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Old Wine in New Bottles: The Effect of Previous Co-Worker Experience on the Survival of New Firms

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Abstract:
The aim of the paper is to investigate the effect of previous co-worker experience on the survival of new established firms. For the empirical analysis I use the Danish Integrated Database of Labor Market Research (IDA). This longitudinal employer-employee database allows me to identify co-worker experience among all members of the firm. In addition, I will make a distinction between ordinary start-ups and entrepreneurial spin-offs. The results show that previous co-worker experience has a positive effect on new firm survival. This effect appears to be valid predominantly for ordinary start-ups then for spin-offs.

Keywords:

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1 Introduction

For many years, the field of entrepreneurship has followed an approach that focused on the single entrepreneur as the driver of the venture creation process (Kamm et al., 1990; Gartner et al., 1994). He, or she, was regarded as: "the lone hero, battling against the storms of economic, government, social, and other environmental forces before anchoring in the harbour of success" (Cooney, 2005, p. 226), despite the fact that entrepreneurship in many aspects is a social activity (Ruef et al., 2003). From this social perspective, many studies started to treat entrepreneurship as a collective activity and pushed the "myth of the lone hero" to the background (Kamm et al., 1990; Eisenhardt and Schoonhoven, 1990; Gartner et al., 1994). Actors involved in this collective activity can be placed both inside and outside the new venture. Depending on the characteristic of the tie, an entrepreneur[1] can enhance organizational trust or acquire additional resources. Regarding the first component Beckman (2006) and Davidsson and Honig (2003) show a positive relationship between internal social capital, or the so-called bonding ties, and the performance of start-ups, which is in line with the liability of newness and adolescence hypotheses, which argue that the social relations are a determining factor in firm survival (Stinchcombe, 1965; Brüderl and Schüssler, 1990).

Studies that treat entrepreneurship as a collective activity started to emerge in the late 1980s and early 1990; however, these studies revolve predominantly around the so-called entrepreneurial or venturing founding team. This focus fails to recognize the important role other employees might play in new ventures (Cardon and Stevens, 2004), both for entrepreneurial teams and solo entrepreneurs. Earlier studies show that the availability of human resources are important for organizations, as well as for new ventures (McPherson, 1983; Sørensen, 2004). It can also be assumed that the relation among these human resources influences the eventual survival of start-ups.

This paper will take its point of departure in the collective perspective of entrepreneurship and focus on the relations that exist within these start-ups. Here I specifically focus on the benefits that arise due to a high degree of previous co-worker experience in these start-ups, as suggested by Campbell (2005), to overcome the liability problems

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[1]In this study, the terms entrepreneur and founder, and entrepreneurial and venture founding team are used interchangeably.

(e.g. liabilities of newness (Stinchcombe, 1965) and liabilities of adolescence (Brüderl and Schüssler, 1990) that are associated with the social relations that exist within these start-ups(Schoonhoven and Romanelli, 2001). The main research question formulated in this paper is: *What is the effect of previous co-worker experience on the survival of new firms?*

The availability of nationally linked employer-employee databases offers the possibility to adopt a broader human resource perspective, including those in studies on entrepreneurship. In this paper, I rely on the Danish Integrated Database for Labor Market Research. From this database, I identify the founding of firms in Denmark and whether these firms are able to survive in the following years. IDA is a longitudinal linked employer-employee dataset which enables researchers to connect individuals to each of these firms. In addition, it is possible to track the employment history of all individuals, thus creating a measure of previous co-worker experience within these 3,043 start-ups. The analyses show a significant and positive effect of previous co-worker experience on firm survival. However, there are clear differences between entrepreneurial spin-offs and in other start-ups and if the relations is between founders, founders and employees or among employees.

After this introduction, I will continue with the theoretical framework. This theoretical framework will focus on the link between previous co-worker experience and firm survival thereby building some testable hypotheses. In Section 3, I will describe the database, sample selection, and the construction of the various variables used in the regression analyses. Section 4 will present the descriptive statistics and the results of the regression analysis. Lastly, the paper will outline some concluding remarks in Section 5 and Section 6.

2 Theory and Hypotheses

2.1 Social Network, and Human Resource Formation

Before determining how former co-workers contribute to the survival of new ventures, it is important to recognize how these and other human resources are mobilized to become part of the new organization. In describing this human resource formation process,

I will make a distinction between the formation of the entrepreneurial team and the recruitment of employees; despite the fact that the motivations behind these different types of human resource formation are similar.

Earlier studies on human resource dynamics in start-ups focus, as mentioned in the introduction, on entrepreneurial or venture founding teams. This focus is one way to incorporate a broader human resource perspective; however, this perspective might still be too narrow since "the focus on the founder or founding team as the only source of human capital fails to recognize the important role that other employees in the new venture may play" (Cardon and Stevens, 2004, p. 296). Employees are, due to their flexibility and creativity, one of the most critical resources for an organization (Aldrich and Ruef, 2006). Ruef et al. (2003) stated that: "Many entrepreneurs begin entirely on their own, although they may turn to others for help with various aspects of the founding process. Others begin with a team, making the enterprise a collective effort" (p. 195-196). This is the reason why I look beyond the entrepreneurial or venture founding team and include all the human resources (i.e. founders and employees).

The existence of an entrepreneurial team depends on the possibility and the desire to be formed (Ruef et al., 2003), and its formation occurs predominantly prior to the start of the new venture (Cooney, 2005). The motivation for adding individuals to form a team are (i) the manifestation of interpersonal attraction and/or (ii) the complementarity of skills and competences (Forbes et al., 2006). Furthermore, a large majority of the entrepreneurial teams are based on social connections that existed before the start of the entrepreneurial process (e.g. friends, family, and associates) (Vyakarman et al., 1999).

