SSE/EFI Working Paper Series in Business Administration No 2008:1

Knowledge combinations and the survival of financial services ventures

Karl Wennberg
Center for Entrepreneurship and Business Creation
Stockholm School of Economics
P.O. Box 6501, SE-113 83 Stockholm
SWEDEN
karl.wennberg@hhs.se

and

SCANCOR
Stanford University
CERAS 531, Stanford
California 94305-3084
USA

This version: 2008-01-05

Acknowledgements: This research was supported by Handelsbanken Research Foundations and the Sweden-America foundation. I am grateful for comments from Paul Windrum, Peter Swann, Erik Stam, Per Skålén, Stefan Jonsson, Leif Lindmark, Jenny Levallius, seminar participants at SCANCOR and the Stanford GSB Macro luncheons, and to M.B. Sarkar for stimulating discussions in a related project. An earlier version was presented May 19th at the 2007 EMAEE conference on Applied Evolutionary Economics in Manchester, UK. All errors remain my own.

Knowledge combinations and the survival of financial services ventures

This version: 2008-01-05

Summary: This paper investigates the role of knowledge in the evolution of new financial services ventures in Sweden between 1990 and 2002. Drawing upon economic theories of human capital and spin-out entrepreneurship, we investigate if knowledge from prior employment in the financial and technological industries facilitates the survival of new entrepreneurial firms. Based on a database tracking the evolution of 1,077 financial services ventures, we find that firms with more extensive knowledge from the financial services and high-tech sectors have higher chances of survival than firms with more narrow knowledge bases. Our findings offer contributions to the emerging literature on spin-out entrepreneurship and to research on entrepreneurship in services.

Key words: Entrepreneurship, Spin-out, spin-off, Knowledge, Financial services, Survival analysis

JEL Classification: L11, L26, M13, L84

Knowledge combinations and the survival of financial services ventures

Services are an increasingly important component of overall economic activity (Miles, 1993). Service firms represent a majority and a growing proportion of new entrepreneurial firms (Armington and Acs, 2004). Deregulation and increasing market instability and have generated business opportunities for the emergence of many new service firms throughout Europe (Lindmark, 2005). In this paper we investigate the development of new ventures in the financial services industry. Since this industry is dominated by very large incumbent firms, we seek to unravel the question: what specific types of *knowledge* and *resources* do new firms use to gain foothold and survive in the financial services industries?

To study this topic we draw upon economic theories of human capital and spin-out entrepreneurship where experienced individuals bring business and technological know-how from their former organisations to organise a new venture. These theories are used to derive hypotheses of how firm founders' professional backgrounds contribute to the knowledge base of new financial services ventures. We predict that firms whose founders bring knowledge from both the financial and technological industries are more able to combine such knowledge into new, innovative capabilities, and that these firms will have higher chances of survival than firms with more narrow knowledge bases. The hypotheses are tested on a 13-year panel tracking the evolution of all new Swedish financial services ventures between 1990 and 2002 using matched employee-employer databases. We find that ventures whose founding team have prior employment with a firm in the finance sector have higher likelihood of survival. Also ventures whose founders have prior employment in the information technology sector have somewhat higher survival chances. And in particular, firm whose founders' have experience from *both* sectors have a clearly higher chance of survival, beyond the effect of employment experience from a single sector. Our findings offer empirical and

theoretical contributions to the emerging literature on spin-out entrepreneurship and to research on entrepreneurship in services. Specifically, we highlight the important role of firm founders' knowledge for their ability to set up a successful firm with high probability of survival.

Entrepreneurship in the financial services industry

Financial services refer broadly to organisations that deal with money management. Firms such as banks, insurance companies and stock brokerages all belongs to the financial services industry, which in terms of earnings is the largest industry in the world. The industry's development has of late been characterised by a growing rate of new entrants spawned by institutional changes and increasing rate of innovation. In regulated industries it is common that new types of innovations tend to come from the periphery of an industry such as from new entrants (Audretsch, 1995).

To establish an intellectual base for theorizing the role of innovations and new firms in the financial services industries we conducted a broad literature review of prior studies of financial services in various strands of the literature such as economics, entrepreneurship and strategic management. To facilitate interpretations of our findings of the empirical investigation (Swann, 2006) we also interviewed the owner-managers of six different financial services ventures in Sweden that over the last five years had successfully established themselves on the market. These interviews indicated that firm founders' personal experiences of the financial industry and its modus operandi were crucial – but so operandi were their abilities to break with some of these practices by introducing new technologies. To date there is still little substantive evidence in the empirical literature to authenticate such arguments. The current study provides an initial test of how knowledge facilitates the

development and survival of new firms, highlighting the role of different types – or *combinations* – of knowledge. One co-founder and director of marketing in a financial services venture explained their uniqueness in offering online payment solutions:

> "This technology is widely available in other industries, see, but none of the existing players seem keen on introducing these services. Maybe they are hesitant of the credit risk. But we know consumers' wants to be billed rather than using (credit) cards! After ten months of operations we are still the only ones offering these types of producer-to-consumer payment solutions"

As this quote illustrate, information technology is often perceived as a great enabler of innovation in service industries. Van der Aa and Elfring (2002) characterise technological innovations as development and implementation of technology, as well as related reconfigurations of concepts and processes related to the services' product offerings. However, a complicating factor is the fact that the quality of professional services is subjective and to some extent depends on the buyer's actual decision to purchase (Gummesson, 1978). In the financial services sector, services that are perceived as high quality have often been the type of advancement that allows customers to interact more easily with service providers, for example through the internet, on the phone, or through electronic transfer through mobile phone systems. Examples are systems that partly routinise the marketing or sales of savings and insurance through the internet or automatic phone systems. One firm we interviewed was based on exactly this type of organisational innovation:

> "Our system works by automatically downloading address data where we order and rank potential customers based on a set of criteria. It is really an easy algorithm. After getting (a customer) the system is used to track and measure profitability in different segments. In this way we use it both for getting and maintaining customers. But still, you need the personal

> contact, see? People want to feel confident we can manage their money. So you need the personal (phone) calls and the occasional meetings, but everything in between, you need to get rid of, really."

