Georg Metzger

ZEW
Zentrum für Europäische Wirtschaftsforschung GmbH
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Non-technical summary

In order to give an answer to the question of whether personal entrepreneurial experience promotes firm survival, or is rather, to quote Oscar Wilde, "a most vicious and limited circle", this paper provides a close examination of how firm survival depends on experience. It analyzes how successful firms are in which at least one ex-entrepreneur who abandoned a business previously (so called 're-starters') participates, i.e. how they differ in their risk of failure compared to other firms. In this regard, it is of particular interest whether entrepreneurs learn their lesson from their previous business failure. There are several theoretical arguments and mechanisms which come into the analysis of this issue. A positive impact of entrepreneurial experience on firm survival can be derived from the human capital theory. This expected effect is therefore expressed in the first hypothesis. The idea of learning mechanisms induced by negative experience would lead us to expect failure experience to affect firm survival positively, too. This expectation is set down in the second hypothesis.

For the survival analysis, this study makes use of the ZEW Foundation Panel. The panel is the result of a co-operation between the *Centre for European Economic Research (ZEW)* and *Creditreform,* which is the largest German credit rating agency. The size of *Creditreform* means that their data on enterprises in Germany is the most comprehensive available. *Creditreform* has provided the data in semi-annual waves since 1989. The ZEW Foundation Panel contains information about three million start-ups which occurred between 1990 and 2005. The unit of registration is the company itself rather than any subsidiaries, i.e. this investigation is based on original foundation events and ignores affiliated foundations.

The analysis herein addresses the question of whether personal entrepreneurial experience promotes firm survival respectively lowers a firm's risk of closure. The question can even be understood as: does entrepreneurial experience affect the probability of business failure? Not every firm closure can be considered as a business failure. Thus, failures have been disentangled from the total number of firm closures and analyzed separately. Two types of failure types can be identified: bankruptcy and the voluntary closure of a firm in financial distress. The results of the analyses suggest that experiences indicating success have no great effects on the risk of failing with a restart. Contrarily, negative experience, i.e. previous entrepreneurial failure, raises the risk of failing again. This means that the hypotheses – that experience initiates learning and thus more success – must be rejected. In particular, the assumption that experience of failure induces higher-level learning is dismissed as the opposite is found to be true: failure experience increases the risk of further failure.

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Georg Metzger

Center for European Economic Research (ZEW), Mannheim,
P.O. Box 103443 D-68034 Mannheim, metzger@zew.de

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Abstract: The analysis in this paper gives attention to effects on firm survival which come from entrepreneurial experience. It is likely that different kinds of experience result in different firm developments and therefore in different types of firm exit. Particular emphasis is placed upon the effects of failure experience. The results provide evidence that both the kind of experience and the type of exit matter. Negative experience, namely the experience of failure, is found to heighten the risk of failing again. This finding indicates that business failures are largely not exceptions, but rather a sign of the entrepreneurs' lack of ability.

Keywords: Entrepreneurial Experience; Business Failure; Firm Survival.
JEL Classification: G33; L25; L26; M13.

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Introduction

Firm formation is seen as a strong force behind economic growth (Kirchhoff 1994; Reynolds 1994, 1999; Wennekers and Thurik 1999). Early analyses for Germany were unable to validate this view (Audretsch and Fritsch 1994; Fritsch 1996) but during the 1990's it became more and more evident (Audretsch and Fritsch 2003). Firm closures are the counterpart of firm formation and are no less relevant. Production factors tied up in existing firms need to be released before they can be reallocated. However, this is the macroeconomic view. In microeconomics firm survival is often used as a measure of success and firm closure taken to be synonymous with failure.

The survival of a firm is influenced by several factors. Some, like economic conditions within a region or industry, affect all firms similarly (Audretsch 1991; Brüderl et al. 1992; Stearns et al. 1995). Other factors are firm-specific, like the firm's age or its size at the time of foundation (Audretsch and Mahmood 1995; Brüderl et al. 1992; Mata 1995). Some of the impacts are generally accepted and are stylized as '*liability of smallness*', '*liability of newness*', or '*liability of adolescence*' (Brüderl and Schüßler 1990; Mahmood 2000; Stinchcombe 1965). But even if such relationships are certain, a firm's development actually depends on the decisions of its managers and, thus, on their specific skills. Hence, the entrepreneur's human capital should be a highly relevant success factor.

Human capital is built up by learning. Possible ways of learning considered here are schooling, vocational education, or professional experience (Becker 1985; Mincer 1974). Experience is a particularly important source of learning as learning means to solve problems and so necessarily involves activity (Arrow 1962). Entrepreneurial knowledge and skills are thus best acquired by experiencing entrepreneurship, i.e. from being an entrepreneur. A typical means of measuring entrepreneurial experience is to track previous self-employment episodes or previous firm ownership. However, this approach only captures a very general kind of entrepreneurial experience as the reality of entrepreneurship is not that simple. Such experience is heterogeneous: at the very least it can be divided dichotomously into 'good' experience and 'bad' experience. In this simple binary classification, good experience is likely to be associated with success and bad experience with failure. Nevertheless, a business failure might be useful: making mistakes is supposed to be the predominant source of learning for small business entrepreneurs (Gibb 1997). It is even suggested that bad experience initiates a superior kind of learning (Chialvo and Bak 1999; Cope 2005). Such arguments are often voiced in discussions about previously failed entrepreneurs. Yet they are rarely, if ever, tested against empirical data.