Recruitment efforts for start-ups are often "unplanned, informal and (. . .) 'unimaginative' " (Barrett and Mayson, 2008, p. 120) with only a very few having established recruitment methods (Aldrich and Ruef, 2006; Barrett and Mayson, 2008). Most start-ups use a mix of formal and informal recruitment processes to attract employees (Aldrich and Langton, 1998; Aldrich and Ruef, 2006). The formal recruitment process, which often leads to the recruitment of strangers, is commonly accompanied by high transaction costs (Lin, 2001). First, new firms, just as other small firms, face the problem of lack of organizational awareness (Williamson et al., 2002). Job seekers have to be notified of the

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existence of the new venture, and the creation of such awareness is costly. Second, there is a high degree of uncertainty in recruiting strangers on both sides of the employment relation. The employer is unaware of the competences of the new recruit and the new recruit is unaware what the position will be like, since he or she will be the first person to hold this position (Aldrich and Ruef, 2006).

It is, however, the informal process that is the primary source for attracting new employees (Williamson and Robinson, 2008). This can be explained by the rather inexpensive method and speed in which a person can be attracted. This is an advantage given the lack of financial and material resources that are available for this recruitment process. The process is somewhat distinct because the channels by which recruitment takes place were originally not intended for job market purposes (Marsden and Gorman, 2001). Such an approach allows firms to increase their application horizon because they are able to move more people into applying for the available position (Williamson and Robinson, 2008). Consequently, the quality of applicants might be higher because the person that suggests an individual has knowledge on the possible fit of the potential applicant. In addition, the reputation of the person in the social network is dependent on the quality of the person they refer Aldrich and Ruef (2006); Williamson and Robinson (2008). Individuals are eventually recruited because they, according to the founder and the already existing and trusted employees, posses the technical skills and experience needed to accomplish the tasks, have a cultural fit with the new organization, and/or have long term potential (Baron et al., 1999).

Thus, the motives for forming an entrepreneurial team and recruiting new employees are similar and both processes rely heavily on existing social networks. The individuals who can be mobilized from a social network are different in the pre-founding relationship (e.g family, friends, colleagues, and other acquaintances). The benefits that can be expected from these individuals might differ because the environment in which the social tie is developed is put into a new context (e.g. a friend or family member becomes a colleague, a former colleague changes organizational context, etc.). Therefore, it is important to distinguish between the different pre-founding relationships, rather than making only a distinction between the benefits of recruiting a strong or a weak tie. It can be expected that recruiting friends and family will have a different impact compared to recruiting former co-workers, because the latter relationship is already embedded in a work context.

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In the following sections, the role of adding a former co-worker to the start-up is discussed more in depth.

2.2 Internal Social Capital, Organizational Culture, and Selection Mechanisms

A widely accepted explanation on why new firms suffer from high mortality rates is their exposure to "liabilities of newness" (Stinchcombe, 1965) or "liabilities of adolescence" (Brüderl and Schüssler, 1990). The liability of newness hypothesis argues in favor of an age dependence of organizational mortality stating that the risk of death decreases with age. Although these liabilities are broad, they fall back on the following four factors that are linked to the social structures within these start-ups:

> (a) New organizations, especially new types of organizations, generally involve new roles, which have to be learned... (b) The process of inventing new roles, the determination of their mutual relations and of structuring the field of rewards and sanctions so as to get the maximum performance, have high costs in time, worry, conflict, and temporary inefficiency... (c) New organizations must rely heavily on social relations among strangers. This means that relations of trust are much more precarious in new than old organizations... (d) One of the main resources of old organizations is a set of stable ties to those who use organizational services. Old customers know how to use the services of the organization, have built their own social systems to use the old products or to influence the old type of government, are familiar with the channels of ordering, with performance qualities of the product, with how the price compares, and know the people they have to deal with... (Stinchcombe, 1965, p. 148-149).

Brüderl and Schüssler (1990) shares the perspective that the early years of a firm are more hazardous but argues that the risk of failure does not decrease directly after the establishment of the start-up. Instead, it increases in the first few months because of their resource endowment and rational behavior. After a short period, normally after the first evaluation, the risk will decline due to the same mechanism as discussed in

the liability of newness hypothesis. Although the timing between these different type of liabilities is different, both approaches hold the view that the mortality rate of start-ups is influenced by: (i) the lack of an organizational culture (i.e. the high cost, worry, conflict and inefficiency due to the invention of new roles), (ii) the lack of internal social capital (i.e. relation among strangers and the resulting low level of trust), and (iii) the lack of inter-organizational relationships (i.e. the ties to those who use organizational services), where the first two factors are closely connected to each other because they both deal with personal relationships.

As explained in the previous section, start-ups rely on social networks in their recruitment and entrepreneurial team formation process. This reliance can assist in overcoming the lack of internal social capital and the lack of an organizational culture. Internal social capital, or bonding ties, are the relations that create a higher degree of cohesiveness within the organization and accelerate the pursuit of collective goals, which fosters cooperative relationships (Adler and Kwon, 2002). From the perspective of new firm creation, intra-organizational bonding ties can only be present whenever a relationship already existed prior to the recruitment or entrepreneurial team formation process. On top of that, the presence of a social tie in the new firm already indicates a level of trust and cohesiveness. There are, however, various types of direct and indirect pre-founding relationships present in a social network (e.g. friends, family, friends of friends, former colleagues, etc.). Each pre-founding relationship and associated level of trust is formed in a particular context; a change of this context might have an effect on the trust and cohesiveness in the new organization. To illustrate this, compare a non-work related bonding tie (e.g. a friend) with a work-related bonding tie (e.g. a former colleague) and both individuals move to a new firm. The context of the latter remains the same (i.e. based on work) while the friend moves from a predominantly social context to a work context; a context which is not familiar to both sides of the newly formed co-worker relationship, and which most likely does not accelerate the pursuit of goals as quickly compared to the collaboration with a former colleague.

This last point is related to the need of a strong organizational culture (Stinchcombe, 1965; Campbell, 2005), also for new and emerging organizations (Aldrich and Ruef, 2006) The problem is that new firms do not have such a culture because they lack (i) the homogeneity and stability of group membership and (ii) the length and intensity

of shared experiences within the organization (Schein, 1984). Be that as it may, the fact that firms do not have a culture of their own does not mean it can, in the infancy phase, build on the shared experiences that have been formed in another organizational context. Involving former co-workers can lead to the creation of a strong culture and improved efficiency (Eisenhardt and Schoonhoven, 1990; Campbell, 2005). Each individual that enters the new start-up has internalized the organizational culture of the firms to which they were connected to in the past (Meek, 1988). If multiple individuals have the same previous firm experience, they bring the same organizational culture into the organization, which might help to overcome any initial problem with efficiency and role determination. This transfer of organizational culture can be placed on the same line with the spin-offs literature and the transfer of organizational routines and resources that influence the survival and overall performance of spin-off (Baron et al., 1999; Burton et al., 2002; Dahl and Reichstein, 2006).