In this way, innovation in financial services can be a way for new entrepreneurial firms to gain a foothold in an industry otherwise dominated by large banks and insurance firms (Cooper et al. 1995). Prior research indicates that firm founders' knowledge and their general resource base are important for the firms' ability to build a viable business platform. We are therefore interested in the types of knowledge and resources that new firms in the financial services industry use to increase their chances to establish a position and survive in a highly competitive market. In the following sections, we draw upon economic theories of spin-out entrepreneurship and human capital to present hypotheses of how firm founders' knowledge enhances the survival of new financial services firms. We test the hypotheses on the survival of 1,077 financial services ventures in Sweden between 1990 and 2002. Sweden offers a particularly good testing ground for these theories: It is a country with highly developed financial institutions where new technologies are swiftly adopted. More than half of the population relies primarily on online banking to conduct personal finances and more than 40 percent declares taxes via mobile phones or the internet. During the latest decade there has been a proliferation of new ventures in the financial services industry, several of which have grown to become quite successful firms (Lindmark, 2005).

THEORY AND HYPOTHESES

Spin-outs, or spin-offs, refer to new firm entrants founded by employees of firms in the same industry (Klepper and Sleeper, 2005). In his characterisation of different types of industrial entrants, Klepper (2001) describes spin-off firms as firms founded by experienced employees of incumbent firms in the same industry. This theoretical perspective draws relevance from

research in industrial organizational economics, arguing that experiences from markets where a firm is currently active shapes the knowledge resources of the firm and in particular the departments and sub-units of which it consists. Therefore, individual employees choosing to leave such a unit to start a new organisation often benefit from their experiences with their prior employer, or "parent" organisation (Klepper and Sleeper, 2005). Since resources and organisational routines are believed to transfer from old to new organisations through personnel migration (Nelson and Winter, 1982: 115-121), an individual firm founder's experiences can have strong influences on the new firm's performance. In other words, the previous experiences of founders of spin-out firms influence not only the formation and product development of new firms, but also the firm's ability to establish a position of competitive advantage and organisational achieving longevity (Agarwal et al. 2004).

In the research context of this paper there is a teleological problem in defining new independent firms started by former employees of a firm as a "spin-off" in that the term indicates that some type of agency or formal relationship should exist between the firm that used to employ the new entrepreneur(s) and the spin-off firm started by the entrepreneur(s). This is often not the case. For example, frustration and conflict with one's employer is often a major reason why skilled employees chooses to leave employment in order to start up a new firm (Garvin, 1983). Helfat and Lieberman (2002) distinguish between "parent spin-offs" that are at least partly owned by the parent firm, and "entrepreneurial spin-offs" that are founded by individuals previously employed by an established firm, but have other owners. To discriminate between different types of new firms, this study therefore follows the terminology of Agarwal et al. (2004) who defined entrepreneurial ventures of ex-employees as "spin-outs".

Spin-outs firms are associated with their parent organisation through the inheritance of knowledge in the form of rules and procedures for conducting business in a specific industry, where knowledge may be thought of as the industrial counterpart to genes (cf. Nelson and Winter 1982: 14–16). The experiences gained through previous employment in parent firms allow founders of spin-outs to bring specific knowledge regarding a wide range of issues to their new firm, e.g. knowledge of customer demand, products, technology, suppliers and competitors (Helfat and Lieberman, 2002). Also, industry experience gained through working in an established organisation allows these individuals access to detailed information which can help them to identify valuable business opportunities (Romanelli, 1989). For example, through employment in an existing organisation individuals can, via interaction with customers, gain knowledge regarding their customers' needs for new and/or modified service offerings (Von Hippel, 1986). They might exploit this knowledge by trying to commercialise their ideas either within the parent organisation, or choose to leave the firm and start their own (spin-out) firm. Further, by developing, marketing, and/or selling financial services in an existing organisation, individuals can build up the personal confidence necessary to engage in building a new venture (Audia and Rider, 2006).

Empirical studies have provided support for several of the theoretical mechanisms proposed by the literature on spin-out entrepreneurship: Agarwal et al. (2004) studied 46 spin-out firms in the U.S. disk drive industry and found that these firms had higher chances of survival than de novo firms without prior industry experience. Klepper and Sleeper (2005) followed the evolution of 79 spin-outs in the U.S. laser industry together with the evolution of their parent firms. They found that the long-lived parents produced more spin-outs, especially parents who had been in existence between 11 and 15 years. Spin-outs were also more likely to produce the same type of lasers that their parent did, and seemed to move from initially targeting niche

markets overlapping with their parents' markets towards targeting related markets not catered to by their parents. Chatterji (2006) studied 69 spin-outs in the U.S. medical device industry and found that the success of spin-outs was driven by non-technological rather than technological knowledge inherited from their parent firm. In Europe, Koster (2005) surveyed 289 Dutch firms and found that prior employment experience provided firm founders with more relevant knowledge, especially in regards to product related knowledge. Finally, Dahl and Reichsten (2007) followed 323 spin-outs in the Danish manufacturing sector from 1980 to 2000 and found that the vitality of the parent company combined with industry-specific experience of the spin-out founder positively affected the new firm's likelihood of survival.