The analysis herein addresses the question of whether personal entrepreneurial experience promotes firm survival or, to be more precise, lowers a firm's risk of closure. The question can even be understood as: does entrepreneurial experi-

ence affect the probability of business failure? Not every firm closure can be considered as a business failure. Thus, failures have been disentangled from the total number of firm closures and analyzed separately. Two types of failure types can be identified: bankruptcy and the voluntary closure of a firm in financial distress. The results of the analyses suggest that experiences indicating success lower the risk of failing with a restart. Contrarily, negative experience, i.e. previous entrepreneurial failure, raises the risk of failing again. This means that the hypotheses – that experience initiates learning and thus more success – must be rejected. In particular, the assumption that experience of failure induces higher level learning is dismissed as the opposite is found to be true: failure experience increases the risk of further failure.

Theoretical perspectives

The survival analysis herein focuses on effects arising from entrepreneurial experience – particularly effects arising from failure experience. It is therefore necessary to disentangle failure experience from each entrepreneur's body of experience. This is not easy to do on the basis of the observable facts. What is observable is if and how an entrepreneur previously abandoned a firm. From this one can distinguish four cases: (1) the entrepreneur has not previously participated in a firm, (2) the entrepreneur is still a participant in a firm founded at an earlier date, (3) the entrepreneur has ceased to participate a firm which is currently still a going concern, or (4) a previous venture on the part of the entrepreneur was closed down. Based on these states a previous business failure can only be assumed in the latter case, i.e. if a venture was actually closed. But even in the case of closure it is difficult to detect a business failure. In reality, "the definition of failure used has, to a large extent, depended on the nature of the data available" (Everett and Watson 1998, p. 374).

One way to define failure is to use an objective measure, such as bankruptcy. Bankruptcy is a technical term meaning financially difficult situations like an inability to pay creditors or excessive debts, and is thus attributable to objective and concrete factors. Personal bankruptcies, i.e. bankruptcies for individuals rather than for business entities, are relevant when the entrepreneurs are sole proprietors or entrepreneurs in liberal professions. But legally forced involuntary closures due to bankruptcy are not the only type of closure. There are also 'voluntary' firm closures. The reasons for voluntary closures are not obvious and can be diverse. For example, an entrepreneur might choose to close his or her business in order to avoid bankruptcy, to go back to employment, to go into retirement, to make a clean break and open a different business, or due to other subjective motives.

Owing to the wide range of reasons for closure, additional information has to be used to disentangle business failures from the set of voluntary firm closures. Smith (1987) points out that signals from the payment behavior of buyers can

normally be used by sellers to identify financially strong firms, and that "the screening process is effective in sorting if it is sufficiently more costly for high default-risk buyers to signal financial health than low default-risk buyers" (Smith 1987, p. 868). Therefore, information about the firms' payment behavior is brought into the analysis. This can be used to distinguish between firms which keep to the payment terms or exceed them only occasionally, and other firms. This approach allows the detection of latent failures among the voluntary closures by looking for deteriorated payment behavior, which firms are likely to exhibit before closures that are officially voluntarily but actually economically forced, for example to avoid bankruptcy. Due to the lack of additional data, bankruptcy and the voluntary closure of a distressed firm are the only definitions of failure which can be considered. Of course, other Entrepreneurs, for example those who close a firm because they don't achieve their targets, might also be considered as having failed.

As summarized in Table 1, there are four experience indicators introduced in the survival analysis, which classify the entrepreneurs by their most recent previous venture: (1) restarters who left a firm by the way of sale of shareholdings, (2) restarters who voluntarily closed a financially sound firm, (3) those who voluntarily closed a financially distressed firm and (4) restarters who went bankrupt. The first two restart types can be considered as having something like entrepreneurial success experience, while the latter two restart types indicate failure experience.

Table 1: Experience measures

Exit experience due to…	Definition	Indicator stands for…
Sale of shareholdings	Entrepreneurs abandoned a previous business by the sale of their shareholdings.	Success
Closure/liquidation of financially sound firm	Entrepreneurs abandoned a previous business by the closure/liquidation of the firm. The firm is assessed to have been in a financially sound situation.	Success
Closure/liquidation of financially distressed firm	Entrepreneurs abandoned a previous business by the closure/liquidation of the firm. The firm is assessed to have been in a financially distressed situation.	Failure
Bankruptcy	Entrepreneurs abandoned a previous business due to bankruptcy of the firm.	Failure

Previously failed restarters can be denoted as '*determined entrepreneurs*' because they closed their firms for financial reasons but are not discouraged by this experience (Stokes and Blackburn 2001). There is another type of experienced entrepreneurs: so called portfolio entrepreneurs. They found or participate in a new business while they are still involved in an existing firm. Hence, portfolio entrepreneurs do not fit the definition of restarters because they lack the fundamental requirement of closure. They are therefore not taken into consideration. Additionally, they are different from restarters or serial entrepreneurs in many ways. They differ in their whole attitude to entrepreneurship, i.e. the reasons

behind their ambition to start up or grow a business (Westhead and Wright 1998). Including portfolio entrepreneurs in the present consideration would mean moving too far from the central focus of this paper

Derivation of hypotheses

As discussed above, the survival of a firm depends on many factors. Nevertheless, the capability of the entrepreneur to make the right decisions should play an important role for a firm's success. An individual's human capital is a measure for this capability: the higher her/his human capital the more likely an entrepreneur is to do a better job. This effect is suggested by the human capital theory. The theory hypothesizes that investment in skills through formal educational attainment, on-the-job training or professional experience increases the productivity of workers (Becker 1985; Mincer 1974). Yet the theory need not be limited to employees. It is similarly appropriate when applied to entrepreneurs, to explain differences in the success of businesses. Experience of self-employment enhances entrepreneurship-specific human capital and increases the individual's ability to manage a firm well. Only this indirect effect of entrepreneurial experience on firm survival can be derived based on the original human capital theory.