Finally, previous interaction with former co-workers functions as a strong screening mechanism. Co-workers are exposed to each others' skills and competences on a daily basis. In this position a person is able to judge whether these skills and competences are valuable for the new organization. If these skills did not prove to be valuable, the former co-worker would not be asked to join the new venture; this would also be the case if it were believed that the person did not fit into the organizational culture. On the other hand, these selection mechanisms can also work the other way from the potential recruit to the new organization. A high degree of co-worker experience might also indicate and influence the co-worker of whether those that run the business have the competences and capability of running a potential success business and putting together a good team.

Based on the above, I derive that the presence of previous co-worker experience would benefit the new start-up in three interconnected ways. First, there is the presence of a bonding tie between the different co-workers in the new organization that leads to a higher level of trust and a higher degree of cohesiveness. Second, the shared organizational context can create a stronger organizational culture because parts of the culture that existed in the previous workplace will be transferred to the new start-up. This familiarity to the organizational culture will lead to more efficiency and less conflict, which is an advantage for the firm to survive in the initial phase. Third, there is a selection mechanism in attracting a former colleague into the organization. Based on the shared

working experience it is possible to make a first-hand judgment on whether individuals possess the resources that are needed to fulfill the task and whether this person will fit in the new firm. This results in the following hypothesis.

Hypothesis 1: An increase in the degree of previous co-worker experience increases the likelihood of firm survival.

Hypothesis 1 focuses on the previous co-worker experience of all human resources in the new venture. The specific role these human resources fulfill (i.e. whether they are a founder or an employee) is not taken into account. Nevertheless, it can be assumed that founders are more committed to the start-up than employees. In addition, they are the main decision makers.

Founders are shaped by their previous job positions, hence the notion of founders as organizational products (Audia and Rider, 2006). These experiences have proven to be influential in determining the survival rate of start-ups because the routines gained in the previous forms of employment are transferred to the new organization (Dahl and Reichstein, 2006). In addition to transferring the routines, they also influence the nature of the organization (Huber, 1991), and determine the organizational culture within the new firm (Schein, 1983, 1984; Bass and Avolio, 1994). Whenever previous co-worker experience is present among the founders, this organizational culture is enhanced because they can build on shared experiences. On top of that, the fact that former co-workers decide to start up a business together indicates a high level of trust and reliance on each other's competences (Eisenhardt and Schoonhoven, 1990).

The role of the employees should, however, not be overlooked. Founders are responsible for the recruitment of employees. By recruiting employees from previous workplaces the founder (i) increases the likelihood of recruiting a person that will fit in the organizational culture of the start-up, and (ii) had the opportunity to identify whether the skills this person has are suitable for the task this person is hired for. These perspectives lead to the formulation of the following hypotheses:

Hypothesis 2: Previous co-worker experience among and with the founder is

more important than previous co-worker experience among the employees.

In addition to the internal social capital and the need of an organizational culture, there was a third liability (i.e. lack of inter-organizational relationships). To overcome this liability problem, a start-up needs to possess industry specific knowledge (e.g. customer demand, products, technologies, suppliers and competition) (Cooper et al., 1994). A high degree of this knowledge will positively influence the surviving chances of the start-up. However, in the previous hypotheses I argue for a stronger effect of previous co-worker experience whenever the founder is involved in this relationship. For this reason, it should be considered whether there is a difference in the role of this previous co-worker experience, especially when the founder has experience in the same industry (i.e. if the start-up is an entrepreneurial spin-off) (Klepper, 2001; Helnat and Lieberman, 2002; Dahl et al., 2003). Earlier studies have already shown that this industry-specific experience of founders has a strong influence on the survival of firms (Agarwal et al., 2004; Klepper and Sleeper, 2005; Dahl and Reichstein, 2006). An entrepreneurial spin-off can build on the existing external relationships and will form a balance on the lack of internal social capital and organizational culture. For this reason, I hypothesize that entrepreneurial spin-offs rely less on previous co-worker experience than other types of start-ups.

> *Hypothesis 3: Entrepreneurial spin-offs rely more on founder experience, and previous co-worker experience will have less influence on the likelihood of firm survival compared to other start-ups.*

In the previous three hypotheses, I argued solely in favor for involving former co-workers into the organization. Despite these benefits, there might be "too much of a good thing", where a large degree of previous co-worker experience will be negative as a result of organizational inertia. I focus here on the structural inertia that arises as a result of high levels of previous co-worker experience. These inertia pressures will put constraints on the adaptive capabilities needed to solve problems of complexity encountered by these new firms. Hannan and Freeman (1977, 1984) list different types of internal and external inertia pressures. Despite the fact that these inertia pressures are discussed in relation to organizational change they can also be applied in connection to new venture creation.

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A new venture with a high degree of previous co-worker experience has strong roots with the previous organization and can therefore be treated as a special form of organizational change. Because I focus on the internal factors that influence the survival of the firm, I will elaborate on these internal inertia pressures: (i) sunk costs in plant, equipment and personnel, (ii) information constraints, (iii) the dynamics of political coalitions, and (iv) the tendency for precedents to become normative standards. [2]

Of most concern are inertia pressures two and four; even more so because they are intertwined. The fourth inertia, related to the tendency for precedents to become normative standards, will have an additional impact on the information constraints. If a start-up has a high degree of previous co-worker experience, the information will predominantly build on the information and contacts that were present in the previous organization, which constrains the search for opportunities (Aldrich and Ruef, 2006, p.78). That is why Adler and Kwon (2002) argues for the importance of both bonding and bridging ties, where bridging ties provide access to unique knowledge and contacts (Beckman, 2006); and resources that otherwise would not be available to the firm (McEvily and Zaheer, 1999). As indicated earlier, one motivation for recruiting new employees into the start-up is to integrate diverse knowledge that the organization lacks (Song et al., 2003). A high degree of previous co-worker experience would result in a lack of structural holes due to the strong tie nature of these contacts, which results in less new knowledge entering the start-up (Burt, 1992).