These prior studies indicate that the transfer of organisationally embedded knowledge from employees to new spin-out firms can facilitate the creation and development of new firms. However, there is still little evidence in regards to how the experiences of individual's employment in a parent organization impart the development of new spin-out firms. Some prior evidence indicate that the knowledge accumulated by the founders of spin-out firms have a positive impact on the competitive advantage of these new firms: Agarwal et al. (2004) found in their study of the rigid disk drive industry that the technological know-how of spin-out firms had a positive effect on their subsequent survival. However, marketing know-how had a negative but insignificant effect. In contrast, the current study concerns the financial services industry, which to a much higher extent is a market-driven industry compared to the technology-driven disk drive industry studied by Agarwal and colleagues. It is therefore likely that marketing know-how should have at least the as positive an affect on the new firms' development as technological know-how (cf. Chatterji, 2006). Prior studies of the financial services industry such as Cooper et al. (1995) indicate that market know-how and prior

experience within the industry can be a vital source of knowledge for these new firms. As example, the marketing manager of one small firm that we interviewed indicated that:

> "We had this new (customer call-back) system that Sven had built at his former job in the telecom business. The whole idea was to construct a similar system that we could use. I knew from heading the manual desks (at a large insurance firm) that sales personnel were usually just making cold calls based on some address list. It was my idea, actually, taking his system and using it to track and register new potential customers. In the end, it proved great at selling, and even better at measuring profitability in different segments."

In the literature to date, there is little existing evidence that different *types* of knowledge is important, despite the theoretical arguments that experience from employment in the industry allow founders to bring *specific* knowledge on products, technologies, suppliers and competitors. Helfat and Lieberman (2002) reviewed the extant literature on capabilities and resources in organizations and industries at the time of new firm's market entry. They suggested that similarity between pre-entry resources and required resources in an industry should affect the likelihood of entry as well as the likelihood of firm survival, indicating an endogenous pattern of prior knowledge and resources for the choice to enter and the subsequent performance of spin-out firms. Other studies indicate that individuals from firms with a longer history of doing business are more likely to start a spin-out (Klepper and Sleeper, 2005) and also more likely to attain a larger share of the market (Lane, 1988). These prior studies have not been able to follow specific individuals but have approximated their knowledge through the industry tenure of their parent companies. Thus, disaggregating the effects of post-entry firm capabilities into intangible resources brought into the firm by individual founders versus tangible initial stockpile of capital and equipment represent and important contribution of this study. Although the knowledge of individual founders and the

characteristics and resources of their parent firm are likely to be positively related, we believe that the precise mechanisms by which industry knowledge enhances the survival of new firms work through the influence of individual firm founders rather than through the characteristics of their parent companies. This leads us to formulate a first hypothesis:

Hypothesis 1: *Firms whose founders have more extensive experience from a parent firm in the financial or the technological industries will have a higher chance of survival.*

A fundamental reason for why new firms are able to thrive despite their relative deficiencies in resources and experience is that they bring something new and valuable to the market. We draw upon three theoretical works to derive theoretical explanation how new firms are able to break with past industry habits by introducing new types of services: First, Schumpeter argued that innovations are new combinations of existing knowledge and incremental learning (Schumpeter, 1934: 65-66). From this perspective, innovations need not be 'disruptive' but are often quite mundane in nature, corresponding to the conditions of the financial services industries. Both mundane and disruptive (radical) innovations necessitate that individual entrepreneurs' knowledge is drawn upon in order to discover how inputs or procedures can be recombined into new products or services or new ways to produce or market these. Second, Nelson and Winter's (1982) theory of industry evolution also highlights the importance of individuals' accumulated knowledge for the introduction of new innovations. The theory is based on the notion that organisations are dependent on different sets of routines in producing and marketing goods and services. To explain how new innovations are introduced by a organisation, Nelson and Winter suggest that it is the departure of employees with idiosyncratic knowledge from a plant that causes the 'mutation' of an existing routine, both in an old plant and in the new organisation (Nelson and Winter, 1982: 119-121). Also from this

perspective, new innovations are closely associated with a new firm's prior stock of knowledge in the form of organisational routines, which "provides the best scope for new combination" (Nelson and Winter, 1982: 131). Third, Kogut and Zander (1992) outlined a theory of innovation and product development in large established firms based on firms' capability to combine unexploited technological opportunities, using prior knowledge accumulated within the firm. We mean that Kogut and Zander's notion of *combinative capabilities* can also be employed to explain the potential for *new* firms to exploit their existing knowledge together with the unexplored potential of new technologies. For new firms in the financial services industry, we cannot readily theorize about an existing knowledge base since the firm itself has no prior history of doing business and have not yet accumulated a body of knowledge distinct to the firm. Rather, the new firm's knowledge is to a large extent the aggregate of firm founders' personal industry experience and business acumen.