Cressy (1996) developed a more purposeful model based on the model of entrepreneurial choice (Evans and Jovanovic 1989). The model of entrepreneurial choice regards the decision to enter self-employment as dependent on expected future returns, which are related to the decision-maker's human capital. In Cressy's variety, human capital has a direct effect as it is used in modeling the utility of both self-employment and wage employment. Following his model, experience increases the probability of making the most of self-employment, through a process of entrepreneurial learning. As a consequence, it improves survival. Indeed, ex-entrepreneurs who embark on a new entrepreneurial venture should have learned from their experience otherwise they wouldn't return (Stam et al. 2006). Learning effects are also suggested by Chialvo and Bak (1999) who simply conclude: "If an adaptive system [novice entrepreneurs in this context] is placed in a new environment, or otherwise subjected to learn something new, the likelihood of making mistakes is generally larger than the chance to be initially right" (Chialvo and Bak 1999, p. 1139).

Enhanced human capital based on specific experience also lowers the negative effects of what Van den Steen (2004) calls 'choice-driven over-optimism'. This refers to the basic range of alternatives an individual has. From a set of alternatives, they choose the one that promises the most success. The actual choice made is, nevertheless, the one about which they are also most optimistic – frequently over-optimistic. This drives the probability of failure. The choice bias "tends to disappear with sufficient experience with the particular choice problem" (Van den Steen 2004, p.2). This enables experienced entrepreneurs to as-

sess the success prospects of new ventures more realistically than novices, i.e. first time entrepreneurs, and should result in a lowered risk of failure.

However, the importance of human capital is not limited to established business, but also plays a role in its pre-start-up phase. Highly educated individuals have advantages in opening a business as they are, for example, more likely than others to be in a position to get adequate financing (Åstebro and Bernhardt 2003; Cressy 1996). Entrepreneurship-specific human capital, i.e. experience, strengthens these advantages. Experienced entrepreneurs often follow 'role models', i.e. they are inspired by other entrepreneurs they know (Stam et al. 2006; Wagner 2003). Hence, ex-entrepreneurs are still insiders in the entrepreneurial community, enabling them to profit from their contacts. Westhead et al. (2005) argue that they can avoid the time-consuming establishment of business relations, as these already exist. Such existing business relations can be compared to superior start-up conditions (Åstebro and Bernhardt 2003; Brüderl et al. 1996), which heighten a firm's prospects of success (Geroski et al. 2003). Additionally, task-related experience leads to more knowledgeable actions and decisions (Reuber and Fischer 1999). Ex-entrepreneurs can therefore identify promising business opportunities more easily (Dutta and Crossan 2005; Ucbasaran et al. 2003). Compared to novices they thus have advantages when it comes to taking their chances.

A further reason why experienced entrepreneurs are likely able to assess the success prospects of new ventures more realistically is that experience leaves somatic markers which play a prominent role in decision processes (Bechara and Damasio 2005). Somatic markers improve intuition. Decisions that are similar to tasks already encountered can be tackled better. Novices cannot benefit from previous decisions, they "cannot rely on behavior and habit if they intend on surviving […] they must learn through their experience […]" (Corbett 2005, p. 482). Entrepreneurial learning, for the most part, comes from individuals' own experience, i.e. 'learning-by-doing' or, in other words, learning from repeated behavior (Cope and Watts 2000). Such behavioral learning is mainly adaptive and its ability to modify routines depends on the outcome of the previous experience (Lumpkin and Lichtenstein 2005). The outcome of previous events determines the mode by which experience is transformed into knowledge (Politis 2005). That is, previous success results in a different type of learning than previous failure. While it is more likely that success stabilizes routines, failure may disrupt them, triggering modes of higher-order learning (Cope 2005). Chandler (1996) illustrates this by an anecdote from a previously successful entrepreneur who failed with a new firm in spite of applying the same "formula" that made the first business succeed.

Chialvo and Bak (1999) even regard learning as a purely mistake-driven process. They argue that only negative reinforcement helps in making progress while positive reinforcement can even reduce the ability to adapt. Even if, ideally,

higher-order learning should be initialized by "intelligent failures" which "have large enough outcomes to attract attention, and small enough outcomes to avoid negative responses" (Politis 2005, p. 411), it is frequently triggered by stressful business failures. In such cases learning might be painful and traumatic and associated with psychological blows that question the entrepreneur's perceptions of himself or herself (see Cope 2005 or Ucbasaran et al. 2006 for a compilation of relevant citations). However, if failure causes entrepreneurs to reflect on what happened, it contributes to avoiding reoccurrence. This might explain why many successful entrepreneurs regard failure as a crucial aspect of their experience (Politis 2005). Owing to this, business failure experience should improve the ability to avoid distress in future.

There is also a selection mechanism which should actually "breed" a positive selection out of all renascent entrepreneurs. Many entrepreneurs are not yet able to cope with the tasks of establishing a business and therefore relinquish their plans in the pre-start-up phase. This selection mechanism is stronger in the case of previously failed entrepreneurs. Some of them learn through the business failure that they are not entrepreneurially minded and drop out of entrepreneurship (Jovanovic 1982). Furthermore, they need to get over their grief about the loss of the business (Sheperd 2003) and have to convince their principals that the venture project is promising and well thought out – despite their previous failure. Novice or previously successful entrepreneurs are not faced with such hardships if they want to (re-)establish. Thus, of all entrepreneurs who have experienced business failure and are making serious attempts to venture again, only a determined elite will withstand the pre-start-up phase.