Hypothesis 4: Large levels of previous co-worker experience will hamper the survival of new firms

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[2]I consider the inertia pressures related to the sunk cost in plants, equipment and personnel and the dynamics of political coalition of least concern due to the selection mechanism in taking over equipment and the recruitment of new members. Equipment that does not represent any value for the organization will not be transferred to a new organization. Individuals who appeared to be of no value to the organization will not be recruited in the new ventures and the same would be valid for members who might cause problems because of a change in the political equilibria. At least there is no reason to assume that there is a higher risk that this occurs compared to the recruitment of other prospective employees.

3 Method

3.1 Data

In order to investigate the formulated hypotheses, I rely on the Danish Integrated Database for Labor Market Research (from now on referred to by its Danish acronym IDA). IDA is a longitudinal and universal linked employer-employee database constructed from government registers and maintained by Statistics Denmark (DST). This database contains detailed information on *all* individuals and *all* establishment in Denmark from 1980 onwards. Each individual and establishment has a unique identification number, which makes it possible to study firm dynamics (founding, growth and disbanding of firm) and the employment history of the labor force. These features make the database suitable for the analyses in this paper. On top of that, it is possible to identify personal (e.g. education and work experience) and firm characteristics, (e.g. number of employees, industry, ownership type and location). Given this structure, I can identify who worked at which establishment at any given year since 1980, which facilitates the identification of previous co-worker experience.

3.2 Start-ups, Founders and Entrepreneurial Spin-offs

For this analysis, I created a sample on all start-ups in the year 2000, excluding those start-ups that are active in the primary and public sector. The motivation for selecting this particular year is two-fold. First, I want to be able to identify co-worker experience over a long period of time; and where industry experience is an important controlling factor in the analyses. The accuracy in measuring industry experiences decreases before 1992 due to a break in the industry classification code. Second, I want to follow the firm for a number of years after founding to identify whether they survive. By choosing the year 2000, I have eight years to identify relevant industry experience and five years to identify firm survival. The founding year is confirmed by using information on the firm's founding date in combination with the establishment and firm identification number. A start-up is thus identified as a firm with no prior firm identification number that consists out of establishments with no previous establishment identification number (Dahl and Reichstein, 2007). I make use of the European NACE industry codes to exclude all start-ups active in the primary and public sector. All those establishments that are not

within the 15 and 75 two-digit level NACE code are excluded. Within these two digit codes there is one classification, 40 to 45 (energy), which is a mix of both public and private firms. Start-ups active in this industry range are also omitted from the sample. I will use the ownership code to remove those start-ups that are considered owned by the public sector or are affiliated to a foreign firm. Finally, I will impose a lower and upper size limit on the start-ups in the sample. It requires at least two individuals to create a connection based on previous co-worker experience. One-employee start-ups would create an estimation bias; for this reason, I put a lower limit size of two individuals. With the above-mentioned sample criteria in place, I have a small number of large start-ups (some with several hundred employees); because these are most likely an error in the data. I set an upper size limit of 25 individuals in the first year, which includes 98 percent of all the start-ups that fulfilled all the other requirements. By incorporating this final requirement, I end up with a sample of 3,034 new founded firms.

For each start-up, I identified the founder or founding team by using the occupational classification scheme of Statistics Denmark. A similar method has been used previously by Nanda and Sørensen (2009) and (Dahl and Reichstein, 2006) on the same database. The structure of the database does not allow me to clearly identify founders. Nevertheless, it is possible to single out managers and owners. Here I ague, in line with Dahl and Reichstein (2006), that the vast majority of Danish firms are likely to be managed by their founders. The selection of these founders will depend on the type of ownership. In the case of sole proprietorship and ordinary partnerships a founder is identified as a person that is either identified as an owner or a high ranked manager. If no identification can be made on these criteria, I identify the highest paid individual as the founder of the firm. For corporate ventures, I use a similar founder identification method with the exception of ventures that have three or less employees; in which case, I consider all individuals part of the founding team.

The work history of the founders will be used to determine whether the start-up was founded by a person who had industry specific know-how (i.e. is an entrepreneurial spin-off). Dahl and Reichstein (2006) identifies, by using the same database, an entrepreneurial spin-off as a start-up with at least two founders coming from the same firm within the same four-digit NACE industry class. I will follow a broader definition of such a spin-off due to (i) the small size of most start-ups, (ii) the low number of founders, and

(iii) the co-worker tie that is already present in this definition. In this paper, an entrepreneurial spin-off is a firm founded by at least one founder who has worked in the same four-digit NACE industry classification in at least one of their last three establishments. Within the sample, I identified 1,420 entrepreneurial spin-offs.

3.3 Variables

Dependent variable: The dependent variable is firm survival, not only for the year of founding but also for each consecutive year up to 2005. Firms might in reality re-enter into the same or in different industries; however, for analytical purposes I will treat these firms as non-survivors. Subsequently, these firms will not re-appear in the sample. Due to the structure of the database, I can only identify the year in which the start-up fails. For this reason, I will use a logistic regression to test the likelihood of survival, thereby creating a binary value firm survival. Table 1 shows the structure of the dataset and it shows that one firm might have more than one observation depending on the number of years it is able to survive. In total the sample consists of 10,540 firm year observations.

Table 1: Structure of the Dataset

FIRM ID	YEAR	SURVIVE	AGE	INDEPENDENT VARIABLES
2000-1	2000	1	1	. . .
2000-1	2001	1	2	. . .
2000-1	2002	1	3	. . .
2000-1	2003	0	4	. . .
2000-2	2000	1	1	. . .
2000-2	2001	0	2	. . .
2000-3	2000	1	1	. . .
2000-3	2001	1	2	. . .
2000-3	2002	1	3	. . .
2000-3	2003	1	4	. . .
2000-3	2004	1	5	. . .
2000-4	2000	0	1	. . .