A separate strand of studies focusing on individual entrepreneurs has investigated the effects of individual firm founders' industry experience for firm survival. This line of research have argued that the largely positive effects of industry experience provides founders with *specific human capital* such as knowledge on how business is conducted and how products can be sold within that specific industry (Iyigin and Owen, 1998; Neal, 1995). The theory of human capital uses economic logic to study, among other things, individual productivity and career choices: General human capital is made up of skills that are useful in a variety of work settings. Specific human capital is made up of skills that are more specialized and valuable for a particular type of purpose or in a specific industry, but less valuable in the general labor market. The effect of such specific human capital as individual firm founders' industry experience has been shown in several studies: Gimeno, Folta, Cooper and Woo (1997)

investigated the survival of 1,547 individual firms belonging to the National Federation of Independent Businesses in the United States. They found that experience from contacts with customers, suppliers, products and services in the same industry raised the likelihood of firm survival. Brüderl, Preisdorfer and Ziegler (1992) investigated 1,849 individual firm founders in the greater Munich area in Germany and found that entrepreneurs with prior industry experience were almost twice as likely to survive in business compared to entrepreneurs without such experience. Pennings, Lee and van Witteloostuijn (1998) investigated the survival of 1,851 Dutch accounting firms during the period 1880–1990 and found that the founding team's industry experience had non-monotonic effect on firm survival where some industry experience facilitated firm survival but very high levels of experience decreased firm survival because founders with extensive experience will tend to be quite old and thus prone to dissolute or sell their firm. Delmar and Shane (2006) also suggested that the founding team's industry experience might impact firm survival and financial performance in non-linear ways, and furthermore might change over time. However, in their study of 223 randomly sampled firms in Sweden, they found that industry experience positively enhanced firm turnover but had no affect on firm survival during their first two years of existence. These studies indicate the importance of controlling for performance measures in studies of new firm survival, and vice versa. Further, the positive effects of founder's experience in the service-based studies as Pennings et al. (1998) should not be automatically generalized to general samples of new firms (Delmar and Shane, 2006).

None of the aforementioned studies investigated the potential of experience from different sectors, although popular lore and practical oriented literature on entrepreneurship highlights the importance of 'having a well rounded team' (Leonard and Sensiper, 1998). This absence of studies that investigates different types of experience among new firms suggests a potential

for theoretical extension between strategic theories of knowledge development in large firms and the evolution of new entrepreneurial firms (Mosakowski, 2001). It is for this purpose we draw upon the theory of combinative capabilities in which firms builds upon their existing knowledge to leverage the unexplored potential of new technologies (Kogut and Zander, 1992). For new firms in the financial services industry, such new knowledge can be conceptualized as the aggregate of firm founders' joint industry experience, i.e. their combined human capital. This individual-level theory of human capital and the firm-level theory of combinative capabilities therefore lead us to formulate a second hypothesis:

> Hypothesis 2: *Firms whose founders have experience from parent firms both in financial services and technological industries will have a higher chance of survival.*

METHOD

Data Sources

The data source in this project is a combination of two longitudinal databases maintain by Statistics Sweden: CFAR, which provides yearly data on all firms registered in Sweden, and LOUISE, which provides yearly data on all Swedish inhabitants. To the best of our knowledge, we are the first to explore a link between these two databases. We sampled all financial services ventures started from 1990 through 2002 and followed these until their termination or until 2002. In total, 1,237 firms were started during the period. We linked data on the ventures to data on their founders' career histories prior to venturing, work experience, education, and various other variables. Firm level data includes performance measures as well as exit codes that allow us to distinguish between firms that merges or are acquired by other firms from firms that are terminated.

Since there is little previous work on how new ventures in the financial services industries manage to survive and build competitive advantage, we also interviewed six different financial services ventures that over the last five years had successfully established themselves on the market. These ventures were sampled from a list of financial services firms started between 2002 and 2006 that had registered with the Swedish Financial Supervisory Authority, a requirement for conducting any type of finance-related business in Sweden. We contacted a random sample of twenty firms meeting these criteria. Eleven of these agreed to participate, but after an initial telephone interview it was clear that only six firms were really "new" in the sense of having been set up, organised and launched some type of service during the past five years. The CEO or one person in the founding team in each of the six firms was interviewed at the company's premises for one to three hours using a semi-structured interview format. All interviews were taped and transcribed in full. The transcriptions were posted to the respondents who commented further upon these. The qualitative data allowed us to gain better familiarity with the conditions of financial services ventures and especially helped guide our theorizing as to how or why knowledge among the founding team could facilitate the firms' development.

Variables

Dependent variable: The dependent variable used in this study is firm survival. In the data, a firm can exit either by termination or by acquisition by another firm. However, acquisition and mergers need not represent a sign of organisational failure. On the contrary, divesting of their equity can instead be seen as the pinnacle of success for many firm founders. We therefore believed that discontinued and acquired/merging firms should not be pooled in our survival analysis. Two statistical tests based on a discrete choice model of the multinomial logit type were used to examine the validity of this belief: We used a log-likelihood ratio tests

to compare the vector of coefficients of the discontinued and the sold firms (relative to surviving firms). The test revealed a statistical significant difference between the vector of coefficients (χ^2 =38.02, d.f.= 12. $p < 0.01$), indicating that the two alternatives should not be pooled. A Hausman test of the Independence of Irrelevant Alternatives (IIA) showed that the coefficients for surviving and non-surviving firms were not affected by excluding firms that were sold from our analysis (χ^2 =11.65, d.f.= 12. $p < 0.46$). We therefore eliminated the 160 sold firms from our dataset, leaving us with a final 1,077 firms.

Independent variables: Our two main independent variables are denoted *finance* and *hightech,* indicating the number of years of prior employment at a firm active in the finance or high-tech industries. A third variable in dummy form, *combinative*, is used to denote firms whose firm founders have experience from both the finance and high-tech industries. All independent variables are time invariant since the founding team's past experience cannot change after a founding event.