The theoretical arguments suggest very clearly that the effect of entrepreneurial experience on firm success should be positive. Yet the empirical findings are ambiguous. There are opposing findings across the whole range of success measures: with regard to firm profits Brüderl et al. (1996) found negative experience effects, while the results of Bosma et al. (2000) are inconsistent with their claim that experienced entrepreneurs make higher profits. Referring to the employment stock Metzger (2006) found higher growth as a result of experience while Kay et al. (2004) or Brüderl et al. (1996) deny such an effect. With regard to firm survival the findings are similarly ambiguous: Taylor (1999) or Headd (2001) show that experience heightens the probability of survival while others contradict any relationship between entrepreneurial experience and firm survival (Brüderl et al. 1992; Van Praag 2003).

With regard to the business success of previously failed entrepreneurs, the empirical evidence is more scarce but just as ambiguous: results of descriptive comparisons suggest positive impacts of failure experience on firms' employment and turnover growth (BCG 2002). Using multinomial analyses on survey data Kay et al. (2004) find no significant impact on employment growth, while

the results of Metzger (2006) reveal significantly negative effects of failure experience (concretely: of bankruptcy experience) on firm growth.

To sum up, two hypotheses can be derived from the theoretical considerations:

> ***Hypothesis 1:*** Entrepreneurial experience enables entrepreneurs to make decisions which lead to a decreased risk of failure compared to novice entrepreneurs.
>
> ***Hypothesis 2:*** Entrepreneurial failure experience enables entrepreneurs to make decisions which lead to a decreased risk of failure compared to novice entrepreneurs and to entrepreneurs who do not have such experience.

Applied data

For the survival analysis, this study makes use of the ZEW Foundation Panel (see Almus et al. 2000 for details). The panel is the result of a co-operation between the *Centre for European Economic Research (ZEW)* and *Creditreform,* the largest German credit rating agency. Due to the size of *Creditreform* their data on enterprises in Germany is the most comprehensive available. *Creditreform* has provided the data in semi-annual waves since 1989. For the period from 1990 until 2005 the ZEW Foundation Panel contains information about three million start-ups. The unit of registration is the company itself rather than any subsidiaries, i.e. this investigation is based on original foundation events and ignores affiliated foundations. *Creditreform* uses three sources of information for collecting their data: (1) official sources of information like the trade register, registers of societies and associations, the land register etc., (2) general sources of information about enterprises like press releases, balance sheets and company reports etc., and finally (3) internal sources of information, i.e. active research in the form of enquiries about individual firms or for marketing purposes, control queries etc. (Egeln et al. 1999).

Relying on these sources of information means that particularly very small firms and entrepreneurs in liberal professions are underrepresented in the data (Fritsch et al. 2002; Harhoff and Steil 1997). Firms trading in liberal professions are excluded from the analyses. Liberal professions are occupations that require special training in the liberal arts or sciences, for example lawyers, notaries, engineers, architects, doctors and accountants. Actually, they are not comparable with other entrepreneurs because self-employment in liberal professions is different from entrepreneurial self-employment. The former is rather focused on the individual, who earns his or her living by supplying “superior” services and employs few assistants, if any. Entrepreneurship on the other hand is a more comprehensive type of self-employment comprising business establishment, hiring of employees, withstanding competition etc. However, even considering that small firms are underrepresented in the data and liberal professions are disregarded,

more than half of the recorded firms are very small firms, i.e. are firms of sole entrepreneurs without employees.

The data contains general information about the firms like name and address, date of foundation, industry affiliation, or the number of employees. Furthermore, it reports dates of occurrences related to closure, like bankruptcies or register deletions. While bankruptcies have to be made public and thus will certainly be recognized, by no means all voluntary firm closures can be identified from register deletions. However, Creditreform provide information about how up-to-date the data available in each wave are. From this information, it is possible to draw conclusions about the firms' survival status, i.e. if business activities have been terminated between two waves, and to approximate the date of a voluntary firm closure accordingly.[1] Beside the information about the firms, the data also contains details about the entrepreneurs involved in these ventures. The entrepreneurial activities of these entrepreneurs have been observed longitudinally, which allows for the identification of those persons who have established one or more companies. Due to the belief that the influence of single entrepreneurs is strongest in smaller enterprises, the analysis concentrates on firms of a start-up size of less than 10 employees. Following data preparation, the sample comprises about 345,000 firms founded since 1995. Eleven founding cohorts, i.e. from 1995 up to 2005, are involved in the survival analysis, which considers the survival of the firms from the year of foundation up to the end of 2005.

In order to give an impression of the firms included in the sample some mean characteristics are shown in Table 2. At least one restarter was initially involved in about 5 percent of all firms. Most of these experiences, i.e. 43 percent of all cases, come from entrepreneurs who restarted after a sale of shareholdings. A further 21 percent of the experience supply can be attributed to restarters who closed their sound firms voluntarily. The remaining experience consists of business failure, and thus of voluntarily closure of financially distressed firms (12 percent) or previous bankruptcy (25 percent). Within-industry experience is present in about 16 percent of the experienced firms, and 19 percent of them are provided with multiple experiences, in that at least one of the founders previously had an ownership share in more than one firm.