Independent Variables: The core variables are those that indicate the degree of previous co-worker experience. This previous co-worker experience is measured on all the human resources that are present in the first *and* second year. The motivation for choosing the human resources in the first two years is: (i) the observation that most firms start small and hardly change in size during their lifetime (Aldrich and Ruef, 2006); (ii) the initial resource profile can be used to predict start-up performance, including failure

(Cooper et al., 1994); and (iii) early hiring decisions have lasting consequences for new organizations (Baron et al., 1999). As IDA uses unique personal identification numbers, I can avoid double counting.

To create these variables, I selected the three most recent establishments in which each individual was active before joining this new venture. Some individuals are not registered to have had any work experience, either because they were new to the Danish labor market or experienced a long spell of unemployment. In total I created four different previous co-worker experience variables. The first variable measures the degree of previous co-worker experience based on all individuals (i.e. founders and employees) who are associated with the new venture in the first two years. This variable, termed *know all* I calculated based on the following concentration measure:

$$C_i = \sum_{i=1}^{n} s_{ij}^2 \tag{1}$$

C_i= Concentration of employees with a previous co-worker relationship in the new firm.

s_{ij}= Share of individuals who can be associated to firm i and share a with at least one individual that previously worked firm j.

n= Those shares where two or more current employees share the same previous workplace.

In order to calculate this measure, I identified those individuals who share a common establishments based on the last three establishments in which they were active. Here I need to stress the fact that around 80 percent of all ties are identified based on the most recent establishment. In addition, it is important to recognize that two individuals can share the same establishment even though they did not work at this establishment at the same time. Afterwards, I measure the share of all individuals who worked in each of the previous establishments and take the square value of each share to assign a higher value to larger groups in the firm. Contrary to a more ordinary concentration measure (e.g. Herfindahl-Hirschman Index) the square values of individuals who do not share a previous establishment with another individual will not be added. The reason for doing so is that a relationship exists between at least two individuals. To further illustrate

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this, imagine a firm with five individuals where two individuals share the same previous workplace. In this situation C_i will have a value of 0.16. If this same firm consisted of ten individuals but still with two from the same workplace, C_i would drop to 0.04. If no individuals share the same previous firm this value would drop to zero.

To disentangle the effect of knowing the founder or knowing other co-workers, I introduce the variable termed *know foundempl*. This variable indicates the share of employees who had a previous co-worker relationship with at least one of the founders. For calculating the degree of previous co-worker experience among the employees, *know employee*, and founders, *know founder*, I use the same measure as presented to calculate *know all*.

Control Variables: In addition to the above-mentioned explanatory variables, I need to control other for factors that explain differences in firm survival. The usual predictors are: size, age, type of ownership, location, and industry. As a measure of size, I take the logarithmic value of the number of employees that are present in the first and second year of founding. The age variable is a categorical variable indicating the age of the start-up in number of years. In addition to size and age I will also, as suggested by (Brüderl and Schüssler, 1990), control for the type of ownership being either sole proprietorship, general partnership or a limited partnership. A dummy variable is created for each of these different ownership types. Another variable to control for is whether the new firm is located in the Copenhagen Metropolitan Area (CMA). Start-ups located in this area face stronger competition compared to those located in other parts of the country. Such a variable has also been used in previous studies (Brüderl and Schüssler, 1990; Eriksson and Kuhn, 2006; Dahl and Reichstein, 2006). The last variable to control for is industry. To do so, I include non-reported fixed effects variables on the two-digit NACE industry code, which will capture a large degree of unobserved heterogeneity among start-ups. Those industries that have only one observation will be assigned to the two-digit industry class to which they are most similar.

In addition to the above-mentioned overall firm characteristic, I also correct for human capital characteristics of the initial human resource composition. Even though a firm is subject to these characteristics changing due to the arrival and departure of employees, the initial composition has proven to be a good estimator for future performance (Cooper et al., 1994). First, I create a variable indicating the share of individuals with

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an academic degree as earlier studies have identified that education has a positive effect on performance. Second, the average number of years of total work experience (average number of years an individual has been present in the database since 1980). Third, tenure in the previous firm (average number of years an individual has been registered as employee of the previous firm). Fourth average year of work experience in the same four-digit NACE industry class. The last variable will indicate the share of individuals who in at least one their last three establishments, worked in the same four-digit NACE industry class as the start-up.

4 Results

4.1 Descriptive Statistics

Table 2 shows the survival of all the start-ups in the sample. The first year, 81.95 percent of start-ups survive, but this number decreases to 64.92 percent in the second, 53.06 percent in the third, and 46.52 percent in the fourth year. At the end of the observation period, in total 1,249 of the start-ups are still present, which accounts for just over 41 percent of all initial start-ups.

In addition to the general survival patterns, firm survival is presented by looking at larger industry classes. This illustrates once more, differences on the level of industry and hence the need to control for this factor in the analyses, however, a more detailed industry classification will be used to capture this heterogeneity. Most new firms are

Table 2: Survival Rate by Year and Industry

Year	Industry						
	TOTAL	MANU.	CONSTR.	WHOLESALE & RETAIL	HOTEL & REST.	TRANS.	FIN. & BUS. SERV.
No. start-ups	3,043	216	437	810	604	176	800
2001	81.95%	87.96%	83.98%	83.95%	71.69%	88.07%	83.50%
2002	64.92%	73.15%	67.51%	67.65%	51.99%	72.16%	66.63%
2003	53.06%	61.57%	56.06%	56.79%	39.90%	63.07%	53.00%
2004	46.52%	55.09%	50.11%	48.52%	33.11%	57.39%	47.88%
2005	41.06%	49.07%	46.45%	43.08%	26.82%	50.56%	42.50%
firms in 2005	1,249	106	203	349	162	89	340

founded in Wholesale & Retail followed by Financial & Business Services. The least number of start-ups occur in the transport sector, most likely due to higher costs of entry. This industry also experiences the highest survival rate, 50.56 percent of start-ups are able to survive the five-year period. The sector that has the highest failure rate is, not surprisingly, Hotel & Restaurant with a survival rate of 26.82 percent. It is also this industry that pulls down the general survival rates of new firms.