Control variables: In order for us to test the impact of knowledge accumulated before the founding of a new firms on subsequent survival, we need, to the highest extent possible, control for other conditions which are known to impact the likelihood of survival for new firms. For example, firm founders bring with them to the new firm not only knowledge imparted upon them from previous employment and training but also financial resources and valuable contacts within their social network. Such resources and contacts should be relatively more valuable in new firms founded not by a single entrepreneur but by several persons who bring with them resources that are mutually advantageous (cf. Nelson and Winter, 1982: 120). With other founding factors held constant, we could expect spin-out firms with larger founding teams to be more able to build a market position that allow them to

survive (Klepper, 2001). We therefore include the ordinal scaled variable *team size*, measuring the total number of firm founders. We also introduce control variables for firm size and resources in the form of number of *employees* (in addition to the founding team), number of *plants*, and yearly *turnover* (revenues). We use dummy variables to control for the firms' legal form (incorporation, partnership, or sole proprietorship) where the simplest form, sole proprietorship, is the base category. Finally, we try to control for two important sources of heterogeneity in firm founder's background that might confound the effects of experience through prior employment: those of social networks and entrepreneurial capabilities. Through job experience in a parent firm, individuals not only acquire knowledge but also accumulate social network ties within that firm. While this network might facilitate career advancement and thus inhibit transition to entrepreneurship (Zenger and Lawrence, 1989), some author argues that social networks might help entrepreneurial firms overcome the first uncertain period and thus facilitate their long-run survival (Davidsson and Honig, 2003). To control for the effects of social networks to the best extent possible, we include the variable *region tenure* that measures how long a firm founder had lived at one single location since 1989. Since living for long time in a region is likely to be correlated with an extensive social network, this variable approximates, albeit in a coarse manner, for the possibility that a new venture's survival is positively enhanced by its firm founders' social capital. To control for entrepreneurial capabilities we tracked all firm founders' experience from 1989 onwards in the LOUISE database, noting each year in which they were working as independent entrepreneurs rather than employees to create an ordinal scaled variable *past entrepreneurship*. For example, if a firm was founded in 1995, we searched the records of all firm founders between 1989 and 1994 for their prior experiences in entrepreneurship. Albeit this is an imperfect measure for individuals with extensive labor market experience – for older persons with extensive labor market experience we do not know their activities during the 1970s or

early 1980s – the inclusion of this additional variable does capture most of the heterogeneity in founding teams' experience, especially more recent experiences which are likely to be more important than very old entrepreneurial experiences. All control variables except team size, past entrepreneurship and region tenure are time variant and updated yearly. In addition, we control for cohort effects by introducing dummy variables for all yearly cohorts.

Statistical Analysis

We use event history analysis to assess firm survival. Similar to prior studies of firm exit where time is measured in discrete intervals (e.g. Anderson and Tushman, 2001), we estimated a piecewise exponential hazard model without the need to make specific assumption in regards to duration dependence of new ventures' survival. The model below denotes the hazard at time *t* of a firm with a vector of characteristics **x** as $h(t|\mathbf{x})$, where *t* goes from 1993 to 2002. To allow the hazard to vary between years, the model is divided into yearly intervals with variable coefficients that are updated yearly (Blossfeld and Rohwer, 1995). Letting *L* denote the time periods, α the coefficients, and β a vector of coefficients, the hazard model is specified as:

$$h(t|x) = \exp(\alpha_{1993}L_{1993} + \alpha_{1994}L_{1994} + \cdots + \alpha_{2002}L_{2002} + \beta' x)$$

This model allows the hazard to vary over yearly intervals but constrains the coefficients to shift the hazard by the same proportion each year.

RESULTS

Investigation of the variables and their correlations provided no indication of multicolinearity among the predictor variables. The variables and their mean values are described in table 1, together with the correlation matrix.

INSERT TABLE ONE HERE

Figure 1 presents Kaplan-Meier survival graphs describing the exit patterns of the 1,077 financial services firms started in Sweden between 1990 and 2002. Three lines denote the survival rates of firms with no prior knowledge (bold line), firms whose founders bring industry knowledge from either the financial services or high-tech sector (dark grey line), and firms whose founders combine industry knowledge from both the financial services and high-tech sectors (bright grey line). The survival rates for all ventures in the sample are comparatively low. 50 per cent of the firms survived no more than four years and after seven years only about one-third of the sample remains in business. The three lines clearly indicate higher survival rates among the firms with some prior knowledge, and in particular those firms with combinative knowledge. Bivariate tests of the survival function verifies the impression that firms with prior knowledge have higher probability of survival (Wilcoxon χ^2: 11.02 d.f.= 2, $p < 0.01$).

INSERT FIGURE ONE HERE

In table two we introduce the event history analysis of firm survival, which allows us to control for factors that might confound the bivariate tests presented in figure two. We present three models: first a base model with only the control variables, followed by a second model introducing the two variables for firm knowledge derived from founders' employment

experience at firms in the high-tech and financial services sectors, respectively. The third model introduces the final variable with an indicator for firms whose founder's have prior employment in both of these industries.

INSERT TABLE TWO HERE

The coefficients in table two are presented as hazard ratios, where coefficients above 1.00 indicates a lower likelihood of survival (higher hazard rate) and coefficients below 1.00 indicates a higher likelihood of survival (lower hazard). Looking first at the control variables, we find that firms that are incorporated, have more plants, higher turnover, a larger founding team, and hire more employees have higher likelihood of survival. One additional member in the founding team increases the probability of survival with fifteen percent, and each individual hired after the first year of existence increases the firms' probability of survival with fourteen percent. Also the founding team's prior entrepreneurial experiences have a seemingly positive effect on firm survival, but this effect disappears after the introduction of the variables denoting experience from prior employment in models 2 and 3. This is consistent with the findings of Gimeno et al.'s (1997) study of independents start-ups in the U.S. and Dahl and Reichstein's (2007) study of Danish spin-outs, but not with the studies by Brüderl et al. (1992) or Delmar and Shane (2006). A plausible explanation is that both the studies of Gimeno et al. and Dahl and Reichstein followed the same procedure as this study by excluded acquired firms from their sample, whereas Brüderl et al. pooled firms that exited by closure and acquisition and Delmar and Shane only followed firms during their first two years of existence.