The initial economic situation seems to be slightly in favor of novice firms. Fourteen percent of the firms founded by novice entrepreneurs pay their bills within the payment terms or exceed them only marginally. This is a better payment practice than experienced entrepreneurs show: only 10 percent of them keep their terms. Besides, Creditreform advises caution with regard to business dealings with about 7 percent of start-ups from novice entrepreneurs and with 15 percent of the experienced firms. Furthermore, about 7 percent of the novice firms are backed with university knowledge, which is 11 percentage points less than in the case of the experienced firms. That is, graduate entrepreneurs seem to be more prone to reestablish than others. In terms of age structure, a higher share

of older entrepreneurs is found in the group of experienced firms compared to novice firms. This is not surprising – even if a higher share of entrepreneurs whose age is unclear biases the structure of the latter. Novice entrepreneurs tend to establish firms alone rather than in an entrepreneurial team, as the comparatively low share of team foundations suggests. About 15 percent of these firms are multi-owned, compared to 24 percent of the experienced firms.

Table 2: Mean values of start-up characteristics

Start-up characteristics	All firms		Firms founded by novice entrepreneurs		Firms founded by experienced entrepreneurs	
Exit experience						
Sale of shareholdings	2.2		-		42.7	
Voluntary closure of sound firm	1.1		-		21.1	
Voluntary closure of distressed firm	0.6		-		11.5	
Bankruptcy	1.3		-		25.4	
Entrepreneurial within industry experience	0.8		-		16.0	
Multiple entrepreneurial experiences	0.9		-		18.6	
Initial economic situation [b]						
Payment behavior (indicator: good)	13.7		13.9		10.4	
Financial standing (indicator: care is advisable)	7.4		7.0		14.8	
University degree	7.3		6.7		17.4	
Education unknown	68.2		69.5		43.9	
Age of entrepreneur(s) [a]						
Younger than 30	19.2		19.7		10.3	
30 to 39 years	33.4		33.4		33.5	
40 to 49 years	18.9		18.4		27.9	
50 to 59 years	6.9		6.6		12.8	
60 and older	1.7		1.6		3.8	
Age unknown	26.4		26.6		22.7	
Team foundation	15.3		14.8		23.5	
Number of employees at start-up (median)	1.9	(1)	1.8	(1)	2.2	(1)
Legal form (limited liability)	22.9		22.0		40.8	
Closure of financially sound firm	7.3		7.4		4.8	
Failure 1 (bankruptcy)	10.3		10.2		11.9	
Failure 2 (financially forced 'voluntary' closure)	9.0		9.2		6.3	

[a] There can be more than one indication per firm.
[b] Appraisal provided by Creditreform.
[c] T-tests on mean differences between firms founded by novices and firms founded by experienced entrepreneurs show significant differences at $p < 0.1$ for the share of all characteristics apart from being in the thirties.

Source: ZEW Foundation Panel.

Half of the firms employ only the entrepreneur at foundation, as indicated by median of the start-up size. Although the median is the same for experienced firms, they provide a workplace for one additional person on average when they found a firm. Twenty-two percent of the novice firms choose legal forms with unlimited liability, which is almost 20 percentage points less than for firms founded by experienced entrepreneurs. Without looking at any specific entry year, 26 percent of the firms close during the observation period. More than a third of these closures are bankruptcies, i.e. less than two thirds are voluntary firm closures. Of the firm exits regarded as business failures, there is an almost equal number of financially forced voluntary closures and bankruptcies. While this pattern is similar in the group of novice firms, there is a distinctive differ-

ence for the experienced firms. There the share of bankruptcies is almost twice the share of financially forced voluntary closures.

Half of all voluntary closures of sound firms happen within 32 months of establishment (not reported in any table). Referring to bankruptcies, the time by failure distribution differs between novice and experienced firms. Half of the novice firms that go bankrupt file to open proceedings during the first 37 months after foundation. This period is shorter in the case of experienced firms; half of them file for bankruptcy within only 30 months. Ignoring the relative number of bankruptcies in each category, one might conclude that experience helps entrepreneurs see economic reason and file for bankruptcy earlier than novices. The time by failure distribution of financially forced 'voluntary' firm closures is uniform again. About 18 months elapse before half of the closures take place.

Testing the hypotheses

In order to account for the large range of important factors that may affect a firm's risk of closure, the analysis uses two types of data: individual information and firm information. The values of the covariates refer to the times when the firms were founded except the measures, which are applied to describe the firm's management. These variables are modeled in a time-varying manner, as when relevant entrepreneurs leave or start participating in a firm during the observation period the management characteristics can change. Measures concerned by this are the four indicators accounting for the way by which previous entrepreneurial experience was gained (i.e. whether the restart took place after a sale of shareholdings, a voluntary closure of a financially distressed firm, a voluntary closure of a financially sound firm, or after bankruptcy). Furthermore, the other experience measures, namely within-industry experience[2] and multiple[3] entrepreneurial experiences, as well as the formal education measure, the age variables, and the team indicator are introduced as time-varying covariates.

The experience measures as the main explanatory variables are applied in order to test the hypotheses, with a lack of success being indicated by failure experience. Within-industry experience is a measure that is more closely related to specific knowledge and multiple experiences indicate inter-business learning and thus enlarged entrepreneurial knowledge. Finally, an indicator for graduates is introduced, which accounts for the possible effects of human capital from higher education.