Table 3: Descriptive Statistics and Correlation Matrix (n=10,540)

VARIABLE	MEAN	S.E.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 survive	0.830	0.376														
2 age	2.608	1.388	**0.07**													
3 size (log)	1.609	0.754	**0.12**	**0.07**												
4 CMA	0.448	0.497	0.00	0.01	0.02											
5 ownership type	2.207	0.951	**0.13**	**0.07**	**0.17**	**0.15**										
6 spin-off	0.494	0.500	**0.06**	**0.04**	**0.09**	0.00	-0.01									
7 know all	0.203	0.301	**0.07**	**0.05**	**-0.13**	-0.02	**0.08**	**0.11**								
8 know found	0.179	0.353	**0.07**	**0.05**	**0.09**	0.03	**0.20**	**0.11**	**0.54**							
9 know foundempl	0.137	0.348	**0.07**	**0.05**	**0.13**	0.00	**0.09**	**0.12**	**0.47**	**0.33**						
10 know empl	0.085	0.205	**0.06**	**0.04**	**0.19**	-0.02	**0.09**	**0.05**	**0.42**	**0.09**	**0.33**					
11 share of higher educated	0.086	0.196	**0.02**	0.01	-0.01	**0.20**	**0.26**	**-0.09**	0.03	**0.13**	0.02	-0.04				
12 tenure in the previous establishment	2.960	2.282	**0.10**	**0.06**	**-0.15**	**-0.09**	**0.12**	0.02	**0.35**	**0.17**	**0.17**	**0.21**	-0.03			
13 average yrs work experience	9.438	4.059	**0.11**	**0.07**	**-0.25**	**-0.04**	**0.24**	0.03	**0.39**	**0.20**	**0.21**	**0.20**	**0.07**	**0.56**		
14 average yrs industry experience	2.538	1.844	**0.11**	**0.07**	**0.11**	-0.01	**-0.11**	**0.44**	**0.05**	-0.01	0.03	**0.08**	**-0.14**	**0.10**	**-0.13**	
15 share from same industry	0.516	0.315	**0.11**	**0.07**	**0.09**	0.00	**-0.08**	**0.64**	**0.10**	0.02	0.06	**0.11**	**-0.14**	0.02	**-0.09**	**0.80**

CORRELATION MATRIX

Note 1: Correlation estimates in bold indicate significance at five percent level.

Note 2: Tests of multicollinearity have been conducted using the variance inflation factor (VIF) method. There is only a high VIF on *know all* in combination with *know founder* and *know employee*. There is no problem of multicollinearity, since the VIF does not exceed the value five, when these variables are included one at a time.

In Table 3, I present an overview of the descriptive statistics of the variables used in the regression analysis, including the correlation matrix. Bear in mind that the averages and standard errors are calculated based on the 10,540 yearly observations. The correlations between the variables are highly significant. The collinearity is high between *know all* on the one hand and *know founder*, *know foundempl*, and *know employee* on the other. Because these are substitute variables in separate regression models this collinearity is expected. In total, 50 percent of all start-ups (1,522) experience some degree of previous co-worker experience. Most co-worker experience is found among the entrepreneurial spin-offs (i.e. just over 56 percent).

4.2   Regression Results

The results of the logistic regressions using industry fixed effects are summarized in Table 4 and Table 5. Please note that survival has the value *one* and death the value *zero* when interpreting the effects of each variable. A positive sign thus indicates a positive effect on the likelihood of survival.

Model A1 shows the outcome of a logistic regression analysis including the control variables and the co-worker experience variable *know all*. After correcting for the usual predictors of firm survival, the analysis shows a significant and positive effect of previous co-worker experience on the likelihood of firm survival. When considering the other employee characteristic variables, a strong effect is visible for the experience variables where tenure in the same industry has a positive effect on firm survival. This indicates the importance on the presence of industry-specific know-how. The other experience variables are also strongly significant indicating that overall experience has a positive impact on the likelihood of firm survival. Finally, education appears to have a significant and positive effect on the likelihood of firm survival; however, this effect is only significant on the ten percent level.

In Model A2, I make a distinction between founders and employees by substituting *know all* with *know founder*, *know foundempl*, and *know employee*. This allows me to determine if there is a different effect when comparing founder-founder, employee-founder, and employee- employee ties. The outcome shows a positive and significant effect regarding the share of employees who worked previously with one of the founders on the likelihood

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Table 4: Summary of the Regression Analyses

Variable	MODEL A1 Estimate		S.E	MODEL A2 Estimate		S.E	MODEL A3 spin-off Estimate		S.E	MODEL A4 other start-up Estimate		S.E
Intercept	-0.658	***	0.167	-0.629	***	0.169	-0.728	**	0.295	-0.901	***	0.223
year 5	0.234	***	0.072	0.233	***	0.072	0.211	**	0.104	0.233	**	0.103
year 4	0.203	***	0.067	0.203	***	0.067	0.107		0.095	0.283	***	0.098
year 3	-0.214	***	0.055	-0.213	***	0.055	-0.179	**	0.081	-0.246	***	0.077
year 2	-0.290	***	0.049	-0.289	***	0.050	-0.236	***	0.074	-0.331	***	0.069
year 1	benchmark			benchmark			benchmark			benchmark		
log(size)	0.521	***	0.044	0.498	***	0.045	0.451	***	0.068	0.560	***	0.074
CMA	-0.018		0.057	-0.020		0.057	-0.005		0.086	-0.050		0.079
limited partnership	0.328	***	0.053	0.331	***	0.053	0.270	***	0.080	0.401	***	0.074
general partnership	-0.144	*	0.078	-0.161	**	0.079	-0.080		0.118	-0.244	**	0.108
sole proprietorship	benchmark			benchmark			benchmark			benchmark		
know all	0.245	**	0.104									
know founder				0.185	**	0.093	0.044		0.125	0.362	**	0.146
know foundempl				0.206	*	0.112	0.181		0.148	0.279		0.179
know employee				0.004		0.163	0.074		0.248	-0.127		0.229
share of higher educated	0.284	*	0.164	0.275	*	0.165	0.681	**	0.307	0.136		0.204
tenure in previous firm	0.066	***	0.017	0.067	***	0.017	0.051	*	0.027	0.067	***	0.023
total work experience	0.062	***	0.010	0.062	***	0.010	0.040	**	0.015	0.083	***	0.013
total industry experience	0.122	***	0.026	0.122	***	0.026	0.148	***	0.035	0.084	*	0.044
share from same industry	0.365	**	0.141	0.367	**	0.144	0.487	**	0.247	0.734	***	0.274
Industry dummies	yes			yes			yes			yes		
N	10,540			10,540			5,202			5,338		
Likelihood ratio	782.007***			786.399***			289.597***			496.711***		

*** Significant at the 1% level
** Significant at the 5% level
*Significant at the 10% level

of firm survival. However, there is also a positive effect visible on the co-worker experience among the founders, which also shows a stronger level of significance. Previous co-worker experience among employees does not have any effect on the likelihood of firm survival. The remaining variables do not differ from those reported in Model 1.