Looking at model 2, we can see that the two variables *finance* and *hightech* are both associated with a higher likelihood of survival, significant at or above the one percent level. This leads us to confirm hypothesis one, firm knowledge gained from its founders' experience in the finance and high-tech industries clearly improves the probability of firm survival. The effect is markedly stronger for finance experience: The final model indicates that for each additional year of experience from the financial services industry within the founding team, the firm increases its probability of survival with eight percent. One additional year of experience from the high-tech industry increases the probability of survival with only one percent. These findings are in opposite to those found by Agarwal et al.'s (2004) study of the technology intensive disc drive industry, where technological know-how but not marketing know-how contributed to the survival of spin-outs.

Model 3 introduces the indicator variable for firms whose founders have prior employment experience in both industries. The coefficient is significant above the one percent level in the expected direction. We therefore confirm also hypothesis two, firms that are able to draw upon firm founders experience from both the financial services and high-tech industries have a twelve percent higher chance of survival, above that contributed by the length of experience in the two industries, respectively.

CONCLUSIONS AND DISCUSSION

In this paper we used economic theories of human capital and spin-out entrepreneurship to present hypotheses how firm founders knowledge should impact the development of spin-out firms. We used matched employee-employer databases to follow the full population of

financial services ventures founded in Sweden between 1990 and 2002, illustrated by interviews with six successful ventures.

We found that larger founding teams with more extensive knowledge gained from employment in the financial services or high-tech industries had higher chances of survival. In addition, firms whose founding teams combined knowledge from both the financial services and high-tech industries had markedly higher chances of survival. The high hazard rates and the strong effects of initial size and resources can be explained by entry barriers in the recently deregulated financial services industry. With relatively low barriers to entry, entrepreneurs will be attracted to enter the industry despite initially high failure rates as long as there are some perceived chances for success (Audretsch and Mahmood, 1994).

Our findings add to the emerging empirical literature on employee spin-outs as transfers of knowledge and business procedures between firms and between different industrial sectors. By drawing upon their knowledge resources from prior employment experiences to create new services that challenge the predominant market conditions – "the carrying out of novel combinations" – spin-outs firms fulfil the role of Schumpeterian entrepreneurs in the financial services sector, a sector where such research has been little investigated. Given the increasing importance of the service sector in modern economies, spin-out firms in services constitute an important part of the industrial dynamics important for job creation and economic growth (Armington and Acs, 2004), or as in Eliasson's (2000: 49) words, "the benefits of financial innovations like junk bonds are to reduce barriers to competitive entry to make both successes and failures possible".

Whereas prior research of individual entrepreneurs have verified the importance of pre-firm knowledge in the form of firm founders' prior employment experiences (Delmar and Shane, 2006; Gimeno et al., 1997; Pennings et al., 1998), this study is the first to demonstrate the importance of different types of knowledge. Our findings suggest that it is the *combination* of different types of knowledge that is particularly important for new service ventures: Several of the examples provided by the firms interviewed in this study simultaneously introduced several different components of innovation such as introducing a new service, a new method of production, and focusing on a new market (Schumpeter, 1934: 65-70). We believe the role of knowledge for new firm survival in the service sector, in particular different *sources* of knowledge, to be an important area where more research is needed.

This study represents a first attempt to investigate the role of spin-out firms in services and necessarily comes with several limitations: First, it is difficult to discuss innovation in any detailed sense without more detailed data on product or service development and commercialisation. While being a strong indicator of success and economic resilience, organisational survival *per se* does not prove that spin-out firms are able to combine knowledge better than other types of start-up firms. Future research should therefore focus on the role of knowledge inherited from parent firms for innovation and product/service development in spin-outs. Second, it is possible that there are other factors except the ones here investigated that are more strongly associated with the successful development of financial service ventures. This could obfuscate the results presented in the current study. Specifically, future research should consider how factors associated with the 'spillover' of knowledge, such as locating in an industrial cluster (Baptista and Swann, 1999; Dahl, Pedersen and Dalum, 2003) might affect the role of combinative knowledge drawn from firm founder's prior experiences. Third, the findings of this study in the financial services industry

might not be generalizable to other service sectors. More detailed investigations of other sectors are therefore also warranted. These limitations offer opportunities for future research investigating the role of new firms in general, and the role of spin-out firms in particular, on innovation and economic change in the service industries.