Several control variables are applied. These measures are necessary to take out side effects of factors that influence survival but are not in the focus of the analysis, including firm information and economic founding conditions. The most probable and the most important control variables are the two indicators regarding the initial economic situation of the firms. The measures are appraisals provided by Creditreform. The first indicator, namely payment behavior, account for firms that on average kept to their payment terms, signaling reliability ,

which helps to build up lasting business relations. The second measure is financial standing. A bad financial standing curtails a firm's capability for growth and thus also for survival, because it impedes the acquisition of financial means. Besides these economic indicators there are also other covariates, for example, the age structure of the entrepreneurs involved in the firms that is important because the entrepreneur's current position in life can affect his closure behavior. In recognition of resource-based approaches, a team indicator is also introduced. A team of managing proprietors should be able to supply above-average resources like financial means or human capital. The start-up size also matters: on the one hand, a small workforce might be a bottleneck, restricting the capacity to take orders; but on the other each employee is a relevant cost factor – even one too many might overstretch a new firm's financial means. One main characteristic of a firm is its legal form, which can be put into the binary categories of limited and unlimited liability legal forms. The choice of a limited liability legal form is associated with demands like minimum margins on the capital stock or particular disclosure requirements. It is thus a kind of quality measure for uninformed business partners. Yet it affects the risk taking behavior of a firm's management and thus the development of the venture. If there is a liability limitation, managing proprietors might be encouraged to approve projects that involve excessive risks. The effects of trading under a limited liability legal form on firm success are indisputable but ambiguous. Thus, a measure is introduced in order to account for the effects of limited liability legal forms.

Finally, control measures for industry affiliation, for site selection in terms of distinguishing between East- and West-Germany and for the year of establishment are introduced. This is relevant due to specific conditions arising from these characteristics, such as the level of necessary capital commitments, the strength and structure of competition, different federal state politics, or other particular conditions. These latter control measures are not reported in the estimation results table.

The indicators concerning the education and age of the involved entrepreneurs are not completely available for all of the firms in the sample. In order to preserve a maximum number of observations a missing-value-indicator approach is therefore applied (Cohen and Cohen 1983). The approach is to generate two dummy variables, which indicates missing values of education and age. At the same time, the missing values are filled up with numeric values.

Estimation method

In survival analysis, one is mostly interested in evaluating the risk or hazard of failure that an object is faced with at a specific time. This type of analysis is widely used in medicine or in engineering, for example with humans and machines as the 'objects' and death and breakdown as the 'failures'. In economics survival analysis has become firmly established in evaluating firm survival, as is

the case here. An approach often used in analyzing survival data is to apply the Cox proportional hazard model introduced by Cox (1972). In his approach Cox devised the hazard function $h(t|x_j)$ as a log-linear function of time-dependent baseline hazard and individual-specific instruments. The hazard function is written as

$$h(t \mid x_j) = h_0(t)\exp(x_j \beta_x)$$

where t is time, x a vector of covariates and β_x a coefficient vector.

The baseline hazard $h_0(t)$ varies with time but is independent of any individualistic parameters. Since the baseline hazard is equal for all subjects, there is no need to specify its shape, so the approach is flexible and easy to compute. The covariates work as factors of proportionality, that is, they are presumed simply to shift the baseline hazard curve up or down with the same impact at each point in time. This functionalism is formulated as the proportional hazard (PH) assumption, which is the key assumption in the Cox model. It follows from this assumption that the hazard of a subject i can be computed by multiplication with the hazard of subject j. Or, to put it another way, the hazard ratio, which is the quota of hazard rates between the hazards of subjects i and j, is constant over time

$$\frac{h_i(t \mid x_i)}{h_j(t \mid x_j)} = \exp\left[\beta_x{}^T (x_i - x_j)\right].$$

The invariance of covariate effects over time is a very strong presumption. It is easy to violate this assumption since it reasonable that initial effects of time-constant covariates actually vanish over time. There are several methods to test whether the PH-assumption holds. Doing so with regard to the covariates introduced reveals no serious violation of the assumption.[4] At least, the Cox likelihood function to be maximized in its simplest form can be derived as

$$L(\beta_x) = \prod_{j=1}^{k} \left(\frac{\exp(x_j \beta_x)}{\sum_{i \in R_j} \exp(x_i \beta_x)} \right)$$

where k is the number of the distinct points in time at which failures occur.

The closure probability analysis is performed sequentially, with each step considering a more disaggregated closure type. A first regression (model A) includes all exit types as exit events, independent of closure conditions. All types of exit are thus considered equivalent in meaning. Model B uses the firm failures as exit events. Voluntary closures that do not indicate failure are treated as censored values. Introduced by Kalbfleisch and Prentice (1980), such an approach is used in several studies (Harhoff et al. 1998; Kay 1986; Narendranathan and Stewart 1991; Taylor 1999). In model C bankruptcy is disentangled from the failure type aggregate and is thus considered as a competing risk to the other types of closure. The alternative closure events are treated as censored in this specification. For a summary of the estimated models, see Table 3.

What can we learn from a comparison of the separate specifications? Model A can give an indication of how firms with a higher probability of closure are characterized. Results of the single failure risk specification, model B, further reveal which firms fail to a higher degree, that is more often suffer fatal financial distress, independent of whether they be legally forced to do so or not. The separation of bankruptcy also enables us to identify differences in the effects if only an objective type of failure is considered.

Table 3: Overview of the estimation specifications

Specification	Observations treated as closures	Observations treated as censored
Model A	All firms which were closed.	All firms active at the end of the year 2005
Model B	All firms which failed, i.e. those which were either voluntarily closed due to financial distress or went bankrupt	All firms active at the end of the year 2005 Firms voluntarily closed without being in financial distress
Model C	Firms which went bankrupt	All firms active at the end of the year 2005 All firms voluntarily closed

Estimation results

Table 4 shows the estimation results for the Cox regressions. It displays the estimated coefficients, robust standard errors, and the 95 percent confidence intervals that result from maximizing the Cox log-likelihood function. The latter are displayed due to the large number of observations introduced in the regressions, which cause increased test statistic values leading to many highly significant results. Readers should have the chance to come to their own conclusions about the meaningfulness of the claimed effects (Cohen 1994).