Since I expect a different effect between entrepreneurial spin-offs and other type of start-ups, I undertook two separate analyses on these firm characteristics. Model A3 presents the results for entrepreneurial spin-offs and Model A4 shows the effects of previous co-worker experience on other start-ups. The two models show distinctive differences in the effect of previous co-worker experience on firm survival. Model 3 cannot present any significant effect of previous co-worker experience. The remaining variables all have a positive effect on the likelihood of firm survival. In Model 4, the results are different. The previous co-worker experience among founders has a significant positive effect on

the likelihood of firm survival, while the other ties do not show any significant signs. For both entrepreneurial spin-offs and other start-ups the presence of individuals with experience in the same industry is important, while the length is stronger and more significant for spin-offs. Other overall experiences seem to have a stronger and more significant effect on other start-ups.

In Table 5 I present three models (i.e. Model B1, Model B2, and Model B3) that test the impact of a large degree of previous co-worker experience. This is done by testing whether there is a curvilinear relationship between previous co-worker experience and firm survival. There turns out to be a high degree of multicollinearity on these core variables, with the exception of know all, which cannot be solved by normalization. However, based on the *know all* variable and the square value of this variable I can test for the presence of a curvilinear effect. Overall, the model suggests that there is a curvilinear effect of previous co-worker experience on the likelihood of firm survival, however, the negative effect is visible for those start-ups where previous co-worker experience is close to the maximum value. In Model B2 there appears to be no significant effect of previous co-worker experience, which was already shown in Model A3. Model B3 shows, just as Model B1, that previous co-worker experience has a curvilinear effect on the survival of start-ups.

5 The Effects of Previous Co-Worker Experience on Firm Survival

In this paper, I analyzed the effect of previous co-worker experience on the survival of 3,043 new established Danish firms. The argument behind the expected importance of this experience is on the one hand, the need for cohesion and an organizational culture to tackle the liabilities faced by start-ups, and on the other hand, is the opportunity for previous colleagues to screen each others competences and skills to the needs of the new start-up. However, I also expect that too much of this previous co-worker experience will lead to organizational inertia; consequently hampering the organization in the search for alternative opportunities to solve complex problems. Based on these theoretical considerations, four hypotheses have been formalized.

Table 5: Summary of the Regression Analyses on Curvilinear Effects

Variable	MODEL B1			MODEL B2 spin-off			MODEL B3 other start-up		
	Estimate		S.E	Estimate		S.E	Estimate		S.E
Intercept	-0.498	***	0.178	-0.732	**	0.309	-0.672	***	0.229
year 5	0.233	***	0.072	0.213	**	0.104	0.232	**	0.101
year 4	0.202	***	0.067	0.108		0.095	0.282	***	0.096
year 3	-0.214	***	0.055	-0.180	**	0.081	-0.248	***	0.076
year 2	-0.289	***	0.050	-0.237	***	0.074	-0.331	***	0.067
year 1	benchmark			benchmark			benchmark		
log(size)	0.493	***	0.046	0.456	***	0.068	0.543	***	0.067
CMA	-0.016		0.057	-0.013		0.086	-0.040		0.078
limited partnership	0.332	***	0.053	0.264	***	0.080	0.407	***	0.073
general partnership	-0.150	*	0.078	-0.078		0.117	-0.226	**	0.107
sole proprietorship	benchmark			benchmark			benchmark		
know all	0.171	***	0.058	0.063		0.082	0.267	***	0.086
(know all)^2	-0.058	**	0.029	-0.042		0.038	-0.082	*	0.046
share of higher educated	0.281	*	0.164	0.683	**	0.305	0.132		0.200
tenure in previous firm	0.066	***	0.017	0.056	**	0.027	0.064	***	0.023
total work experience	0.061	***	0.010	0.043	***	0.015	0.080	***	0.013
total industry experience	0.124	***	0.026	0.144	***	0.035	0.091	**	0.044
share from same industry	0.354	**	0.144	0.558	**	0.251	0.682	**	0.270
industry dummies	yes			yes			yes		
N	10,540			5,202			5,338		
Likelihood ratio	786.007***			288.531***			497.705***		

*** Significant at the 1% level
** Significant at the 5% level
*Significant at the 10% level

Hypothesis 1, which argues in favor of previous co-worker experience on the likelihood of firm survival, is supported. Previous co-worker experience appears to have explanatory power in the survival of new ventures. Adding former co-workers to the organization seems to be a fruitful strategy to overcome a firm's liability of newness, as suggested by Eisenhardt and Schoonhoven (1990); Schoonhoven and Romanelli (2001); Campbell (2005). Whether this is because these co-workers bring in the required internal social capital, organizational culture, or competences cannot, however, be identified. In addition, co-worker experience is based on the last three establishments before the person joined the new venture, which means that (i) members do not have to be present during the same time period and (ii) members who were never in contact with each other. Nevertheless, the likelihood that those individuals who shared a previous workplace without having known each other in this previous workplace is rather low, especially since 80 percent of all relations were based on the most recent establishment. Even if they did not work together they still have internalized the previous firm's organizational culture

(Meek, 1988).