REFERENCES

Agarwal R, Echambadi R, Franco A, Sarkar MB (2004) Knowledge Transfer through Inheritance: Spin-out Generation, Development and Survival. Academy of Management Journal 47(4): 501-522

Anderson P, Tushman M (2001) Organisational environments and industry exit: the effects of uncertainty, munificence and complexity. Industrial and Corporate Change, 10(3): 675-711

Armington C, Acs Z (2004) Job creation and persistence in services and manufacturing Journal of Evolutionary Economics 14(3): 309–325

Audia P, Rider C (2006) Entrepreneurs as organisational products: Revisited. In J Baum, M Frese & R Baron (Eds.), The Psychology of Entrepreneurship, Hillsdale, NJ: Lawrence Erlbaum Associates

Audretsch, DB (1995) Innovation and industry evolution, London: MIT Press

Audretsch DB, Mahmood T (1994) Firm selection and industry evolution: the post-entry performance of new firms. Journal of Evolutionary Economics 4(3): 243–260

Baptista R, Swann P (1999) A comparison of clustering dynamics in the US and UK computer industries Journal of Evolutionary Economics, 9(3): 373-399

Blossfeld H-P, Rohwer G (1995) Techniques of Event History Analysis: New Approaches to Causal Analysis. Mahwah, NJ: Lawrence Erlbaum Associates

Brüderl, J Preisendörfer P, Ziegler R, (1992) Survival Chances of newly founded business organizations. American Sociological Review 57(April): 227-242

Chatterji A. (2006) Spawned with a Silver Spoon? Entrepreneurial Performance and Innovation in the Medical Device Industry. Working Paper. Duke University

Cooper AC, Folta TB, Woo C (1995) Entrepreneurial Information Search, Journal of Business Venturing, 10(2): 107-120

Cooper RG, Easingwood CJ, Edgett S, Kleinschmidt EJ, Storey C (1994) What Distinguishes the Top Performing New Products in Financial Services. Journal of Product Innovation Management 11(4): 281-299

Dahl MS, Reichstein T (2007) Are you experienced? Prior experience and the survival of new organisations, Forthcoming in Industry and Innovation 14(5).

Dahl MS, Pedersen C, Dalum B (2003) Entry by Spinoff in a High-tech Cluster. Aalborg University: DRUID Working Paper No 03-11

Davidsson P, Honig B (2003) The role of social and human capital among nascent entrepreneurs. Journal of Business Venturing 18(3): 301-331

Delmar F, Shane S (2006) Does experience matter? The effect of ounding team experience on the survival and sales of newly founded ventures. Strategic Organization 4(3): 215–247

Eliasson G (2000) Deregulation, innovative entry and structural diversity as a source of stable and rapid economic growth. Journal of Evolutionary Economics 1(1): 49-63.

Garvin DA (1983) Spin-offs and the new firm formation process. California Management Review 25(2): 3-20

Gimeno J, Folta T, Cooper A, Woo C (1997) Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. Administrative Science Quarterly 42(2): 750-783

Gummesson E (1978) The marketing of professional services: An organisational dilemma, European Journal of Marketing, 13(5): 308-318

Helfat CE, Lieberman M (2002) The Birth of Capabilities: Market Entry and the Importance of Pre-History. Industrial and Corporate Change 11(4): 725-760

Iyigun M, Owen A (1998). Risk, entrepreneurship and human capital accumulation. American Economic Review 88: 454-457

Klepper S (2001) Employee Startups in High Tech Industries. Industrial and Corporate Change 10(3): 639-674

Klepper S, Sleeper SB (2005) Entry by Spinoffs. Management Science 51(8): 1291-1306

Kogut B, Zander U (1992) Knowledge of the firm, combinative capabilities, and the replication of technology. Organization Science 3(3): 383-397

Koster S (2005) Entrepreneurial capabilities inherited from previous employment: What did entrepreneurs learn in their careers? Paper presented at the 45th congress of the European Regional Science Association, Amsterdam, August 23-27, 2005

Lane SJ (1988) Entry and industry evolution in the ATM manufacturers' markets Unpublished PhD dissertation Stanford University

Leonard D, Sensiper S (1998) The Role of Tacit Knowledge in Group Innovation. California Management Review 40(3): 112-132.

Lindmark L (2005) Exploitation of entrepreneurial opportunities in the service sector – a blind spot in entrepreneurship research, Paper presented at the Nordic Academy of Management meeting in Aarhus, Denmark, August, 2005

Miles I (1993) Services in the New Industrial Economy, Futures 25(6): 653-672

Mosakowski E (2001) Overcoming resource disadvantage in entrepreneurial firms: When more is less. In M Hitt et al. (Eds) Strategic Entrepreneurship: Creating a New Mindset (pp. 106-122). Oxford: Blackwell

Neal D (1995). Industry-Specific Human Capital, Evidence from Displaced Workers. Journal of Labor Economics, 13(4): 653-677

Nelson R, Winter S (1982) An Evolutionary Theory of Economic Change. Cambridge, MA: Belknap Press

Pennings JM, Lee K, van Witteloostuijn A (1998) Human capital, social capital, and firm dissolution. Academy of Management Journal 41(4): 425- 440

Romanelli E (1989) Environments and strategies of organization start-up: Effects on early survival. Administrative Science Quarterly 34(3): 369-387

Schumpeter JA (1934) The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle. Cambridge: Harvard University Press

Swann P (2006) Putting Econometrics in its Place: A New Direction in Applied Economics. Cheltenham, UK: Edward Elgar

Van der Aa W, Elfring T (2002) Realizing innovations in services. Scandinavian Journal of Management, 18(2): 155-171

Von Hippel E (1986) Lead users: A source of novel product concepts. Management Science, 32(7): 791-805

Zenger T, Lawrence, BS (1989) Organizational Demography: The Differential Effects of Age and Tenure Distributions on Technical Communication Academy of Management Journal 32(2): 353-376