Model A refers to the single risk specification in which all exit types are pooled. Firms in which at least one of the entrepreneurs involved made a restart after business failure, independent of the failure type, are more likely to be closed again than novice firms. The closure probability of restarts after closing a firm in financial distress is on average 37 percent higher than that of novice firms.[5] Restarts after bankruptcy are faced with a probability of closure, which is raised by an average of 45 percent. They thus behave differently from other restarts because restarts after sale of shareholdings and restarts after closing a sound firm voluntarily do not differ from novice entrepreneurs' firms in their probability of closure. Similarly, having entrepreneurial experience in the restart industry does not significantly affect the likelihood of closure, but having multiple entrepreneurial experiences does, raising the probability of closure.

Model B refers to the single risk specification in which only the risks of firm failure are pooled. The results are very similar to the previous single risk specification, although closure is now is synonymous with failure. Restarts after sale of shareholdings do not differ significantly in their probability of failure

Table 4: Cox regression on firm closure

Dependent variable: hazard rate	Model A (Pooled exit types)				Model B (Pooled failure types)				Model C (Bankruptcy)			
	Coefficient [a]		95%-confidence interval		Coefficient [a]		95%-confidence interval		Coefficient [a]		95%-confidence interval	
Exit experience (reference: no experience)												
Sale of shareholdings	-0.026	(0.027)	-0.078	0.026	-0.011	(0.031)	-0.071	0.049	0.048	(0.039)	-0.028	0.125
Voluntary closure of sound firm	0.013	(0.041)	-0.068	0.093	-0.075	(0.049)	-0.172	0.021	-0.195***	(0.066)	-0.324	-0.067
Voluntary closure of distressed firm	0.315***	(0.047)	0.224	0.406	0.319***	(0.051)	0.219	0.419	0.236***	(0.071)	0.097	0.375
Bankruptcy	0.370***	(0.030)	0.311	0.428	0.452***	(0.032)	0.389	0.516	0.534***	(0.042)	0.453	0.616
Entrepreneurial within-industry experience	0.084*	(0.046)	-0.006	0.173	0.049	(0.052)	-0.052	0.150	0.085	(0.066)	-0.043	0.214
Multiple entrepreneurial experiences	0.219***	(0.039)	0.142	0.296	0.215***	(0.044)	0.129	0.301	0.174***	(0.056)	0.064	0.285
Initial economic situation [b]												
Payment behavior (indicator: good)	-0.282***	(0.009)	-0.300	-0.264	-0.806***	(0.013)	-0.832	-0.780	-0.319***	(0.016)	-0.349	-0.288
Financial standing (indicator: care is advisable)	0.440***	(0.011)	0.418	0.462	0.694***	(0.012)	0.671	0.717	1.014***	(0.016)	0.982	1.046
Higher education (indicator: graduate)	-0.220***	(0.015)	-0.249	-0.192	-0.309***	(0.018)	-0.344	-0.273	-0.368***	(0.023)	-0.414	-0.323
Education unknown	0.165***	(0.008)	0.150	0.180	0.197***	(0.009)	0.180	0.215	0.218***	(0.012)	0.193	0.242
Age of the entrepreneur(s) (reference: under 30 years)												
30 to 39 years	-0.142***	(0.009)	-0.161	-0.124	-0.145***	(0.011)	-0.167	-0.123	-0.118***	(0.016)	-0.149	-0.087
40 to 49 years	-0.111***	(0.010)	-0.130	-0.091	-0.112***	(0.012)	-0.135	-0.088	-0.104***	(0.017)	-0.137	-0.072
50 to 59 years	-0.029**	(0.013)	-0.054	-0.005	-0.065***	(0.015)	-0.094	-0.036	-0.115***	(0.020)	-0.155	-0.075
60 and older	0.084***	(0.020)	0.045	0.123	-0.030	(0.025)	-0.079	0.018	-0.207***	(0.033)	-0.272	-0.142
Age unknown	-0.094***	(0.012)	-0.117	-0.070	-0.178***	(0.014)	-0.206	-0.149	-0.612***	(0.023)	-0.658	-0.566
Governance (indicator: team)	-0.208***	(0.011)	-0.230	-0.185	-0.348***	(0.014)	-0.375	-0.321	-0.474***	(0.018)	-0.510	-0.438
Number of employees at start-up	0.031***	(0.002)	0.027	0.034	0.053***	(0.002)	0.048	0.057	0.102***	(0.003)	0.097	0.108
Legal form (indicator: limited liability)	0.003	(0.009)	-0.014	0.021	0.172***	(0.010)	0.152	0.192	0.707***	(0.013)	0.681	0.733
Location (indicator: East-Germany)	0.061***	(0.008)	0.046	0.077	0.058***	(0.009)	0.040	0.076	0.211***	(0.012)	0.187	0.236
χ^2-Test on joint significance of the												
Industry dummies [c]	2,296***				1,803***				1,284***			
Founding year dummies [c]	3,628***				2,106***				80***			
Wald-test χ^2	12,052***				16,827***				14,182***			
Number of subjects / number of exits	345,179 / 91,750				345,179 / 66,684				345,179 / 35,566			

[a] Confidence levels: $p < 0.01$ = "***", $p < 0.05$ = "**" and $p < 0.1$ = "*". Robust standard errors in parentheses.
[b] Appraisal provided by Creditreform.
[c] Not separately reported.

just as restarts after closing a sound firm voluntarily do not. Conversely, restarts after business failure are more likely to fail than other restarts or firms of novice entrepreneurs. However, the effects of the two failure types differ in amplitude. Compared to novice firms, restarts after closing a distressed firm voluntarily have a 25 percent higher risk of failure, while the risk for restarts after bankruptcy is increased by 57 percent compared to novice firms. Besides, again it is found that the failure risk is not significantly affected by entrepreneurial within-industry experience and entrepreneurs who have multiple experiences are faced with an increased risk of failure. Owing to these results, the first hypothesis is rejected. Experience that is, one might say, crowned with success, does not lower the risk of failure. Negative experience increases the failure risk. This means that the second hypothesis is definitely rejected; indeed, the opposite effect even arises. Nevertheless, the derived effect might be relevant if bankruptcy is separated from the failure type aggregate.