Hypothesis 2 takes the first hypothesis as a point of departure but puts emphasis on the importance of the founder as the main decision-maker and the person that determines the organizational culture in the new firm. The results, which are presented in Model 2, support the hypothesis that previous co-worker experience with and among founders is more important in explaining the likelihood of firm survival. The founder should be part of the previous co-worker relationship in order to have an effect on the survival of new ventures. However, the employees are also a crucial component. This would support the argument that founders are not the only contributing factor to the success and failure of new ventures (Katz et al., 2000; Cardon and Stevens, 2004) and that there is a need for broadening the scope by including all human resources of the new organization. One potential problem that I encountered was whether the persons whom I identified as being part of the founding team are indeed the founders of the start-up. It might be that the founding team is larger or smaller, nevertheless, the founding team is based mostly on those who are identified as top managers and owners of the start-up. This means that previous co-worker experience in this group is positive. In addition, even if I over-estimated the size of the team or identified the wrong individuals as founding team members, there is still a strong effect on overall previous co-worker experience.

Hypothesis 3 makes a distinction between entrepreneurial spin-offs and other start-ups and states that entrepreneurial spin-offs predominantly benefit from industry-specific knowledge lowering the impact of previous co-worker experience. This hypothesis is supported since entrepreneurial spin-offs do not seem to benefit from previous co-worker experience. They benefit more from the fact that founders have experience in the same industry, which partly solves the inter-organizational liability problem, and the length of this industry experience has a strong significant and positive effect on the likelihood of firm survival. Other start-ups seem to benefit from the previous co-worker experience that existed among the entrepreneurial team, although the same disclaimer would apply as described in the previous paragraph regarding the selection of these founders. Because these start-ups lack these inter-organizational competences among the founders, they deal with the high level of uncertainty by creating an organization that is built on trust and cohesion. Furthermore, the overall work experience and the experience in the last firm has a stronger effect in these ordinary start-ups compared to entrepreneurial spin-

offs. This can also be interpreted as the intensity of previous co-worker experience since most of the former co-worker relationships are based on the last establishment in which they were active.

The last hypothesis finds minor support in the results of the regression analysis. There appears to be a marginal decreasing effect of previous co-worker experience where close to maximum values show a negative effect . Thus, a high degree of previous co-worker experience leads to some degree of inertia and hampers the organizations in their search for opportunities (Aldrich and Ruef, 2006). This also supports the argument that there is a need for both bonding and bridging ties in the organization, where bridging ties provide the start-up with new sources of information (Davidsson and Honig, 2003). However, when splitting up the sample into entrepreneurial spin-offs and other start-ups, this curvilinear effect is only visible for other start-ups, which was to be expected given the non-significant effect of previous co-worker experience found while testing for Hypothesis 3. As it was shown, other start-ups can overcome their problem of liability by working together with former colleagues, which can enhance the level of trust and cohesion or simply enable the selection of better competences. Nevertheless, too much previous co-worker experience creates an environment where too much of the same organizational culture and competences are applied in a completely different industry. This can lead to too much reliance on established routines which in turn can make a firm inflexible and slow to adapt and survive when there are changes in an unknown industry and/or the market.

6   Discussion

New ventures face a list of challenges, all related to what is called liability of newness (Stinchcombe, 1965) and liability of adolescence (Brüderl and Schüssler, 1990). Both these liabilities lie in the social domain of these ventures (e.g., personal and inter-organizational relationships). In addition, new ventures also face challenges in the recruitment process (Williamson et al., 2002), which results in a strong reliance on informal recruitment methods. This process might, besides the speed and costs, reduce the liability problem since it leads to the recruitment of individuals who have a relationship with the founder and trusted employees. Consequently, the internal social capital in these

ventures can be improved. Furthermore, if these new recruits are former co-workers, these relationships can build on a strong bonding tie and bring established organizational cultures into an environment where this culture is crucial (Campbell, 2005). Up to now, I identified a few studies that address this issue of shared affiliation within new ventures, Beckman (2006); Beckman et al. (2007), but no studies have been found that include all human resources (i.e., founders and employees) into the analysis.

This study, based on a sample of 3,043 newly founded firms in the Danish economy, provided some micro level evidence on the importance of previous co-worker experience. This is consistent with what one would expect when looking at the theory on how these shared experiences would affect the survival of new ventures (Eisenhardt and Schoonhoven, 1990; Schoonhoven and Romanelli, 2001; Campbell, 2005). Thereby controlling the usual predictors of firm survival (e.g., industry, location, average age, education, and work experience), there is a clear indication that this previous co-worker experience has a significant and positive effect on the likelihood of firm survival, especially for those start-ups that cannot build on established routines within the same industry. This effect is mostly ascribed to the situation in which the founder is part of this previous co-worker experience between founders and employees, indicating the importance of founders in the process that determines the direction of the new organization. The results do not only show the importance of previous co-worker experience, but also provide minor support that there are inertia pressures as a result of a high degree of previous co-worker experience. Hannan and Freeman (1977) addresses this problem for the adaptive capability of organizations. These problems appear to be valid only for normal start-ups since they will be hampered by the inertia pressures that predominantly rest on the routines in a completely different industry.

Although the results show a significant and positive effect there is definitely more room for future research. In this paper, I focused on co-workers since the data only allows me to look at this specific role. This analyses could be expanded by identifying more precisely what the underlying mechanism were for mobilizing the co-worker in the new venture (i.e., internal social capital, organizational culture, selection of the competences and skills required), and if there is a difference in how these motives affect new venture performance. More qualitative approaches can identify what the real motivation is for starting up with former colleagues. Especially because many of these former colleagues

will leave a secure job position to work in an uncertain environment. Furthermore, it would be interesting to look at other specific roles within the strong and weak ties dichotomy (i.e., family, friends, including the effect of strangers); it is the interaction between all these individuals that determine firm survival. This interaction most likely varies in different types of start-ups and across different industries. Other studies on human resource formation in entrepreneurship have shown that there is a tendency to create homogeneous teams, but the impact of such a composition has only recently become an area of interest. Some studies argue for the benefits of being diverse while others argue that diversity leads to conflict. The accessibility to the current linked employer-employee databases offers the possibility to test, and in the process challenge, these viewpoints.

Finally, I would like to stress the importance on the issue raised by Katz et al. (2000) and Cardon and Stevens (2004) to not forget the importance of employees in the analyses and the impact that human resources may have on start-up performances. The access to linked employer-employee databases provide researchers with a powerful tool to look beyond the founders. Founders are a small part of a small organizational setting and it is the interaction between all the members that eventually determine the performance of new ventures.

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