Table 1: Variables and correlation matrix

	Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1	Exit	0.10	0.21											
2	Incorporation	0.39	0.29	-0.07										
3	Partnership	0.06	0.07	-0.01	-0.02									
4	Plants	1.73	11.80	-0.10	0.09	0.02								
5	Turnover (log)	2.33	5.28	-0.10	0.28	0.06	0.03							
6	Employees	3.29	23.94	-0.07	0.34	0.03	0.32	0.27						
7	Region tenure	4.43	4.50	-0.02	0.01	0.02	-0.02	-0.02	-0.04					
8	Past Entrepreneurship	0.70	3.42	-0.13	-0.02	-0.03	0.03	0.02	0.01	0.01				
9	Teamsize	3.33	6.31	-0.08	0.03	-0.01	0.42	-0.04	0.31	0.01	0.01			
10	Finance	6.47	4.50	-0.02	-0.03	-0.01	0.02	-0.02	0.01	0.29	-0.02	0.06		
11	Hightech	5.38	3.49	-0.01	-0.03	-0.02	-0.02	0.01	-0.03	0.32	-0.02	-0.05	-0.26	
12	Combinative	0.15	0.36	-0.03	0.04	-0.01	0.08	-0.02	0.10	0.24	-0.01	0.23	0.37	0.39

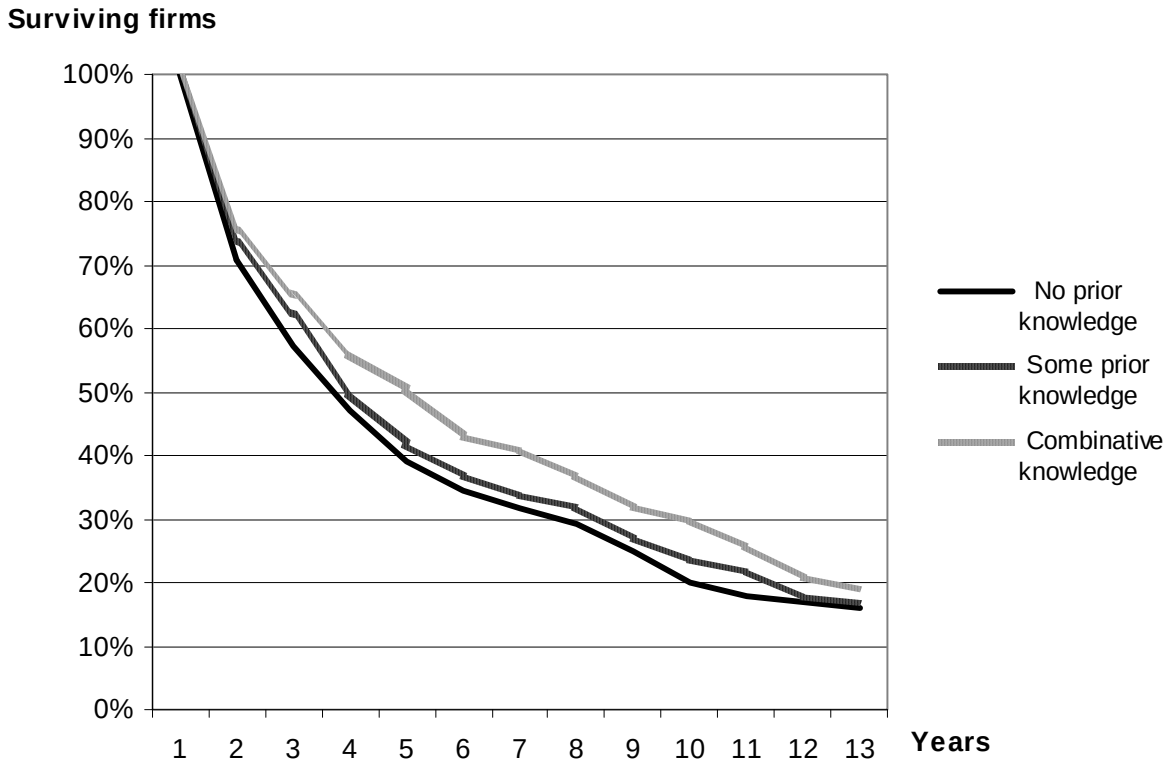
Note: All correlations above ±0.03 significant at the 5 percent level. Legal form and combinative variables are in dummy form and thus represent total frequencies.

Table 2: Piecewise exponential models on new firm survival

	Model 1	Model 3	Model 4
Incorporation	0.38 ***	0.40 ***	0.41 ***
	(0.05)	(0.05)	(0.05)
Partnership	1.12 *	1.11 *	1.11 *
	(0.09)	(0.09)	(0.09)
Plants	0.80 *	0.80 *	0.79 *
	(0.05)	(0.05)	(0.05)
Turnover (log)	0.99 ***	0.99 ***	0.99 ***
	(0.01)	(0.01)	(0.01)
Employees	0.85 *	0.86 *	0.86 *
	(0.10)	(0.11)	(0.11)
Region tenure	0.99	0.99	0.99
	(0.13)	(0.14)	(0.14)
Past Entrepreneurship	0.98 *	0.99	0.99
	(0.10)	(0.13)	(0.13)
Teamsize	0.83 ***	0.85 ***	0.85 ***
	(0.02)	(0.06)	(0.06)
Finance		0.94 ***	0.94 ***
		(0.02)	(0.02)
Hightech		0.98 **	0.99 *
		(0.04)	(0.04)
Combinative			0.88 **
			(0.05)
Log likelihood:	-3672.34	-3658.32	-3648.11
LR test vs. previous model:	35.40	28.04**	20.42*

Note: * p < .05, ** p < .01, *** p < .001. Coefficients in hazard rate form, standard errors in parenthesis. All models include cohort dummies and are based on 2,668 firm-year observations and 1,077 unique firms.

Figure 1: The impact of single and combinative knowledge on firm survival



Note: 1,077 firms, founded at any time during 1990-2002