Comparing the results of the single failure risk regression with those of model C, which are the failure type specific estimates, helps to evaluate the findings above. Model C, which is based on failure due to bankruptcy, yet again shows that failure experience increases the risk of bankruptcy compared to novice firms. The additional bankruptcy risk is 26 percent for restarts after closing a distressed firm voluntarily, and is 71 percent for restarts after bankruptcy. Only restarts after closing a sound firm voluntarily have an 18 percent lower bankruptcy risk. Restarts after sale of shareholdings do not significantly affect the bankruptcy risk. As seen twice above, experience gained within the same industry in which the restart took place has no significant effect on the closure risk while multiple experiences lead to an extra risk again.

Discussion of the findings

The comparison of the results of the three applied models shows that specific firm characteristics mostly unambiguously increase or decrease the firms' closure probability or failure risk. Only in a few cases, the same characteristic leads to different results as referred to, for example, senior entrepreneurs who increase the probability of closure but decrease the bankruptcy risk. With regard to the human capital indicators, it is a similar story. Apart from restarts after closing a sound firm voluntarily, which do not differ from novice firms in their closure probability but are less likely to fail, all other experience effects are unambiguous. Experience that is based on the sale of shareholdings does not matter at all, but failure experience does. Restarts after a voluntary closure of a financially distressed firm, as well as restarts after bankruptcy are faced with a higher closure probability and also with an increased risk to fail again.

However, why do failure experiences increase failure risks? Ucbasaran et al. (2006) argue that failed entrepreneurs are faced with pressure to take action because they have dragged themselves into a loss situation. This would force risk-

seeking behavior, which may result in badly thought-out business activities with an increased risk of failure. Sheperd (2003) stresses the psychological approach in his explanation, in which the emotional fallout of previous failure prevails. A high level of grief reduces the ability to convert feedback information into knowledge, i.e. hampers learning, or even results in learning the wrong lessons (Sitkin 1992). Over-optimism plays an additional role. The findings of Stokes and Blackburn (2002) indicate that over-optimism is crucial for experienced entrepreneurs, too. An absolute majority of ex-entrepreneurs are motivated to start another enterprise because they are of the opinion that they have learned and will be able to make it work next time – even if they closed a venture unsuccessfully. However, the most likely reason for heightened failure risk is that individuals are prone to disavow their own failures. Mental defensive routines tempt previously failed entrepreneurs to blame unfortunate circumstances for their failure, rather than owning up to having failed due to their own inability (see Van den Steen 2004 for a compilation of relevant citations). They thus do not learn about their lack of entrepreneurial talent as suggested by Jovanovic's passive learning model (Jovanovic 1982).

The finding that a business failure resulting in further failure is not the exception from the rule, but rather systematically dependent on the entrepreneurs, is much more alarming against the background of the described selection mechanism, which should theoretically filter the failed entrepreneurs down to an elite. However, even this cream of the crop does not learn from their mistakes. This indicates that lowering the barriers for restart might increase the firm birth rate, by encouraging both first-time ventures and restarts, but it does not improve the sustainability of new businesses.

There are limitations to consider arising from entrepreneurs evading the economic consequences of failure. Entrepreneurs who went bankrupt are recorded in a public debtor register. With the entry, they are faced with difficulties like limited access to finance, as explained above, or with difficulties entering into contracts at all, even in private affairs. In order to avoid the restrictions, a few use loopholes, for example by opening businesses in the name of relatives. In this way, they are not recorded as restarters but rather as novices. Thus, they tend to worsen the results for novices because, as we have seen, the probability of failing anew, whether by repeating the same mistakes that led to the failure or due to other factors, is increased.

Summarizing conclusion

The analysis herein addresses the question of whether personal entrepreneurial experience promotes firm survival and therefore lowers a firm's risk of closure. The question can even be understood as: does entrepreneurial experience affect the probability of business failure? Not every firm closure can be considered as a business failure. Thus, failures have been disentangled from the total

number of firm closures, and have been analyzed separately. There are two failure types, which can be identified: bankruptcy and the voluntary closure of a firm in financial distress. The results of the analysis indicate that experiences of success have no favorable effects when it comes to the probability of failure, apart from partly lowering the bankruptcy risk for a restart. Conversely, negative experience, namely previous entrepreneurial failure, raises the risk of failing again. This means that the derived hypotheses – experience initiates learning and thus more success – are mainly rejected. In particular, the assumption that experience of failure induces higher-level learning is dismissed. Indeed, the opposite seems to be the case: failure experience increases the risk of further failure.

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Notes

[1] This approximation to identify voluntary firm closures has been validated by real exit dates of voluntary closures obtained from the ZEW Founder Study (see Almus et al. 2001 for details on the survey).

[2] Within-industry experience is measured as previous entrepreneurial experience within the same NACE-4-digit category for each considered firm.

[3] Multiple entrepreneurial experiences are given if an entrepreneur has been involved in more than one firm prior to participation in the business considered.

[4] Using different graphical methods for testing reveals no grounds for a violation of the PH-assumption.

[5] Table 4 reports coefficients rather than hazard rates. To obtain hazard rates the coefficients have to be exponentiated. Since exp(0.315) = 1.370 the closure probability increases by about 37 percent.